University of Pennsylvania, School of Engineering & Applied Science

Department of Chemical & Biomolecular Engineering

220 South 33rd Street

Philadelphia, PA 19104

Tuesday, April 19, 2022

Dear Dr. Sue Ann Bidstrup Allen and Professor Bruce Vrana,

Please find enclosed a report detailing the technical and economic specifications of a process to convert polyethylene terephthalate (PET) polymer waste into dimethyl terephthalate and ethylene glycol monomers, as proposed by Mr. Stephen Tieri. The process depolymerizes 100,000 metric tons of polyethylene terephthalate and produces 94,132 and 52,984 metric tons of dimethyl terephthalate and ethylene glycol per year. The dimethyl terephthalate product is more than 99.5 wt% pure and the ethylene glycol product is more than 97.5 wt% pure. The plant will be located in Charleston, WV, allowing the plant to have considerable access to both feedstock sources and customer facilities, and will operate 24 hours per day for 330 days per year.

With a cost of capital at 15% and current feedstock and product prices, the depolymerization process has a negative Net Present Value (NPV) of -$198MM. While several optimization options for the process are provided in the report that may increase the NPV, we would not recommend the depolymerization plant as a standalone process from an economic point of view. However, larger government incentives for recycling of plastics in addition to direct cooperation with an adjacent repolymerization plant could make it a much more economically attractive process.

Additionally, analysis of greenhouse gas emissions found that our chemical recycling process produces more greenhouse gas emissions than a mechanical recycling process would. However, emissions cannot be compared directly versus the emissions rate for the production of virgin PET from fossil fuel resins, as our process does not include the energy requirements for re-polymerization of dimethyl terephthalate and ethylene glycol. It can be estimated though that if less than 2.36 lb of greenhouse gases per kg of PET is produced when repolymerizing dimethyl terephthalate and ethylene glycol, chemically recycling PET via our process will emit less greenhouse gases than producing virgin PET.

Thank you for the support throughout the semester.

Sincerely,

Chelsea Cao Hyuck Choi Christopher Kline Shannon Zhang

Mixed PET Plastics Waste to Dimethyl Terephthalate & Ethylene Glycol

Chelsea Cao, Hyuck Choi, Christopher Kline, Shannon Zhang

Faculty Advisor: Dr. Sue Ann Bidstrup Allen

Project Author: Mr. Stephen Tieri

University of Pennsylvania

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4. Abstract

Polyethylene terephthalate (PET) plastic is integral to our everyday lives. As the primary plastic used in food and beverage packaging and synthetic textiles (PET Resin Association, 2015), PET is produced in North America at a rate of 3.1 million tons per year. However, as of 2015, only 26.6% of the PET produced is being recycled per year (PET Resin Association, 2015). Thus, the accumulation of PET waste has become a significant environmental concern. To address this problem, this report proposes a methanolysis plant using technology from Eastman Chemical Company (Sharpe et al., 2020) to depolymerize 100,000 metric tons of PET plastic waste annually into dimethyl terephthalate (DMT) and ethylene glycol (EG). The process in this report uses a sodium carbonate catalyst with a methanol reagent at a temperature of 160°C and pressure of 250 psig for one hour, during which the PET polymer undergoes a transesterification reaction to produce DMT and EG. Various separation processes were included in the design to produce products of 99.8 wt% pure DMT and 99.1 wt% pure glycols (97.5 wt% EG). Preprocessing equipment was also included in the design to filter out impurities from the PET waste feedstock before it entered the reactors.

Based on a cost of capital of 15% and current prices of feedstock and products, economic analyses predicted a -$198MM net present value (NPV), return of investment (ROI) of –12.18% in year 3, and a negative internal rate of return (IRR). However, based on aggressive growth rate projections of the recycled PET market, it is possible but unlikely to reach a positive NPV of 677MM. Thus, although the process is not currently economically viable, it is likely that future uptake of sustainable plastics would make the process profitable.

5. Introduction and Objective-Time Chart

5.1 Introduction of the Problem

Plastic products are ubiquitous in the modern world but present significant problems in handling and disposal at the end of their lifecycle. To date, humans have created over 8.3 billion metric tons of plastic (Dengler, 2017). It is commonly believed that much of this plastic finds a second life as recycled material, but, as of 2018, less than 10% of all plastic is recycled (United States Environmental Protection Agency, n.d.). There are several reasons why plastic is not easily recyclable. First, there are many varieties of plastic; plastics are broadly categorized into one of seven resin codes and cannot be recycled in combination. Additionally, during the manufacturing process, dyes and additives can be added to plastics to change their inherent properties, but these additives must be removed in the recycling process ("Recycling Plastic: Complications & Limitations," n.d.). Many plastic wastes contain other contaminants as well, such as moisture, organic material, and adhesives. Thus, the process to sort resin from its additives and contaminants is difficult, energy intensive, and expensive, so often, buying virgin feedstock is a much cheaper option. Finally, even after the previous difficulties are addressed, plastics can degrade in certain recycling processes, and many plastics can only be recycled once, into lower-grade products.

Taken together, these factors make plastics some of the most prolific waste materials in our landfills and oceans. Once disposed of, plastics may take up to 1,000 years to decompose, all while leaching toxic compounds like phthalates and bisphenol A into the environment. Additionally, plastics decompose into nanoparticles that enter the food chain, and these particles have shown the ability to cross the blood-brain barrier and alter the behavior of affected organisms (UN Environment Programme, 2021). Meanwhile, incineration of plastics for energy

generation releases carcinogenic compounds, neurotoxins, and air pollutants (Rosenberg et al., 2021). However, not only does plastic cause disposal issues at the end of its lifecycle, but it also poses environmental problems at the very start. Plastics are produced from crude oil and natural gas, raw materials that are produced via fracking (a dangerous and destabilizing process) and that liberate carbon deposits as they are extracted. These petrochemicals need to be refined and cracked to produce the correct size of polymers. Refining and cracking both require massive amounts of heat and release toxic compounds into the environment. The harms of plastic production and disposal are so great that environmental advocates have coined the term “plastic death cycle” (Synoracki, 2021).

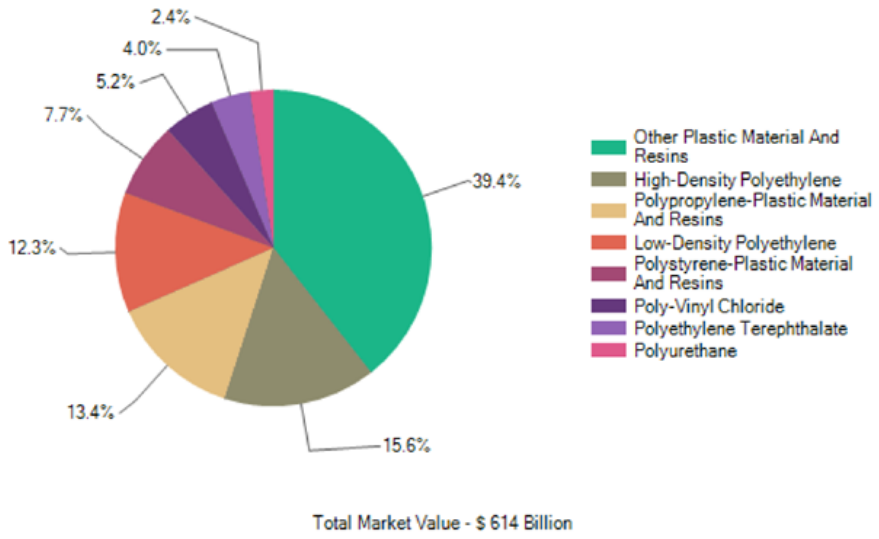


Figure 5.1.1 Breakdown of the global plastic resin market in 2019 by type of resin ($ Bn) from Mohite et al., 2020.

Polyethylene terephthalate (PET), also known as No. 1 plastic (per its resin code), is one of the most common types of plastics in use, accounting for 3.1 million tons produced annually in North America. PET is strong and highly resistant to moisture, gas permeability, and solvation by organic and inorganic compounds, making it an ideal candidate for use in food and beverage

packaging and textiles (PET Resin Association, 2015). PET also has a recycling rate of 26.6%, making it one of the more recyclable plastics currently in use (PET Resin Association, 2015).

5.2 Goals and Scope

In 2020, Eastman Chemical Company filed for an international patent governing the process of recycling PET plastic using methanolysis, aided by the presence of several potential catalysts, into dimethyl terephthalate (DMT) and ethylene glycol (EG). Eastman stated that such a process could reduce the greenhouse gas (GHG) burden of PET production by up to 30% when compared to virgin PET. This senior design project aims to construct an economically viable process to complete this depolymerization of mixed PET waste at a rate of 100,000 metric tons of PET per year. Additionally, this process aims to recycle the greatest amount of reagent possible and limit the production of waste to maximize its eco-friendliness.

5.3 Timeline

Table 5.3.1 Gantt chart of team timeline

Milestones	**1/18**	**1/25**	**2/1**	**2/8**	**2/15**	**2/22**	**3/1**	**3/8**	**3/15**	**3/22**	**3/29**	**4/5**	**4/12**	**4/19**	**4/26**
Material Balances															
Preliminary Cost Analysis															
Selection of Reaction Pathway															
Computer Drawn PFD															
Market Analyses															
Environmental, Toxicity, Safety															
Detailed Equipment Design															
Financial Analyses															
Deadlines	**1/18**	**1/25**	**2/1**	**2/8**	**2/15**	**2/22**	**3/1**	**3/8**	**3/15**	**3/22**	**3/29**	**4/5**	**4/12**	**4/19**	**4/26**
Midsemester Oral Report															
M&T Presentation															
Report															
CBE Presentation															

6. Innovation Map (N/A)

7. Market and Competitive Analyses

7.1 Market Sizing

The global demand for plastics continues to grow, driven by increases in demand for durable and nondurable goods. In turn, these consumer appetites are fed by factors such as a growing middle class in the developing world and the manufacture of desirable consumer goods like electric vehicles. Another significant driver of growth in the plastics industry is the COVID-19 pandemic that has increased use of personal protective equipment. Taken together, the growth of the plastics industry represents both an increase in availability of recycling feedstock and an increase in demand for recycled plastic products.

Table 7.1.1 Projected global market for PET from 2019 to 2027 by region, in kilotons. Accessed from the 2020 October Plastics Resin Market Report.

REGION	2019	2020	2021	2022	2023	2024	2025	2026	2027	CAGR (2020–2027)
North America	5,089.2	4,987.7	5,255.1	5,531.3	5,816.3	6,110.0	6,412.1	6,722.4	7,040.7	5.0%
Europe	6,960.0	6,801.4	7,145.5	7,499.8	7,863.9	8,237.7	8,620.9	9,013.1	9,413.9	4.8%
Asia-Pacific	11,634.7	11,314.6	11,829.5	12,355.7	12,892.6	13,439.7	13,996.3	14,561.6	15,134.9	4.2%
LAMEA	3,819.5	3,723.1	3,901.5	4,084.5	4,272.0	4,463.7	4,659.4	4,859.0	5,062.3	4.5%
Total	27,503.4	26,826.8	28,131.6	29,471.3	30,844.9	32,251.1	33,688.7	35,156.2	36,651.9	4.6%

The global demand for DMT and EG continue to grow as well. DMT is primarily used in the production of plastics such as PET, polytrimethylene terephthalate (PTT), and polybutylene terephthalate (PBT). Meanwhile, EG is a more versatile compound often used for heat transfer applications, such as antifreeze or coolant (American Chemistry Council, n.d.).

The global PET, DMT, and EG markets are inextricably linked, as DMT and EG are monomeric components of PET. As of 2020, the global PET market was valued at $27 billion, and is expected to surpass $40 billion by 2028, with a CAGR of 3.69% (Allied Market Research,

2017). The recycled PET (rPET) market comprises a large subset of the PET market, at $8.6 billion, and is expected to grow at a significant CAGR of 6.7% until 2028 (Grand View Research, 2021). Meanwhile, the global DMT market was valued at $790 million with a CAGR of 5.7% (SNNTV, 2022) and the global EG market was valued at $26.1 billion with a CAGR of 3.3% (Research and Markets, 2022).

Taken together, the total addressable market for DMT and EG amounts to $26.9 billion. Assuming a similar market penetration of recycled products as PET, the serviceable addressable market for EG and DMT amounts to $8.6 billion. On a basis of 100,000 tons of PET per year, the share of market occupied by this senior design process is $126 million per year.

7.2 Competitive Analysis

In addition to Eastman, another major company that recycles PET via methanolysis is Loop Industries. Loop is a Canadian company with a $100 million chemical recycling facility in Quebec and $250 million facilities planned for construction in France and the USA (Loop Industries, 2021). Loop claims to have developed a proprietary catalyst enabling methanolysis at low temperatures and atmospheric pressure. Such a catalyst would give Loop an enormous competitive advantage, given the significant energy costs of heating and pressurizing PET during the depolymerization reaction. However, there has been controversy associated with Loop's claims; Hindenburg Research was unable to replicate this catalyst in independent testing and have alleged that Loop has no viable technology based on Loop's claims of a 100% yield on PET recycling. There have also been anonymous claims that key experimental data was manipulated (Hindenburg Research, 2020).

Loop has major corporate partners such as Suez (a major French environmental group) and Indorama (a PET manufacturer). However, Loop has already fallen behind on key milestones, such as the construction of its South Carolina plant (Hindenburg Research, 2020). Loop has also already signed agreements to supply Pepsico, Danone, and L'Oréal with branded rPET packaging (Loop Industries, 2021a; Loop Industries, 2021b). However, it was unable to meet supplier milestones with Coca-Cola Cross Enterprise Procurement Group, who terminated their contract as a result. Finally, concerns have been raised about the accuracy of Loop's financial data (Goldsberry, 2020).

7.3 Green Premium

Currently, rPET is priced at a 16% premium to virgin PET (vPET) due to strong demand. Major companies such as Nestle and Danone have pledged millions of dollars to switch their packaging to sustainable materials, driven by consumer pressure, as half of consumers have stated that they are willing to pay premium prices for eco-friendly products (Accenture, 2019). This drastic increase in consumer interest is also reflected in Figure 7.3.1. Thus, we priced the rEG and rDMT products from our process at a similar premium ($0.89 and $1.59 per pound respectively).

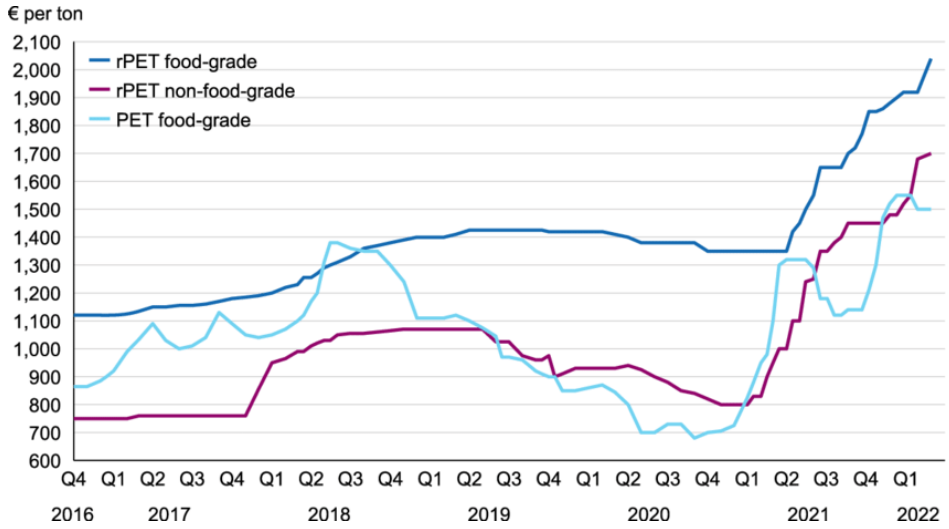


Figure 7.3.1 Price trend of virgin and recycled PET polymers between 2016 and 2022. Figure obtained from Kahlert and Bening, 2019.

7.4 Sales Projections

Sales of our process's EG and DMT will be based on a feed rate of 100,000 MT of PET waste per year. More detailed sales projections are provided in Section 24 (Profitability Analysis).

8. Customer Requirements (N/A)

9. Critical-to-Quality (CTQ) Variables – Product Requirements (N/A)

10. Product Concepts (N/A)

11. Superior Product Concepts (N/A)

12. Competitive Process Synthesis (N/A)

13. Preliminary Process Synthesis

13.1 Recycling Pathway Considerations

Depolymerization of PET can be completed through four different processes: hydrolysis, glycolysis, aminolysis/ammonolysis, and methanolysis. The process examined in this report is methanolysis, which was chosen after careful consideration of all four processes.

PET hydrolysis produces terephthalic acid (TPA) and EG, and can be further divided into three types of reactions: alkaline hydrolysis, acid hydrolysis, and neutral hydrolysis. In general, the disadvantages of hydrolysis are that it requires high temperatures (200-250°C) and pressures (200-290 psig) and long reaction times (Sinha et al., 2010). Additionally, acidic hydrolysis requires the use of corrosive solvents, while alkaline hydrolysis forms inorganic salts that are difficult to dispose of. While neutral hydrolysis is appealing due to its use of water or steam as a nontoxic and cheap reactant, the TPA produced from this process is expensive to purify as it retains mechanical impurities found in the feed PET material (Sinha et al., 2010).

PET glycolysis produces bis(2-Hydroxyethyl) terephthalate (BHET) by reacting PET with alkylene glycols (typically EG). While the production of BHET would be desirable due to its ability to produce PET directly via polycondensation, the reaction of PET with EG produces other oligomers of PET alongside BHET. Separation of BHET from other PET oligomers is difficult due to their chemical similarities, but not isolating BHET and leaving different oligomers in the presence of BHET during its polycondensation can interfere with the PET manufacturing process (Inagaki et al., 2013). As a result, most commercial-scale glycolysis processes are coupled with a subsequent methanolysis treatment, in which the oligomers are reacted with methanol to produce DMT and EG.

PET aminolysis produces bis(2-hydroxyethyl) terephthalamide (BHETA) using amines, while PET ammonolysis uses ammonia to produce terephthalamide. Neither process has been used on a commercial scale for PET recycling (Damayanti & Wu, 2021), and available information on PET aminolysis and ammonolysis reaction kinetics and process limitations is lacking.

PET methanolysis produces DMT and EG via a transesterification reaction of PET with methanol. This process was developed with the goal of avoiding the heterogeneous reaction products of glycolysis and finding a renewable and eco-friendly degradation agent for PET (Geyer et al., 2016). Disadvantages of the process include high costs of product separation and refinement (Al-Sabagh et al., 2016). Additionally, the global trend of PET production has shifted away from using DMT to using TPA, which can be attributed to the lower VOC emissions of the TPA-to-PET process (US EPA, 1991) alongside a growing demand for more environmentally across the world ("Recycled Polyethylene Terephthalate Production", 2021)

This report discusses the design of a methanolysis PET recycling process that makes use of a sodium carbonate catalyst, operates at 160°C and 265 psig, and has a residence time of 1 hour. While the process is not without its disadvantages as discussed above, it addresses the issues of difficult solvents and excessive reaction temperatures and times that plague PET hydrolysis, requires less equipment than the glycolysis-methanolysis process, and has been sufficiently studied such that information on existing methanolysis processes and reaction kinetics are available, unlike with PET aminolysis and ammonolysis. Additionally, Eastman recently announced plans to build a $250 million methanolysis recycling facility in Tennessee, USA (Tullo, 2021) and a $1 billion methanolysisEastman Chemical Company, 2022). Eastman's commitment to methanolysis in future PET recycling endeavors inspired this report's pursuit of

PET recycling via methanolysis as well. However, preliminary research into potential reaction processes included an in-depth analysis of the viability of glycolysis and why it is less compelling than methanolysis, which is discussed in Section 13.3.

13.2 Preliminary Preprocessing Processes

Two different preprocessing lines were considered when designing a process for cleaning and purifying a feed of post-consumer PET bottle bales: a process line from Zhangjiagang Lianguan Recycling Science Technology Co., hereafter referred to as Lianguan Recycling, and a process line from ASG Recycling Machinery.

Lianguan Recycling

The PET preprocessing line presented by Lianguan Recycling adequately separates the PET bottle bales into pure PET bottle flakes for the reaction process. Lianguan uses a multitude of process equipment to debale the feed, remove labels and other contaminants, and crush the PET into flakes. The advantages of this line include the presence of a shredder, which helps reduce the feed size for the crusher and reduces the power demands on the equipment. The process line is also quoted at a significantly lower price than that of ASG Recycling Machinery's line. However, there are a few major disadvantages to the Lianguan process. There is less automation than the ASG line and the inclusion of a manual sorting table requires a higher labor cost for operators to manually separate bottles. The line also has a lower maximum capacity of 3,000 kg/hr, requiring the purchase of more processing lines to handle our hourly processing rate. The Lianguan process also produces a less pure product than the ASG process, with 2% water content and 300ppm of miscellaneous impurities ("PET Bottle Washing Line (Luxury Configuration)", n.d.).

ASG Recycling Machinery

The PET preprocessing line offered by ASG Recycling Machinery was also explored when considering how to purify the contaminated PET bottle bale feedstock. Much like the Lianguan Recycling line, a multitude of process equipment is used to remove contaminants like glass, metals, labels, residues, glues, and non-PET plastics. While this process is more expensive in terms of equipment cost, it produces a purer PET bottle flake product which has less than 1% water content and 100ppm of impurities ("PET Bottle Washing Line (2019 Update)", n.d.). The benefit of a purer feed for the reactor system, along with the reduction of labor costs due to automation of the line, far outweighed the disadvantage of higher purchase costs. The process can also handle a higher feed rate of 4,000 kg/hr, reducing the number of lines needed to handle the required feed rate to the system for our process. One disadvantage for this process is that the output flake size is 14-16 mm ("PET Bottle Washing Line (2019 Update)", n.d.), while a particle size of about 1 mm is desirable to ensure an increased rate of reaction for our methanolysis depolymerization (Ligorati et al., 1970). However, the ASG line was chosen due to its other advantages versus the Lianguan line. To address the particle size issue, we replaced the line's given crusher with additional crushing equipment to further reduce the pure PET bottle flake size.

13.3 Preliminary Reaction Processes

Four different reaction processes were investigated to depolymerize PET into its monomer form DMT and EG: (1) supercritical methanol; (2) methanolysis via Loop Industries' proprietary catalyst; (3) glycolysis in tandem with methanolysis; (4) Eastman Chemical methanolysis process.

Supercritical methanol

Supercritical methanol was investigated for its high yield percentage and absence of a catalyst. Based on a surface methodology approach (Liu et al., 2015)°C with a residence time of 112 minutes and a 6:1 ratio of methanol to PET resulted in the highest yield percentage of DMT (99.79%). Reaction yield percentage results from Liu's research (2015) at different temperatures, residence times, and ratios of the reactants can be found in Table 13.3.1.

Table 13.3.1 Experimental Design Based on RSM for the Yield of DMT from Liu et al. (2015).

Run order	Temperature (°C) X_1	Time (min) X_2	MeOH/PET mass ratio X_3	Yield (%)
1	280	68	8	76.34
2	280	15	10	21.18
3	280	120	10	93.39
4	320	68	6	90.96
5	240	68	6	52.41
6	320	68	10	96.57
7	280	68	8	78.35
8	280	68	8	79.37
9	240	15	8	6.73
10	240	68	10	52.31
11	240	120	8	76.16
12	280	15	6	21.03
13	280	120	6	91.46
14	320	120	8	99.79
15	320	15	8	28.11

Comparisons of DMT yield over various papers, as shown in Table 13.3.2, also indicate high yield in general when using supercritical methanol. A high mass ratio of methanol to PET and high reaction temperatures are required for this reaction to work.

Table 13.3.2 Comparisons of DMT Yield Obtained with Different Reaction Conditions from Liu et al. (2015).

References	Optimum reaction conditions			DMT yield (%)
	Reaction temperature (°C)	Reaction time (min)	MeOH to PET mass ratio	
This study	298	112	6	99.79
Kim [28]	310	60	10	97.7
Sako [18]	300	30	15 mL MeOH to 0.5 g PET	~100
Yang [19]	260–270	40–60	6–8	~98
Peng [37]	330	45	43	73

Despite acceptable yields, several obstacles prevent this reaction from being considered viable for this project. First, high temperatures and pressures are required for methanol to reach supercritical conditions. At 240°C, a minimum pressure of 1175 psig must be maintained. Although not problematic for lab procedures, safety issues arise when industrial quantities of methanol are heated and pressurized to process 100,000 metric tons of PET. Second, high utility costs due to the required temperatures and pressures make the economics of the project unfavorable. Unless a substantially higher price than the current market price is introduced for the sales of DMT and EG, operating costs were determined to outweigh the price of the desired products as shown in appendix 28.25.

Loop Industries

The methanolysis reaction using Loop Industries' proprietary catalyst was also investigated. Loop depolymerizes waste PET plastic and polyester fiber to TPA and EG and re-polymerizes these products to PET. Experimental results have shown their proprietary catalyst enables the methanolysis reaction to occur at room temperature and atmospheric pressure for a mixing time of 1-5 hours, which addresses the aforementioned problems with supercritical methanolysis (Essaddam, 2019). Loop also tested varying amounts of different alkali methoxides (sodium methoxide, potassium ethoxide, aluminum tri-n-propoxide, tetrabutylammonium

methoxide) and different cosolvents (DMSO, halogenated solvent, methanol, benzyl alcohol) that could be used to decompose PET at a temperature lower than the boiling point of methanol. Specifically, use of dichloromethane, potassium hydroxide, and methanol have provided the most profitable results at room temperature and atmoshperic pressure (Essaddam, 2019).

Despite these favorable results, the validity of Loop's technology is suspect, as Hindenburg Research was unable to independently duplicate the experimental results shown in their patent (Hindenburg Research, 2020).

Glycolysis

The glycolysis reaction was investigated using a Teijin Fibers Limited process. Teijin's process proposed a method of depolymerizing dyed PET fabric into its monomers, DMT and EG, by using a glycolysis process followed by methanolysis process. In the process, the dyed PET fabric is first charged with paraxylene in a dye extraction step, followed by a solid-liquid separation step involving suction filtration. This is repeated twice with paraxylene and then a third time with EG to fully remove the dye from the PET. The PET fabric is then depolymerized into BHET, along with other PET oligomers, using EG and a potassium carbonate catalyst. A distillation step is performed to remove excess EG from the BHET. Recall that the products from glycolysis contain not only BHET, but other PET oligomers that interfere with the PET manufacturing process (Inagaki et al., 2013). To avoid this, the BHET and other PET oligomers from the glycolysis process undergo methanolysis using a potassium carbonate catalyst to form DMT and EG. DMT and EG are then separated out for purity. The process appears to be viable given its high yield percentages of 85% (Mukai & Nakashima, 2011) at atmospheric pressures and lower temperatures than required for the supercritical methanol approach. However, there are multiple disadvantages to this process. The generation of a wide array of oligomers greatly

increases the cost of separations. Furthermore, the reaction from dimer to BHET is reversible, meaning that the reaction equilibrium can shift backwards to produce dimers from BHET if the glycolysis product stream is left to sit for too long (Walas, 1990). These complications, paired with the high cost of the dye extraction steps, make this process undesirable.

Eastman Chemical Methanolysis

Eastman Chemical Company filed a patent for their methanolysis process using various catalysts at different catalyst loading mol%, temperatures, and methanol to PET ratios as shown in Table 13.3.3 (Sharpe et al., 2020). From subsequent experiments detailed in Sharpe et al., (2020) it was determined that sodium carbonate was the optimal catalyst using the process specified in the patent. Compared to the prior three reaction processes, this process had sufficient data in addition to acceptable yields of 77.7% at relatively low temperatures compared to the supercritical methanolysis processes. Preliminary analyses showed that utility costs were more affordable compared to the supercritical method. The process will be discussed in more detail in Section 16.2.

Table 13.3.3 Catalyst Evaluations for Methanolysis at Different Parameters from Sharpe et al. (2020).

Experiment	Catalyst	Catalyst loading (mol %)	MeOH:PET (w/w)	Temperature (°C)	Dissolution Time (minutes)	%DMT of soluble material (GC)	% Insoluble material (GC)
1	None	0	3.33:1	150	Never Dissolved	0.06	68.9
2	Sodium Methoxide	10	3.33:1	150	30	65.5	0
3	Sodium Methoxide	10	3.33:1	100	Never dissolved	64.34	22.9
4[1]	Sodium methoxide, zinc acetate	10,2	3.33:1	150	60	50.43	3.81
5	DBU	10			60	83.86	0.32
6	DBU	5	3.33:1	170	240	66.99	7.43
7	Magnesium methoxide	10	3.33:1	150	Never Dissolved	89.11	65.4
8	Magnesium methoxide	10	3.33:1	200	Could not measure	56.05	0.61
9	Magnesium methoxide	5	3.33:1	200	Could not measure	74.25	1.31
10	TBD	10			30	68.36	2.78
11	TBD	5	3.33:1	130	150	72.20	3.37
12	TMG[2]	10	3.33:1		75	59.99	0.48
13	Triethylamine	10	3.33:1	150	Never dissolved	42.9	96.34
14	Triethylamine	10	3.33:1	170	Never dissolved	63.90	82.30
15[3]	Zinc acetate, N,N-dimethylurea	10,10	3.33:1	150	Never dissolved	63.77	60.74
16	Bmim$(ZnCl)_3$	10	3.33:1	150	Never dissolved	Did not analyze	Did not analyze
17	TBD/MSA	10	150	150	Never dissolved	34.8	96.9
18	tBuOK	10	150	150	60	51.33	9.63
19	Na_2CO_3	5	2.5:1	150	Never dissolved	52.7	43.27
20	Na_2CO_3	10	2.5:1	160	Could not measure	74.20	2.78
21	$NaHCO_3$	10	2.5:1	150	Never dissolved	47.7	14.8
22	K_2CO_3	10	3.33:1	150	120	59.07	5.54
23	K_2SO_4	10	3.33:1	150	Never dissolved	61.7	92.67
24	KOH	5	3.33:1	150	Never dissolved	Did not analyze	Did not analyze
25	NaOH	5	3.33:1	150	Never dissolved	Did not analyze	Did not analyze
26	$Ti(O^iPr)_4$	10	3.33:1	150	Never dissolved	4.41	95.89

13.4 Preliminary Separation Processes

Azeotropes

To develop an accurate separation process, an understanding of the mixture that is produced from the reactor is necessary. The chemistry behind the methanolysis of PET is known, as shown in Section 14.4. PET undergoes a transesterification reaction to replace its ester with the alcohol in methanol, producing DMT and EG. In a preliminary analysis of our proposed process, we assumed that our reaction would be ideal; 100% pure PET would react with methanol, leading to our reactor containing and producing only the following components: PET, methanol, DMT, and EG. Figure 13.4.1 shows the ternary diagram between methanol, DMT, and EG produced using Aspen. Any binary parameters that do not exist in Aspen's database are estimated using the UNIFAC method for the NRTL parameters.

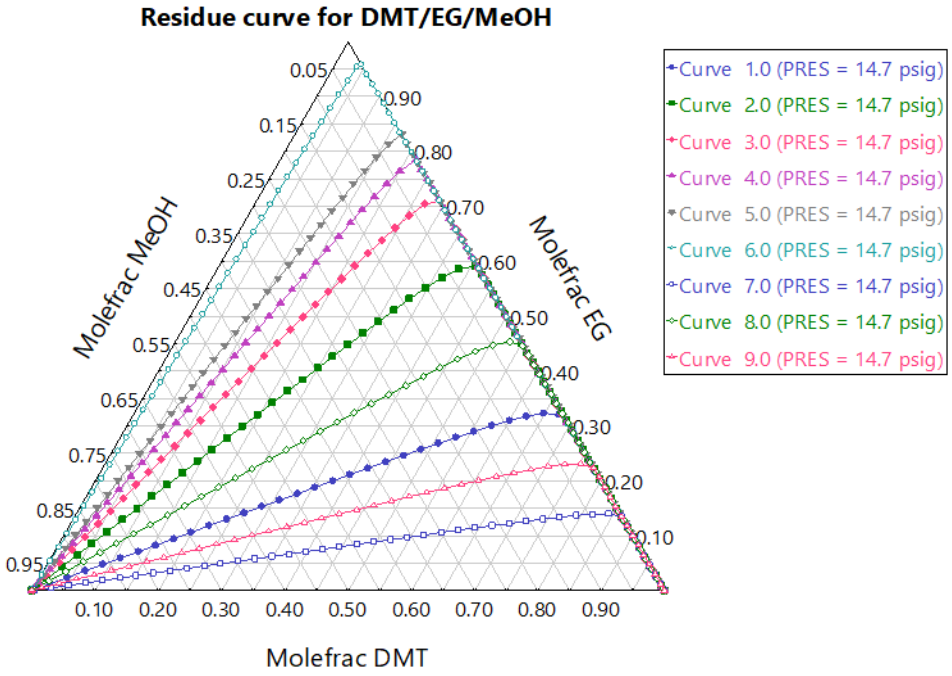


Figure 13.4.1 Ternary diagram methanol, DMT, and EG at 14.7 psig. No azeotropes exist in the diagram.

Note that no azeotropes are found on Figure 13.4.1. While no azeotropes exist in our idealized product mixture, Pudack et al.'s 2020 literature review and US patents numbers 5,391,263 (Hepner et al., 1995) and 2,945,788 (Watzl & Siggelmethanolysis process. A search in Gould's *Azeotropic Data* (1973) reveals that while an azeotrope does not exist between glycol and methyl phthalate, as replicated in Figure 13.4.1, an azeotrope does exist between DEG and methyl phthalate at a boiling point of 245°C and in a mixture with 96.3 wt% DEG. The x-y diagram for DEG and DMT produced in Aspen is shown below in Figure 13.4.2, which displays this azeotrope. Any missing binary NRTL parameters from the Aspen database used to generate the diagrams are estimated using the UNIFAC method.

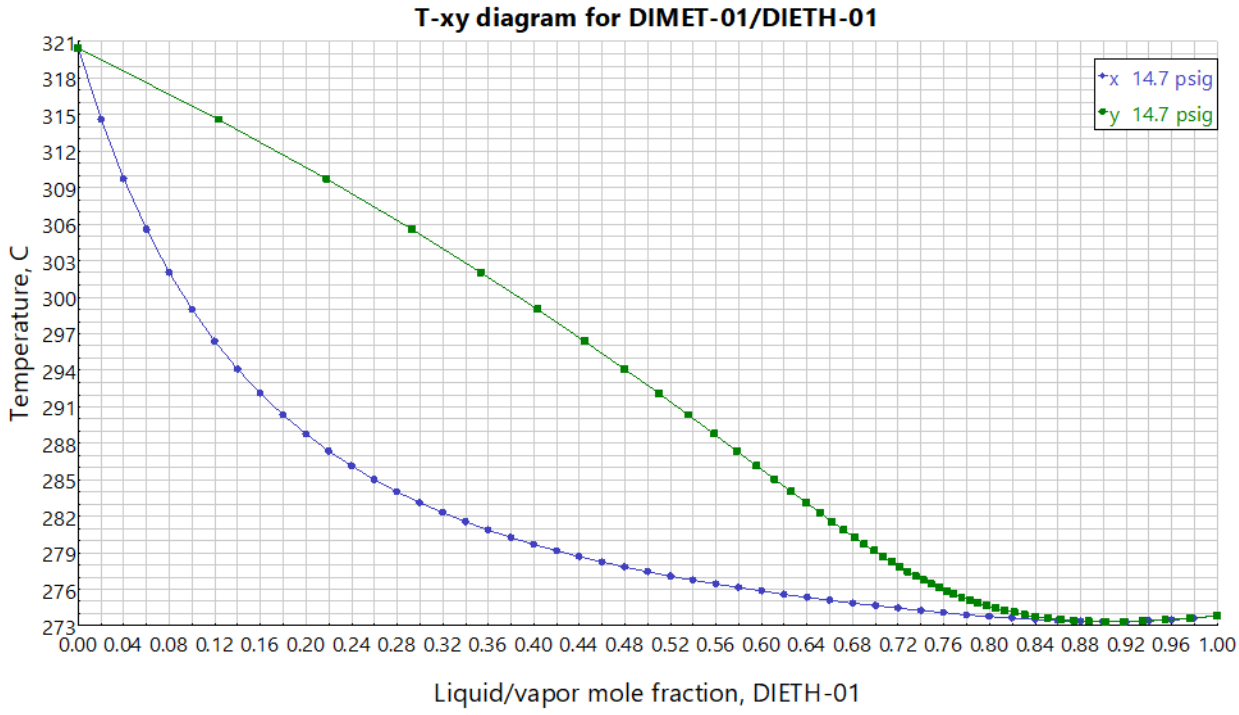


Figure 13.4.2 Binary T-xy diagram between DMT and DEG at 14.7 psig.

Holland and Hay (2002) report that commercial PET produced by Eastman and DuPont contains between 2.3 to 6.8 mol% DEG, as DEG is produced during the PET polymerization process by dehydration of EG (Kirby et al., 1965). In agreement with the azeotrope found in the

aforementioned sources and with these findings, we assumed that the PET feedstock to our process would produce 95 mol% EG and 5 mol% DEG. Thus, our separation process was developed to be able to break the azeotrope between DMT and DEG to enable the production of high-purity DMT and EG.

Separation Process Iterations

Several different iterations of separation processes were developed over the progression of this project. All include a solid/liquid separation block before a more detailed liquid/liquid separation process, which is expanded upon at the end of this section.

The first iteration was developed before the DMT/DEG azeotrope was discovered, so while it can achieve high purity DMT and EG products in mixtures without DEG, it is not viable for our final process. Figure 13.4.3 shows this design iteration, where the liquid product from the reactors is sent to a distillation column (DC-1) that removes DMT as bottoms, and the overhead is sent to another distillation column (DC-2) to separate methanol in its overhead and EG in its bottoms. Two problems emerge with this design: first, the DMT bottoms stream, when simulated in Aspen Plus, comes out at 315°C. To avoid using hot oil in the reboiler rather than steam, we later altered this design to reduce the DMT stream temperature to below 240°C. Additionally, removing methanol from the final distillation column significantly increases the size of the first distillation column, as there is a large amount of methanol in the mixture. It is more cost-efficient to remove the methanol first in our separation process to reduce the size of subsequent equipment.

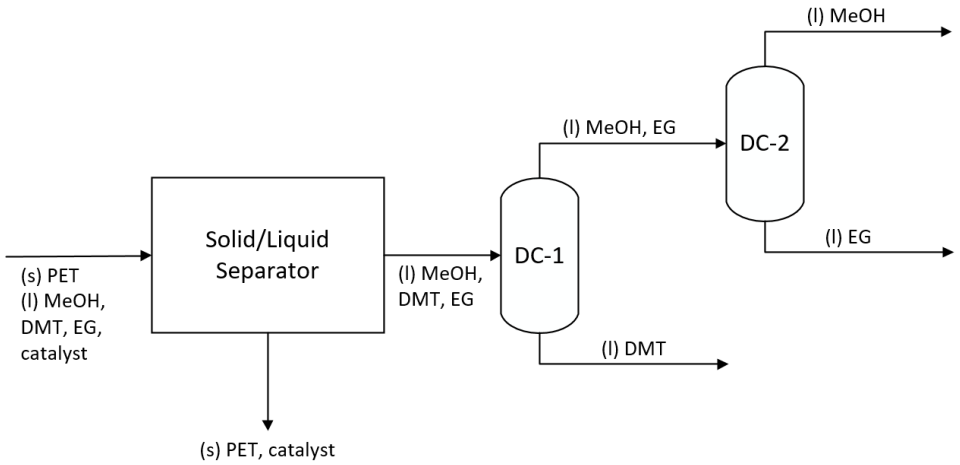


Figure 13.4.3 Preliminary distillation separations design with no azeotropes present.

The next processes were all developed with consideration of the DMT/DEG azeotrope. Figure 13.4.4 is based on US patent 6,706,843 (Ishihara et al., 2004), and uses a crystallizer. The slurry from the crystallizer is sent to a centrifuge, which produces a wet DMT cake and a liquid composed of mostly methanol and EG, but also small amounts of DEG and DMT. The wet cake is washed with methanol and dried, producing high-purity DMT, and the liquid stream is distilled. Crystallizing the DMT circumvents the issue of removing DEG from the DMT product. However, the liquid emerging from the centrifuge still contains a small amount of liquefied DMT and DEG – while methanol can be easily separated out from the mixture, high-purity EG or a high-purity mixed solution of DEG/EG cannot without additional equipment to break the DMT/DEG azeotrope. Further development of this process sequence was halted as we investigated a separation process that more closely resembled the one found in US patent 5,391,263.

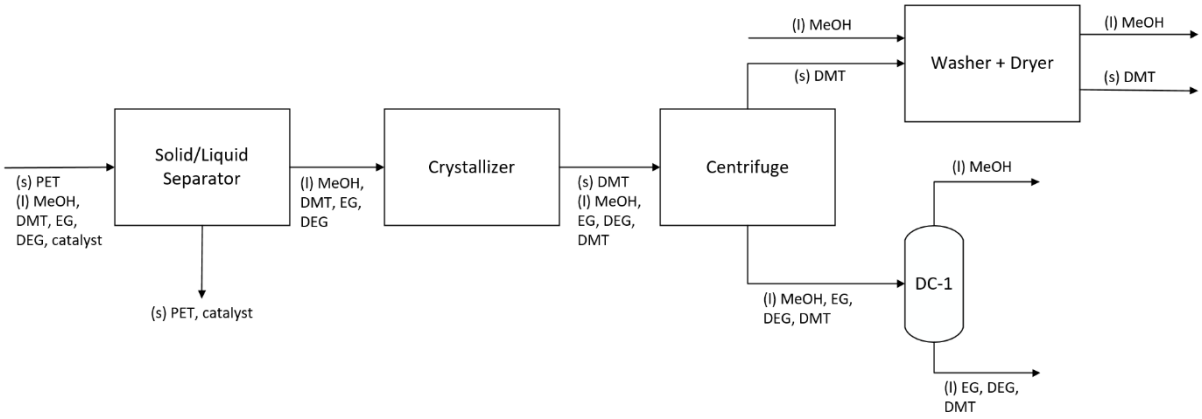


Figure 13.4.4 Preliminary crystallization separations design with DMT/DEG azeotrope present.

US patent 5,391,263 details a process for separating high-purity DMT and EG from a PET methanolysis process using methyl p-toluate (MPT), methyl benzoate (MB), or a mixture of MPT and MB as an azeotrope-breaking agent. Through examination of this patent, we came up with two different potential separation processes, which are shown in Figure 13.4.5 and Figure 13.4.6. Figure 13.4.5 is an iteration on Figure 13.4.3, which fixes both issues previously described with Figure 13.4.3. The high DMT stream temperature is adjusted by including a vacuum system with DC-2 in Figure 13.4.5 to reduce its pressure to 2.18 psig, which reduces the temperature of the DMT product stream to 233°C. The methanol is also removed in the first step of the process, which significantly reduces the size of the subsequent columns in the process. This process variation was developed with the goal of maximizing the simplicity of the process design with the DMT/DEG azeotrope in mind. No azeotrope breaking agent is included which simplifies the process at the expense of product purity. Simulating this process in Aspen Plus produces product streams of 94.8 wt% pure glycols (93.6 wt% EG) and 99.5 wt% pure DMT. Note that while prices are readily available for 95% inhibited EG, these solutions are blended with a specific inhibitor that reduces its EG purity, while our solution of 95 wt% EG contains

arbitrary impurities including DMT and water. Prices for general solutions of 95 wt% EG are not readily available.

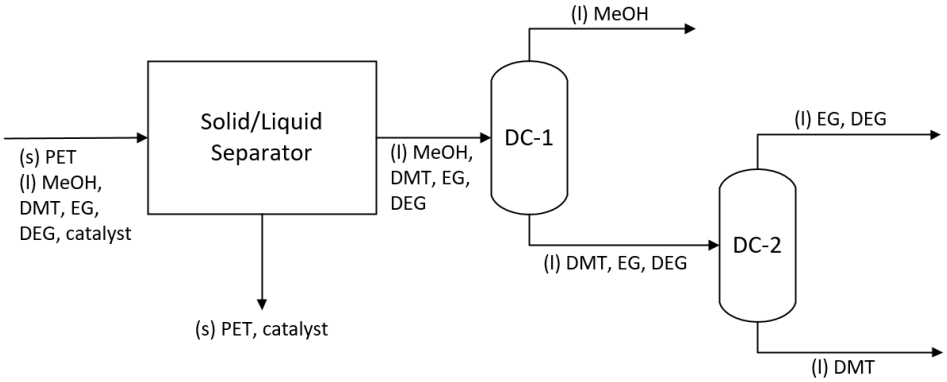


Figure 13.4.5 Preliminary distillation separations design with DMT/DEG azeotrope present without an azeotrope breaking agent.

Figure 13.4.6 shows the separation process developed to include an azeotrope breaking agent, MPT, from US patent 5,391,263. It was designed by closely following the process described in the patent as well. In the process, methanol is removed first via distillation in DC-1. At startup, a charge of MPT is added to the second distillation column (DC-2) along with the bottoms product from the methanol distillation column, which is rich in DMT. At steady state, a smaller constant stream of MPT is added to the second distillation column. The overhead product of the second column contains the glycols and MPT, which are sent to a decanter (DEC). As described in US patent 5,391,263, the mixture in the decanter will separate into two phases: one rich in MPT, and one rich in glycols. The MPT-rich phase is recycled back to the second distillation column, and the glycol-rich phase is distilled one more time via DC-3 to produce a high-purity glycols product in the final column's bottoms product. The final column's overhead product, which is mostly MPT, is recycled back to the decanter. When modeling this process in Aspen Plus, the second MPT recycle stream from the final distillation column was treated as a

purge stream instead due to difficulties with getting the mass balances in the simulation to close. This adjustment is carried over in our final separation process, as observed in Figure 13.4.7. The product purities from this process as modeled in Aspen Plus can achieve a 99.1 wt% glycols product (95.6 wt% EG) and a 99.8 wt% DMT product, which is better than in the previous process shown. However, this process requires more equipment.

We decided to move forward with this design despite the additional equipment costs because prices for 95 wt% glycol solutions are not readily available, while prices for 99 wt% glycol solutions are. However, if the price of a general 95 wt% glycol solution does become available, consideration should be given as to whether the presumably lower price from this product versus a 99 wt% glycols product would offset the additional equipment cost associated with an azeotrope breaking process.

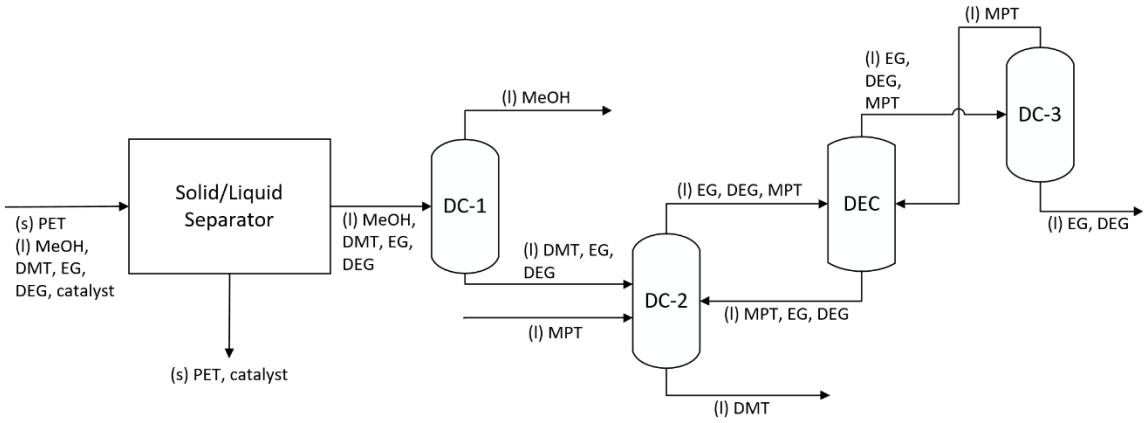


Figure 13.4.6 Preliminary distillation separations design with DMT/DEG azeotrope present and an azeotrope breaking agent.

Several adjustments were made to the separation process before finalizing the design, which is shown in Figure 13.4.7. First, an additional distillation column was added to distill the DMT-rich bottoms stream after it is separated from the glycols and MPT. This is due to further research into PET solubility in methanol revealing that 98.2 wt% of PET is soluble in methanol

(Sharpe & Morrow, 2021). The unreacted, soluble PET is removed from DC-3 as shown in Figure 13.4.7 to be recycled back to the reactor block. 95 wt% of the bottoms stream from this additional column is recycled back to the reactor block to have another chance to depolymerize, and the rest of the stream is purged in the case that it contains heavy contaminants.

We also designed the solid/liquid separation block. An evaporator was included, which is fed the stream out of the reactor after it is reduced in pressure using a pump (not shown). The evaporator crystallizes the catalyst that is dissolved in the methanol, which is then removed from the liquid remaining in the evaporator along with insoluble PET and other solid contaminants using filter candles. The stream out of the filter candles is fed into a distillation column, DC-2, to separate the glycols from DMT. The evaporator operates at vacuum, so a compressor and heat exchanger were added to increase the pressure and condense the vapor stream from the evaporator so it can enter a distillation column, DC-1. This distillation column serves to separate methanol from the DMT and glycols that were also vaporized from the evaporator. Its overhead is recycled back to the reactor block, and its bottoms is sent to DC-2 to separate the glycols from DMT. The rest of the process is the same as that of Figure 13.4.6, with the adjustment to the overhead stream from DC-4 taken into account. Figure 13.4.7 shows the block flow diagram for our finalized process, which is discussed in more detail in Section 16.

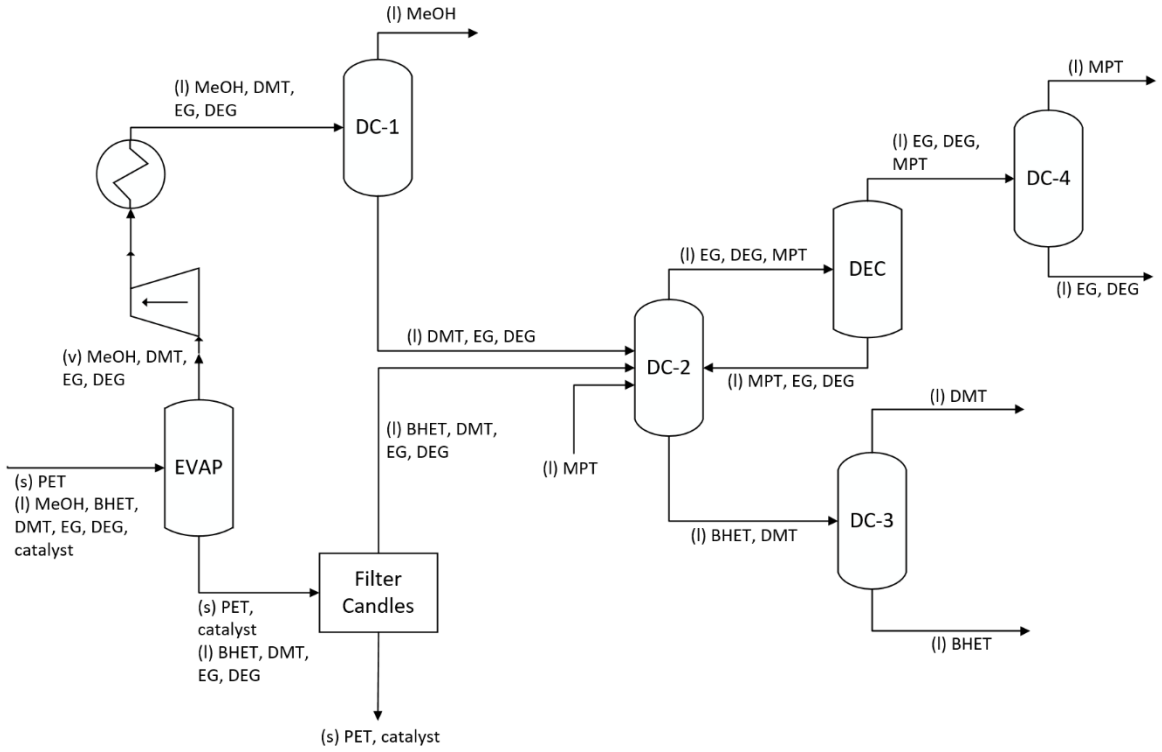


Figure 13.4.7 Finalized separation design with DMT/DEG azeotrope present and an azeotrope breaking agent, MPT.

14. Assembly of Database

14.1 Raw materials and products

Prices for raw materials and products are shown in Table 14.1.1. PET feed price was taken as the spot price of PET in February 2022 and is expected to rise in the future due to inflation and increased interest in PET recycling processes.

Table 14.1.1 Prices of raw materials and products of the PET recycling process

Material Name	Price (USD/kg)	Source
Polyethylene Terephthalate (PET)	$0.65	ICIS
Ethylene Glycol (EG)*	$0.73	ICIS
Diethylene Glycol (DEG)	$1.21	ICIS
Dimethyl Terephthalate (DMT)*	$1.29	ICIS
Methyl p-Toluate (MPT)	$30.00	Parchem
Sodium Carbonate	$0.38	Parchem
Methanol (MeOH)	$0.39	ICIS

* Non-premium prices

Table 14.1.2 shows the thermochemical properties of the raw materials and products involved in the PET recycling process. This data was considered in the design of the process to ensure that streams were not vaporizing or solidifying unexpectedly within the equipment.

Table 14.1.2 Melting and boiling points of raw materials and products

Material Name	Melting Point	Boiling Point	Source
Polyethylene Terephthalate (PET)	260°C	350°C	NIOSH
Ethylene Glycol (EG)	-12.9°C	197°C	NIOSH
Diethylene Glycol (DEG)	-10.4°C	245°C	Cameo Chemicals (NOAA)
Dimethyl Terephthalate (DMT)	141°C	300°C	Cameo Chemicals (NOAA)
Methyl p-Toluate (MPT)	33.5°C	217°C	Cameo Chemicals (NOAA)
Sodium Carbonate	851°C	1600°C	Vedantu
Methanol (MeOH)	-97.8°C	64.6°C	Cameo Chemicals (NOAA)

Similarly, the melting points and density of four major potential contaminants were also gathered and considered. This data informed the heat specifications of the preprocessing steps and the necessary specifications needed to separate components by density.

Table 14.1.3 Thermochemical properties of potential major contaminants

Material Name	Melting Point	Density (g/cm^3)	Source
High Density Polyethylene (HDPE)	130°C	0.958	Polymer Database
Polypropylene (PP)	162°C	0.865	Polymer Database
Iron	1540°C	7.87	Royal Society of Chemistry
Aluminum	660°C	2.70	Royal Society of Chemistry

14.2 Safety and Toxicity of Major Chemicals

Material Safety Data Sheets (MSDS) for major materials present in the PET recycling process may be found in the appendix. Of particular note, ethylene glycol and diethylene glycol are acutely toxic if inhaled or ingested, MPT and sodium carbonates are irritants, and methanol is flammable and acutely toxic.

14.3 Yield Data

Catalyst selection for the depolymerization process was based on catalyst cost and yield considerations. The catalyst data used for this process found in Table 14.3.1 was obtained from an Eastman patent filed by Sharpe and Morrow (2021).

Table 14.3.1 DMT yield data of PET polymerization reactions at varying reaction conditions involving a sodium carbonate catalyst

Experiment Number	Methanol to PET Mass Ratio	Catalyst Loading (mol %)	Temp.	Reaction Time (hours)	% insoluble material (normalized)	GCMS Desirability (1-5)	DMT Yield
63	1.67:1	2.50	140	4	0.17	3	67.81
64	1.67:1	7.5	140	4	36.26	4	45.16
65	3.33:1	2.50	140	4	1.82	4	77.76
66	1.67:1	2.50	180	4	3.39	3	55.69
67	1.67:1	5	160	4	4.89	3	48.12
68	2.2:1	2.5	153	4	4.81	4	58.02
69	2.5:1	5	140	4	11.36	5	61.26
70	2.1:1	4.37	144	4	9.31	4	62.15
71	3:01	7.5	140	4	8.61	3	60.76

14.4 Reaction diagram of PET methanolysis to DMT and EG

This method of recycling PET uses a methanolytic transesterification to break down PET into DMT and EG, catalyzed by sodium carbonate. It is necessary to use a large excess of methanol to push the equilibrium towards the product side. No kinetic data was provided in the Eastman methanolysis patents; instead, catalytic yields are given in Table 14.3.1.

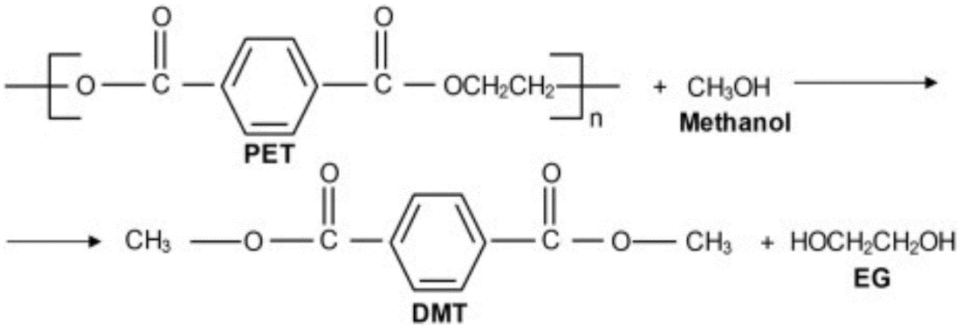


Figure 14.4.1 Reaction equation of PET with methanol to form DMT and EG from Al-Sabagh et al. (2015).

14.5 Solubility of Sodium Carbonate and PET in Methanol

The solubility of sodium carbonate in pure methanol has been established in existing literature at temperatures ranging from 20 to 35°C (El-Dossoki, 2005). The solubility of sodium carbonate beyond this temperature range was approximated through the extrapolation of existing data, as shown in Figure 14.5.1. Due to the irregular solubility trends of ionic solids, this may cause some design calculation uncertainty. This solubility is important to establish the operating conditions of the evaporator, which serves to crystallize any sodium carbonate solids that are solubilized in the liquid stream from the reactor before it enters any distillation columns. It is assumed that pressure does not affect the solubility of the sodium carbonate. At 160°C and 265 psig, the solubility of sodium carbonate is 0.245 g mol/kg solvent and at 140°C and 2.18 psig, the solubility is 0.217 g mol/kg solvent. Meanwhile, solubility data for PET in methanol was provided in the Eastman patent for catalysts for PET methanolysis as 1.82% insoluble material (see Table 14.3.1).

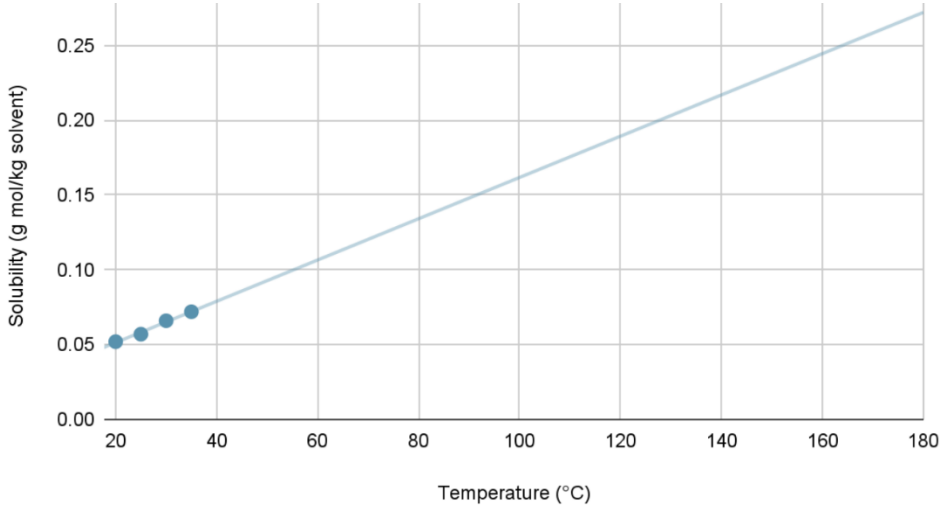


Figure 14.5.1 Solubility of sodium carbonate in pure methanol as a function of tempeature. Dta obtained from El-Dossoki (2005).

15. Process Flow Diagram and Material Balances

The overall flow diagram of the process can be found in Figure 15.1. Figure 15.1 only displays the main chemicals in action and does not provide a rigorous mass balance analysis.

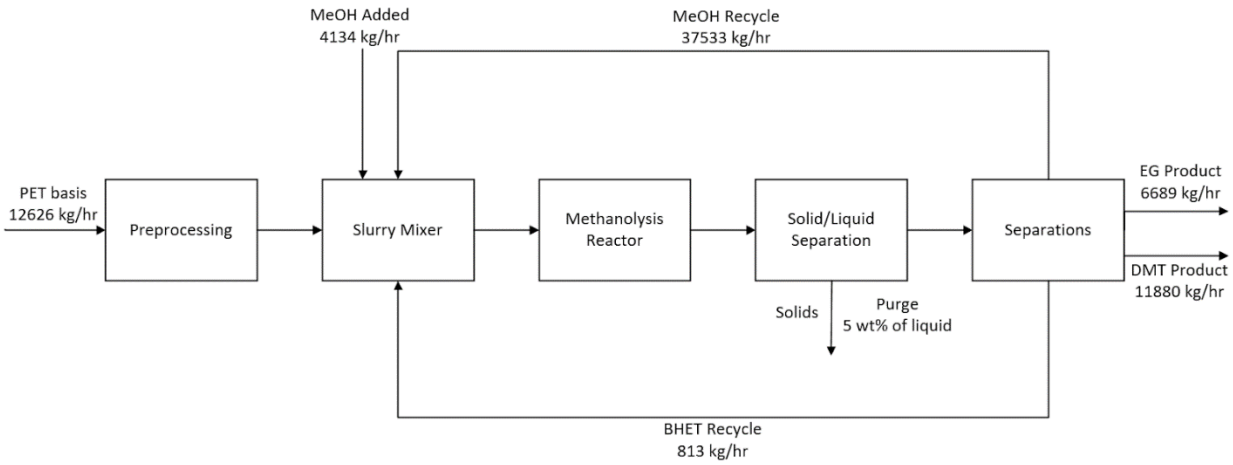


Figure 15.1 Generic process flow diagram for the depolymerization of PET into DMT and EG.

The preprocessing sequence filters out the undesired waste (polypropylene (PP), high density polyethylene (HDPE), metal scraps, bottle caps, and bottle labels) to provide pure PET into the slurry mixer in flake form at sizes of approximately 1 mm. The slurry composed primarily of PET flakes, recycled BHET, and methanol is pumped into the reactor sequence where methanolysis occurs. The solid/liquid separation filters out insoluble solids, such as insoluble PET and the sodium carbonate catalyst, and sends the remaining liquid to the liquid/liquid separations sequence where the stream passes through a series of distillation columns to produce purified EG and DMT products. An excess of methanol at a ratio of 3.3:1 kg of methanol to kg of PET waste was supplied to make the production of EG and DMT favorable. The excess methanol is recycled back to the slurry mixer.

The following figures and tables illustrate detailed process flow diagrams and their corresponding mass balances at steady state. Figure 15.2 and Table 15.1 depict the overall process flow diagram and overall mass balance of components. Figures 15.3, 15.4, and 15.5 and Tables 15.2, 15.3, and 15.4 describe the preprocessing sequence, reactor sequence, and separations sequence respectively.

Note that the “recycle stream” for methanol in Figure 15.2 is purposefully broken into two streams (S-27 and S-27-2) to ensure that the Aspen Plus simulation would compile. Also, some sections of the process flow sheet are present that would not exist in the actual depolymerization plant. Further details are explained in section 16.

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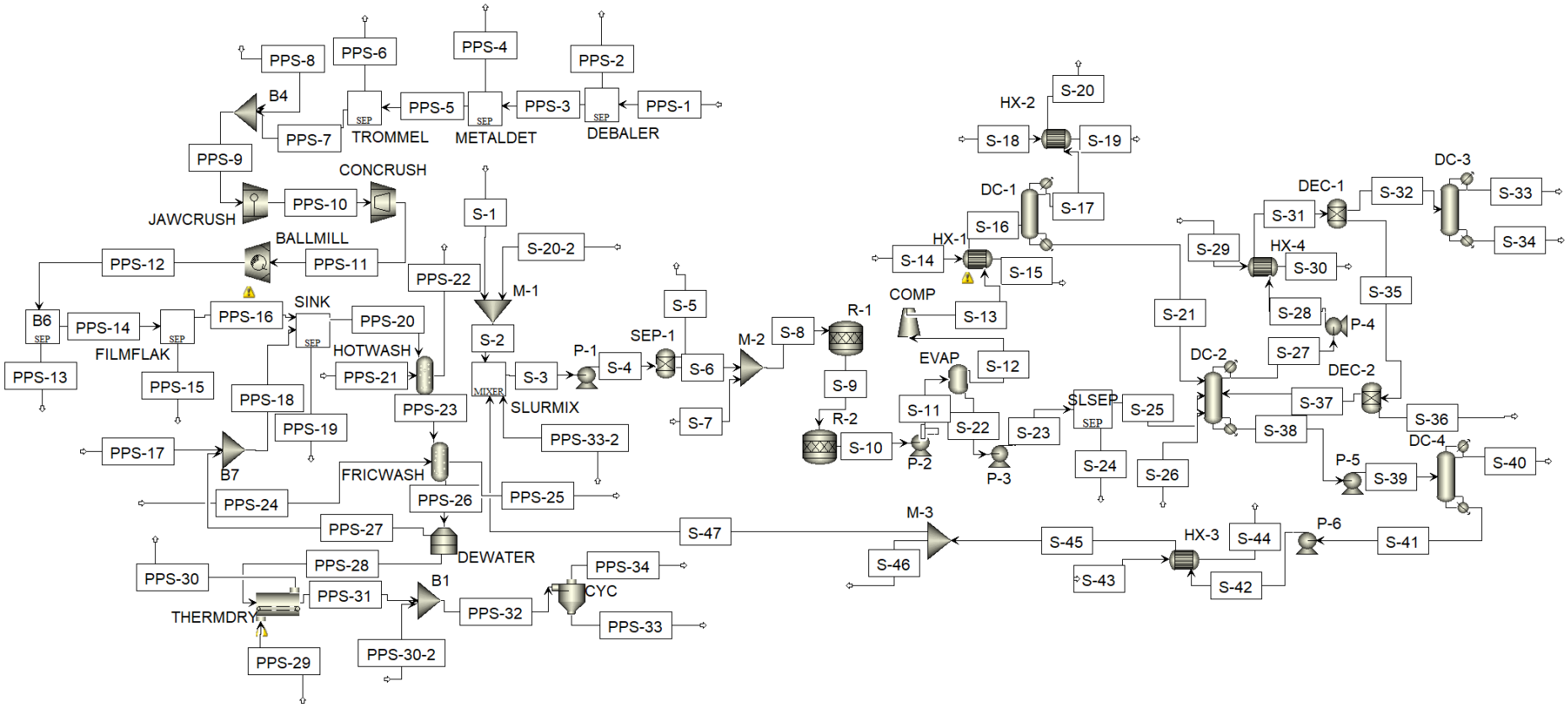


Figure 15.2 Complete process flow diagram - ASPEN

Table 15.1 Overall Mass Balances of Components at Steady State

Comp. Mass Flows (kg/hr)	Total In	Total Out
METHANOL	4134	21
EG	130	3774
DMT	0	12494
PET	12626	230
NA2CO3	170	170
HDPE	561	561
ALUM	140	140
WATER	27983	28032
DEG	0	290
BIS-2-01	0	43
MPT	1500	1500
IRON	281	281
PP	421	421
AIR	4851	4851

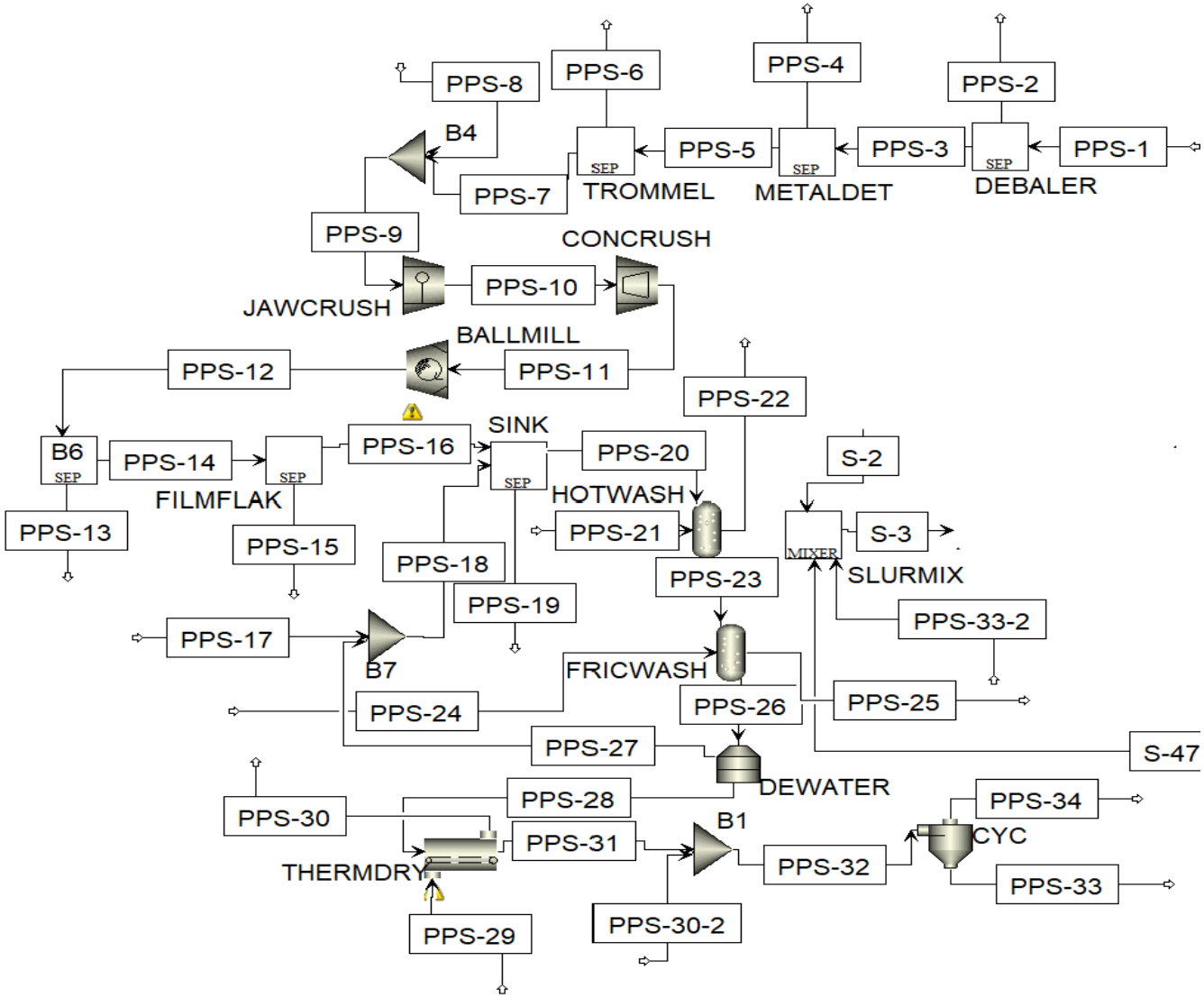


Figure 15.3 Process flow diagram for preprocessing sequence

Table 15.2 Stream Summary Table for Preprocessing Sequence at Steady State

Stream	PPS-1	PPS-2	PPS-3	PPS-4	PPS-5	PPS-6	PPS-7	PPS-8	PPS-9
Temperature (C)	25	25	25	25	25	25	25	25	25
Pressure (psig)	0	0	0	0	0	0	0	0	0
Mass Vapor Fraction	0	0	0	0	0	0	0	0	0
Mass Liquid Fraction	0	0	0	0	0	0	0	1	0
Mass Solid Fraction	1	1	1	1	1	1	1	0	1
Mass Flows (kg/hr)	26655	211	26444	70	26374	140	26234	4410	30644
Comp. Mass Flows (kg/hr)									
METHANOL	0	0	0	0	0	0	0	0	0
EG	0	0	0	0	0	0	0	0	0
DMT	0	0	0	0	0	0	0	0	0
PET	25252	0	25252	0	25252	0	25252	0	25252
NA2CO3	0	0	0	0	0	0	0	0	0
HDPE	561	0	561	0	561	0	561	0	561
ALUM	140	0	140	0	140	140	0	0	0
WATER	0	0	0	0	0	0	0	4410	4410
DEG	0	0	0	0	0	0	0	0	0
BIS-2-01	0	0	0	0	0	0	0	0	0
MPT	0	0	0	0	0	0	0	0	0
IRON	281	211	70	70	0	0	0	0	0
POLY(-01	421	0	421	0	421	0	421	0	421
AIR	0	0	0	0	0	0	0	0	0

Table 15.2 (continued)

Stream	PPS-10	PPS-11	PPS-12	PPS-13	PPS-14	PPS-15	PPS-16	PPS-17	PPS-18
Temperature (C)	116	116	117	117	117	117	117	25	78
Pressure (psig)	0	0	0	0	0	0	0	0	0
Mass Vapor Fraction	0	0	0	0	0	1	0	0	0
Mass Liquid Fraction	0	0	0	0	0	0	0	1	1
Mass Solid Fraction	1	1	1	1	1	0	1	0	0
Mass Flows (kg/hr)	30644	30644	30644	12626	18018	4831	13187	9058	14864
Comp. Mass Flows (kg/hr)									
METHANOL	0	0	0	0	0	0	0	0	0
EG	0	0	0	0	0	0	0	0	0
DMT	0	0	0	0	0	0	0	0	0
PET	25252	25252	25252	12626	12626	0	12626	0	0
NA2CO3	0	0	0	0	0	0	0	0	0
HDPE	561	561	561	0	561	0	561	0	0
ALUM	0	0	0	0	0	0	0	0	0
WATER	4410	4410	4410	0	4410	4410	0	9058	14864
DEG	0	0	0	0	0	0	0	0	0
BIS-2-01	0	0	0	0	0	0	0	0	0
MPT	0	0	0	0	0	0	0	0	0
IRON	0	0	0	0	0	0	0	0	0
POLY(-01	421	421	421	0	421	421	0	0	0
AIR	0	0	0	0	0	0	0	0	0

Table 15.2 (continued)

Stream	PPS-19	PPS-20	PPS-21	PPS-22	PPS-23	PPS-24	PPS-25	PPS-26	PPS-27
Temperature (C)	81	81	100	87	87	100	93	93	100
Pressure (psig)	0	0	0	0	0	0	0	0	0
Mass Vapor Fraction	0	0	0	0	0	0	0	0	0
Mass Liquid Fraction	0	1	1	1	0	1	1	0	1
Mass Solid Fraction	1	0	0	0	1	0	0	1	0
Mass Flows (kg/hr)	561	27490	7257	14864	19883	7257	7257	19883	5806
Comp. Mass Flows (kg/hr)									
METHANOL	0	0	0	0	0	0	0	0	0
EG	0	0	0	0	0	0	0	0	0
DMT	0	0	0	0	0	0	0	0	0
PET	0	12626	0	0	12626	0	0	12626	0
NA2CO3	0	0	0	0	0	0	0	0	0
HDPE	561	0	0	0	0	0	0	0	0
ALUM	0	0	0	0	0	0	0	0	0
WATER	0	14864	7257	14864	7257	7257	7257	7257	5806
DEG	0	0	0	0	0	0	0	0	0
BIS-2-01	0	0	0	0	0	0	0	0	0
MPT	0	0	0	0	0	0	0	0	0
IRON	0	0	0	0	0	0	0	0	0
POLY(-01	0	0	0	0	0	0	0	0	0
AIR	0	0	0	0	0	0	0	0	0

Table 15.2 (continued)

Stream	PPS-28	PPS-29	PPS-30	PPS-30-2	PPS-31	PPS-32	PPS-33	PPS-34
Temperature (C)	100	25	48	25	48	35	25	25
Pressure (psig)	0	0	0	0	0	0	0	0
Mass Vapor Fraction	0	1	1	1	0	0	0	1
Mass Liquid Fraction	0	0	0	0	0	0	0	0
Mass Solid Fraction	1	0	0	0	1	1	1	0
Mass Flows (kg/hr)	14077	4851	6175	4851	12754	17605	12754	4851
Comp. Mass Flows (kg/hr)								
METHANOL	0	0	0	0	0	0	0	0
EG	0	0	0	0	0	0	0	0
DMT	0	0	0	0	0	0	0	0
PET	12626	0	0	0	12626	12626	12626	0
NA2CO3	0	0	0	0	0	0	0	0
HDPE	0	0	0	0	0	0	0	0
ALUM	0	0	0	0	0	0	0	0
WATER	1451	0	1324	0	128	128	128	0
DEG	0	0	0	0	0	0	0	0
BIS-2-01	0	0	0	0	0	0	0	0
MPT	0	0	0	0	0	0	0	0
IRON	0	0	0	0	0	0	0	0
POLY(-01	0	0	0	0	0	0	0	0
AIR	0	4851	4851	4851	0	4851	0	4851

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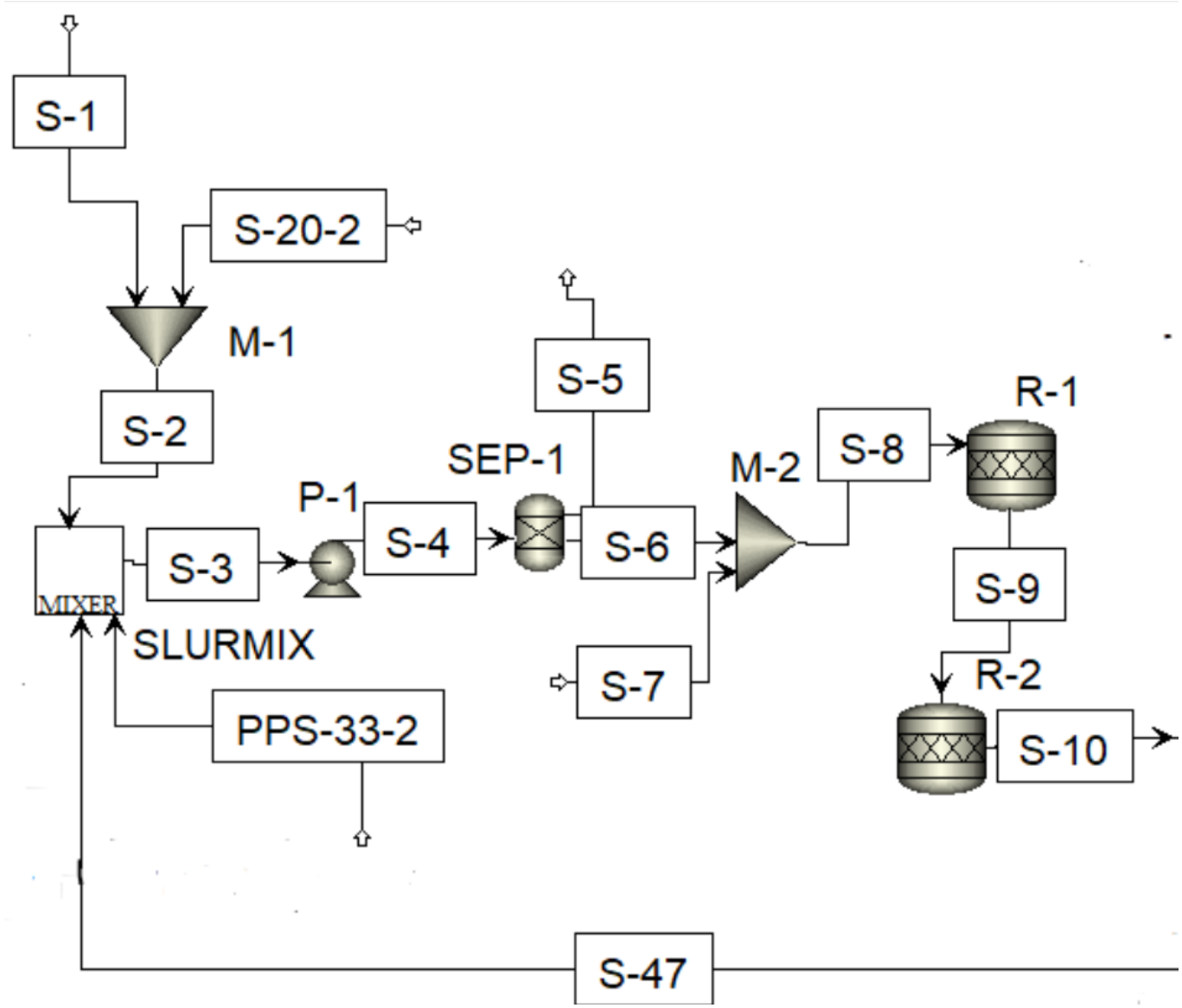


Figure 15.4 Process flow diagram for methanolysis reactor sequence

Table 15.3 Stream Summary Table for Methanolysis Reactor Sequence at Steady State

Stream	PPS-33-2	S-1	S-2	S-3	S-4	S-5
Temperature (C)	25	25	57	55	56	56
Pressure (psig)	0	0	0	0	250	250
Mass Vapor Fraction	0	0	0	0	0	0
Mass Liquid Fraction	0	1	1	1	1	0
Mass Solid Fraction	1	0	0	0	0	1
Mass Flows (kg/hr)	12754	4304	41967	62416	62416	12396
Comp. Mass Flows (kg/hr)						
METHANOL	0	4134	41667	41667	41667	0
EG	0	0	130	130	130	0
DMT	0	0	0	6882	6882	0
PET	12626	0	0	12626	12626	12396
NA2CO3	0	170	170	170	170	0
HDPE	0	0	0	0	0	0
ALUM	0	0	0	0	0	0
WATER	128	0	0	128	128	0
DEG	0	0	0	0	0	0
BIS-2-01	0	0	0	813	813	0
MPT	0	0	0	0	0	0
IRON	0	0	0	0	0	0
POLY(-01	0	0	0	0	0	0
AIR	0	0	0	0	0	0

Table 15.3 (continued)

Stream	S-6	S-7	S-8	S-9	S-10	S-20-2	S-47
Temperature (C)	56	160	73	160	160	60	34
Pressure (psig)	250	250	250	250	250	14	14
Mass Vapor Fraction	0	0	0	0	0	0	0
Mass Liquid Fraction	1	1	1	1	1	1	1
Mass Solid Fraction	0	0	0	0	0	0	0
Mass Flows (kg/hr)	50019	16400	66419	66419	66419	37663	7695
Comp. Mass Flows (kg/hr)							
METHANOL	41667	0	41667	38296	37544	37533	0
EG	130	0	130	6654	7777	130	0
DMT	6882	0	6882	17097	19375	0	6882
PET	230	0	230	230	230	0	0
NA2CO3	170	0	170	170	170	0	0
HDPE	0	0	0	0	0	0	0
ALUM	0	0	0	0	0	0	0
WATER	128	0	128	128	177	0	0
DEG	0	0	0	6	290	0	0
BIS-2-01	813	16400	17213	3839	856	0	813
MPT	0	0	0	0	0	0	0
IRON	0	0	0	0	0	0	0
POLY(-01	0	0	0	0	0	0	0
AIR	0	0	0	0	0	0	0

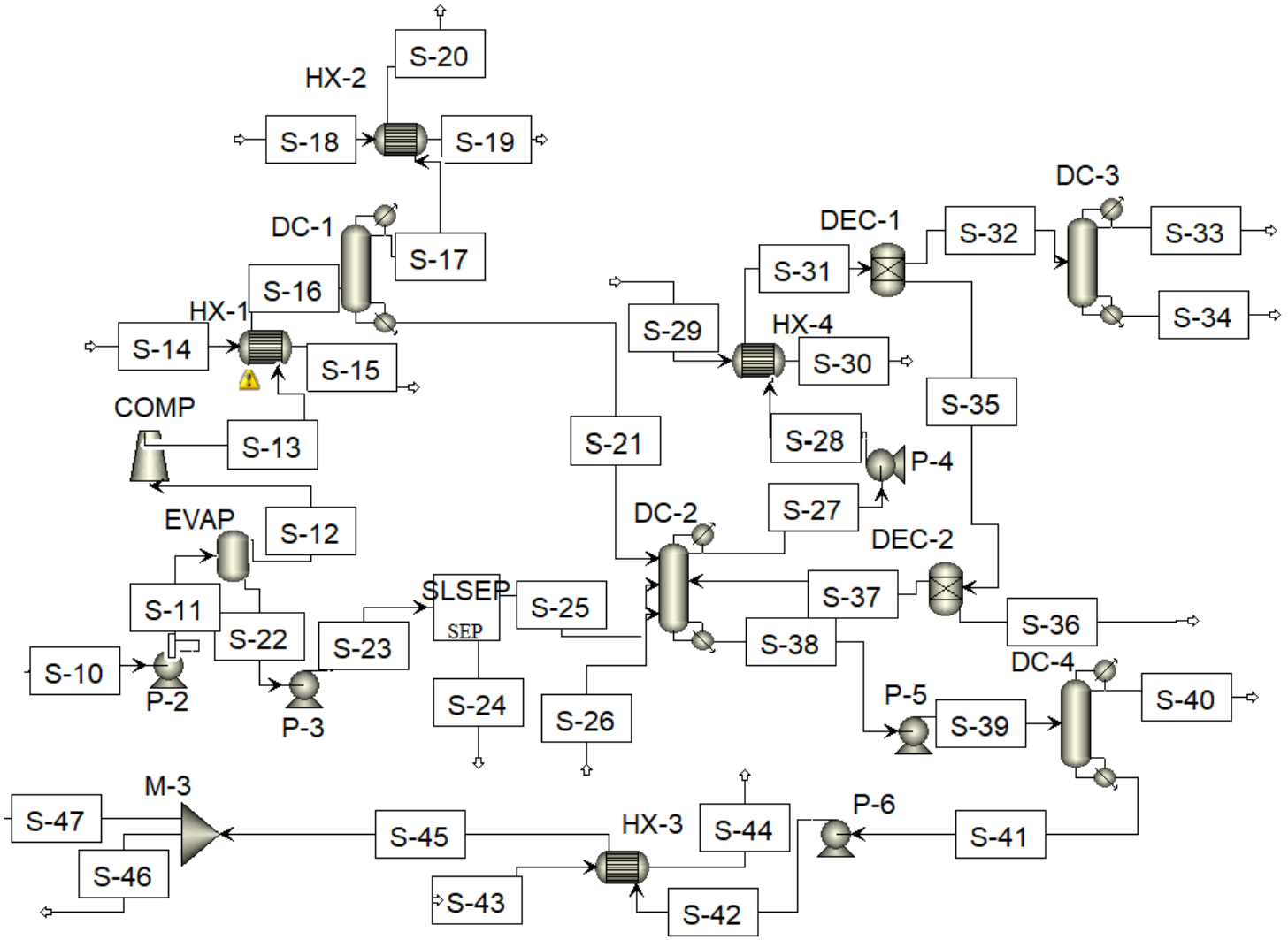


Figure 15.5 Process flow diagram for separations sequence

Table 15.4 Stream Summary Table for Separations Sequence at Steady State

Stream	S-10	S-11	S-12	S-13	S-14	S-15	S-16	S-17
Temperature (C)	160	160	140	347	32	38	76	83
Pressure (psig)	250	0	-13	22	0	-10	19	14
Mass Vapor Fraction	0	0	1	1	0	0	0	0
Mass Liquid Fraction	1	1	0	0	1	1	1	1
Mass Solid Fraction	0	0	0	0	0	0	0	0
Mass Flows (kg/hr)	66419	66419	61310	61310	3736061	3736061	61310	37723
Comp. Mass Flows (kg/hr)								
METHANOL	37544	37544	37534	37534	0	0	37534	37523
EG	7777	7777	7662	7662	0	0	7662	39
DMT	19375	19375	15659	15659	0	0	15659	0
PET	230	230	0	0	0	0	0	0
NA2CO3	170	170	0	0	0	0	0	0
HDPE	0	0	0	0	0	0	0	0
ALUM	0	0	0	0	0	0	0	0
WATER	177	177	177	177	3736061	3736061	177	161
DEG	290	290	279	279	0	0	279	0
BIS-2-01	856	856	0	0	0	0	0	0
MPT	0	0	0	0	0	0	0	0
IRON	0	0	0	0	0	0	0	0
POLY(-01	0	0	0	0	0	0	0	0
AIR	0	0	0	0	0	0	0	0

Table 15.4 (Continued)

Stream	S-18	S-19	S-20	S-21	S-22	S-23	S-24	S-25
Temperature (C)	32	50	62	232	140	140	140	140
Pressure (psig)	15	14	13	15	-13	43	43	43
Mass Vapor Fraction	0	0	0	0	0	0	0	0
Mass Liquid Fraction	1	1	1	1	1	1	0	1
Mass Solid Fraction	0	0	0	0	0	0	1	0
Mass Flows (kg/hr)	37173	37173	37723	23587	5109	5109	592	4516
Comp. Mass Flows (kg/hr)								
METHANOL	0	0	37523	10	10	10	1	10
EG	0	0	39	7623	115	115	6	110
DMT	0	0	0	15659	3717	3717	186	3531
PET	0	0	0	0	230	230	230	0
NA2CO3	0	0	0	0	170	170	170	0
HDPE	0	0	0	0	0	0	0	0
ALUM	0	0	0	0	0	0	0	0
WATER	37173	37173	161	16	0	0	0	0
DEG	0	0	0	279	11	11	1	11
BIS-2-01	0	0	0	0	856	856	0	856
MPT	0	0	0	0	0	0	0	0
IRON	0	0	0	0	0	0	0	0
POLY(-01	0	0	0	0	0	0	0	0
AIR	0	0	0	0	0	0	0	0

Table 15.4 (Continued)

Stream	S-26	S-27	S-28	S-29	S-30	S-31	S-32	S-33
Temperature (C)	25	132	132	4	24	22	22	98
Pressure (psig)	0	-13	14	0	-5	14	14	-13
Mass Vapor Fraction	0	0	0	0	0	0	0	0
Mass Liquid Fraction	1	1	1	1	1	1	1	1
Mass Solid Fraction	0	0	0	0	0	0	0	0
Mass Flows (kg/hr)	1500	23115	23115	88182	88182	23115	8267	1267
Comp. Mass Flows (kg/hr)								
METHANOL	0	41	41	0	0	41	20	20
EG	0	20538	20538	0	0	20538	7729	1039
DMT	0	366	366	0	0	366	60	0
PET	0	0	0	0	0	0	0	0
NA2CO3	0	0	0	0	0	0	0	0
HDPE	0	0	0	0	0	0	0	0
ALUM	0	0	0	0	0	0	0	0
WATER	0	59	59	88182	88182	59	16	16
DEG	0	611	611	0	0	611	279	29
BIS-2-01	0	0	0	0	0	0	0	0
MPT	1500	1499	1499	0	0	1499	162	162
IRON	0	0	0	0	0	0	0	0
POLY(-01	0	0	0	0	0	0	0	0
AIR	0	0	0	0	0	0	0	0

Table 15.4 (Continued)

Stream	S-34	S-35	S-36	S-37	S-38	S-39	S-40	S-41
Temperature (C)	158	22	22	22	223	223	210	225
Pressure (psig)	-11	14	14	14	-12	0	-13	-12
Mass Vapor Fraction	0	0	0	0	0	0	0	0
Mass Liquid Fraction	1	1	1	1	1	1	1	1
Mass Solid Fraction	0	0	0	0	0	0	0	0
Mass Flows (kg/hr)	7000	14848	1337	13511	20000	20000	11900	8100
Comp. Mass Flows (kg/hr)								
METHANOL	0	21	0	21	0	0	0	0
EG	6690	12810	0	12810	4	4	4	0
DMT	60	305	0	305	19129	19129	11885	7244
PET	0	0	0	0	0	0	0	0
NA2CO3	0	0	0	0	0	0	0	0
HDPE	0	0	0	0	0	0	0	0
ALUM	0	0	0	0	0	0	0	0
WATER	0	43	0	43	0	0	0	0
DEG	250	332	0	332	10	10	10	0
BIS-2-01	0	0	0	0	856	856	0	856
MPT	0	1337	1337	0	1	1	1	0
IRON	0	0	0	0	0	0	0	0
POLY(-01	0	0	0	0	0	0	0	0
AIR	0	0	0	0	0	0	0	0

Table 15.4 (Continued)

Stream	S-42	S-43	S-44	S-45	S-46
Temperature (C)	226	32	33	34	34
Pressure (psig)	14	0	-3	14	14
Mass Vapor Fraction	0	0	0	0	0
Mass Liquid Fraction	1	1	1	1	1
Mass Solid Fraction	0	0	0	0	0
Mass Flows (kg/hr)	8100	1868031	1868031	8100	405
Comp. Mass Flows (kg/hr)					
METHANOL	0	0	0	0	0
EG	0	0	0	0	0
DMT	7244	0	0	7244	362
PET	0	0	0	0	0
NA2CO3	0	0	0	0	0
HDPE	0	0	0	0	0
ALUM	0	0	0	0	0
WATER	0	1868031	1868031	0	0
DEG	0	0	0	0	0
BIS-2-01	856	0	0	856	43
MPT	0	0	0	0	0
IRON	0	0	0	0	0
POLY(-01	0	0	0	0	0
AIR	0	0	0	0	0

16. Process Descriptions

16.1 Preprocessing Sequence

Most of the preprocessing sequence is conducted at ambient pressure and temperature unless otherwise noted. A PET bottle bale feed stream (PPS-1) is conveyed at a rate of about 14,000 kg/hr through a debaler, which is used to cut the wires holding the bale together. Freed PET bottles are conveyed onto a conveyor belt (PPS-3) and are subjected to a suspended belt magnet to remove any magnetic components. Stream PPS-5 is then fed into a rotating trommel separator. The trommel consists of a large mesh screen tunnel that rotates slowly, pushing the PET bottles forward while small contaminants like glass, wood, metal, and paper fall through the mesh to be collected. The PET bottles are conveyed into a series of size reduction equipment, in which a small amount of process water is added to provide wet granulation (PPS-8). Wet granulation serves to prevent dust accumulation and explosion, to provide lubrication which reduces power consumption, to enable a slurry to be formed which is easier to remove from a ball mill (Walas, 1990), and to partially clean PET flakes ("PET Bottle Washing Line (2019 Update)", n.d.).

Deviating from the original ASG Recycling Machinery line, as mentioned in Section 13.2, a jaw crusher is placed first in the series of size reduction equipment after the trommel to allow for a larger range of post-consumer PET plastic sizes to be fed into the system. As seen in Appendix 28.24.1, the PET bottle stream PPS-9 contains a particle size distribution, PSD, with an average particle diameter, D50, of 63.5 mm ("Water Bottle-Single-Use", n.d.). PET bottle flake at a D50 of 53.7 mm (Appendix 28.24.2) emerges from the jaw crusher (PPS-10) in a slurry at 116°C and is screw conveyed into a cone crusher. The PET bottle flake stream (PPS-11) exits

the cone crusher at 116°C with a D50 of 5.25 mm (Appendix 28.24.3) and is screw conveyed into a ball mill. The ball mill outputs the PET bottle flake (still containing PP and HDPE contaminants) at the desired D50 of 1.07 mm (Appendix 28.24.4) in a slurry at 117°C, which is screw conveyed and dropped through the film and flake separator.

The film and flake separator sends a column of air through the chamber, separating the lighter PP particles to be stored, while the heavier HDPE and PET flakes fall through the chamber. The HDPE and PET flake stream PPS-16 is fed into a sink float separation tank, removing the floating HDPE flakes as PET flakes sink to the bottom of the tank. A process water feed stream (PPS-17) is fed into the sink float separation tank to account for water loss. Rotating drums will move the floating particles into waste storage, while a screw conveyor collects the PET flakes at the bottom of the tank and transports them to the hot washer (PPS-20). The hot washer is fed with water (PPS-21) that is electrically heated and removes remaining glues, oils, and grease from the PET bottle flakes. The flake stream PPS-23 is then fed into a high-speed friction washer. Process water is sprayed into the washer (PPS-24), which removes dirt and debris from the flakes.

The clean PET bottle flake stream PPS-26 is transferred to the dewatering machine and dried to 15-20 wt.% water content ("PET Bottle Washing Line (2019 Update)", n.d.). Separated process water at 100°C is then recycled from the dewatering machine to the sink float separation tank in stream PPS-27. The flakes are then further dried in a thermal dryer to less than 1 wt.% water content by mixing with hot air through a long spiral of tubing and then ending with a cyclone separator ("PET Bottle Washing Line (2019 Update)", n.d.). The dry pure PET bottle flakes exit the cyclone separator into a product silo at a rate of 12,626 kg/hr PET and about 128 kg/hr water, assuming the feed bales contain 90 wt% PET ("The Association of Plastic

Recyclers", n.d.), which are stored during downtime in operation or are conveyed out of and into the slurry mixer.

Note that PPS-1 does not actually contain 25,252 kg of PET, but should only be considered as containing 12,626 kg of PET. The additional PET is introduced so that the input particle size distribution is classified for both the MIXED and CIPSD sub streams. Without this, Aspen is unable to perform the wet granulation simulation properly. Also note that B6 is not part of the process and only serves to correct the above-mentioned issue by removing the extra 12,626 kg of PET in stream PPS-13 after the granulation steps.

Additionally, note that stream PPS-30 is not a physical stream in the process. PPS-30 is introduced to remove the water from the thermal dryer outlet stream, allowing ASPEN to perform the cyclone simulation properly.

Streams PPS-33 and PPS-33-2 are the same stream. However, the streams are broken apart to manually change the ASPEN sub stream classification from CIPSD to MIXED so that further simulation blocks may be performed correctly.

16.2 Reaction Sequence

The preprocessed PET flakes from stream PPS-33-2 are transferred and dropped into the slurry mixer at 25°C and 14.7 psi. They are thoroughly mixed with the recycled BHET from stream S-47 and fresh methanol, recycled methanol, and sodium carbonate catalyst coming from stream S-2. These two streams are cooled down before entering the mixer in order to prevent the generation of methanol vapor. A liquid slurry is required to provide a transfer medium for the PET flakes. The slurry is assumed to be approximately 20 wt% solid in order to ensure its transferability. Future optimization could be conducted to increase this percentage while

preserving fluidity of the slurry, allowing the process to recycle hot methanol directly into the reactor rather than cooling it to ambient temperatures. The slurry is pressure driven into the reactor by increasing its pressure from 14.7 psia to 265 psia using pump P-1. Although the required minimum pressure is 250 psia, a higher pressure is required to ensure all the products and methanol in and out of the reactors are in liquid form.

Note that S-5 and S-7 are not physical streams in the process. The two streams are introduced into the process in order to account for the recycling of BHET. Aspen is unable to convert soluble PET to dissolved BHET due to lack of chemical and physical data of PET, so S-5 manually displaces the soluble PET and S-7 inputs an equivalent molar amount of BHET and EG.

Additionally, note that the methanol recycle stream is simulated using two individual streams, S-20 and S-20-2, rather than a single recycle stream. This is to help the Aspen simulation compile without producing a buildup of material in the methanol recycle stream. There is a difference in the components of S-20 and S-20-2. S-20-2 emerges from DC-2 with a small amount of EG and water. Physically, these impurities in the methanol stream would be separated out to prevent the buildup of water and/or EG in the recycle stream via another separation block or a purge stream. This is not reflected in our process, but to account for this optimization via a purge stream, the EG and water impurities are not introduced back into the system via the recycle stream and S-20. Thus, S-20 is a pure methanol stream.

Two continuous stirred tank reactors in series are held in series to optimize the conversion rate and kinetics. Test results regarding the reaction at different conditions with the use of sodium carbonate can be found in Table 14.3.1. Based on Table 14.3.1, the reaction parameter set of interest is experiment number 65, which shows a 77.7% fractional conversion of

PET to DMT and EG at 140° C and a reaction time of 4 hours. The methanol to PET mass ratio is 3.33:1 and the amount of sodium carbonate is 2.50 catalyst loading mol%. The temperature of the reactors was increased in our process to 160°C to decrease the residence time to one hour based on a general heuristic that increasing the temperature of a reaction by 10°C halves its required reaction time. 1.82% of the PET feedstock is left as a insoluble solid while the remaining unreacted PET solubilizes in the reaction liquid as BHET. Sodium carbonate is also soluble in the excess methanol of the reaction. A conversion of 95% of the solubilized PET was observed with the use of two tanks in series.

16.3 Separations Sequence

Solid-Liquid Separation Sequence

The stream from the reactor (S-10) contains liquid methanol, DMT, EG, DEG, BHET, sodium carbonate, and solid insoluble PET. To be able to separate the methanol, DMT, and glycols via distillation columns, all solids must be removed from S-10. The amount of sodium carbonate required for this process is entirely dissolved in the excess methanol in S-10. Once methanol is removed from the stream, the sodium carbonate will precipitate out and form a solid. To ensure that this precipitation does not occur in a distillation column, which would plug up the trays or packing in a column, S-10 is sent to an evaporator (EVAP) where the sodium carbonate is crystallized out of the methanol, which is vaporized. In between S-10 and EVAP, S-10 is first sent to a pump (P-2) to lower its pressure from 265 psig to 14.7 psig. The resulting stream from the pump (S-11) is then sent to EVAP, which vaporizes 99.9 wt% of the MeOH, along with 98.5 wt% EG, 80.5 wt% DMT, and 95.9 wt% DEG. Doing so crystallizes 98 wt% of sodium carbonate out of the mixture and leaves 5200 kg/hr of liquid. EVAP must be operated as a

vacuum at a pressure of 2.18 psig to ensure that enough methanol is vaporized from the mixture so that as much sodium carbonate precipitates out of the mixture as possible, but the mixture in EVAP is not hot enough to polymerize the DMT and EG into PET at 170°C (US EPA, 1991).

The vapor from EVAP (S-12) is increased in pressure to 29 psig via a compressor (COMP), condensed via a shell-and-tube heat exchanger (HX-1), and sent to a distillation column (DC-1). In DC-1, methanol is removed from the stream in the overhead product and recycled back to the slurry mixture via S-20 and S-20-2, as described in Section 16.2. The bottoms product from DC-1 contains all other components found in the mixture, including DMT, EG, and DEG, and is sent to another distillation column (DC-2) to separate the DMT from the glycols. This is further described in the following section on the liquid/liquid separation sequence.

The liquid from EVAP (S-22) is increased in pressure to 58 psig via a pump (P-3) and sent through filter candles (SLSEP) to be separated from any solids. The solids and an estimated 5 wt% of the liquids in the stream are removed from the process as purge stream S-24. Finally, the liquid stream from SLSEP is sent to the final liquid/liquid separation sequence required to produce our glycol and DMT products.

Liquid-Liquid Separation Sequence

From the solid/liquid separation sequence, there are two streams of liquid containing DMT, EG, DEG, BHET, and a small amount of water. These two streams are from blocks DC-1 and SLSEP. Both streams are sent to a distillation column, DC-2, to separate the DMT and BHET from the glycols. MPT, the DMT/DEG azeotrope-breaking agent chosen for this process, is also charged into DC-2 via S-36. DC-2 operates at 2.2 psig with the help of a three-stage rotary lobe vacuum system (not shown) to ensure that cooling water can be used in the column's

condenser and steam at or under 550 psig can be used in its reboiler. This vacuum system was chosen to avoid the added contaminants from steam ejector and liquid-ring pump vacuum systems. The bottoms product from DC-2 (S-38) contains mostly DMT and BHET, with trace amounts of water, EG, DEG, and MPT. The overhead product from DC-2 (S-27) contains mostly EG, DEG, and MPT, with trace amounts of water, DMT, and BHET.

S-38 is sent to a pump (P-5) to increase its pressure to 14.5 bar so that it can enter another distillation column, DC-4. DC-4 operates at 2.2 psig for the same reason as DC-2, and again uses a three-stage rotary lobe vacuum system to achieve this column pressure. The overhead product from DC-4 (S-40) is the DMT product with a purity of 99.8 wt%. The bottoms product from DC-4 (S-41) is rich with BHET. It is pumped to 14.5 psig using P-6 and cooled down using a shell-and-tube heat exchanger (HX-3) to 34°C before 5 wt% is removed as a purge (S-46) and the rest is recycled to SLURMIX to give the BHET a second chance at depolymerizing in the reactors. Increasing the pressure and decreasing the temperature of the stream is done to ensure that the recycle stream is able to enter SLURMIX, which operates at 14.7 psig, and the stream does not vaporize any methanol in the mixer, respectively.

S-27 from DC-2 is pumped up to 29 psig via P-4 so it can enter a decanter operating at 14.5 psig (DEC-1). The resulting stream at 29 psig, S-28, is then sent to a heat exchanger (HX-4) to bring the stream temperature down to 10°C, the decanter operating temperature. Within the decanter, as described by US patent 5,391,263, the mixture of MPT and glycols will separate into a phase rich in MPT and a phase rich in the glycols. Its low operating temperature encourages phase separation.

The phase rich in MPT is recycled back to DC-2 via stream S-35. The process flow diagram shows that S-35 is sent to another decanter, DEC-2. However, DEC-2 is a purely

theoretical block added to our Aspen simulation to ensure that it compiles. S-26, which is the stream of MPT entering DC-2, adds 1,500 kg of MPT to the column per hour. In reality, 1,500 kg of MPT will be added to the column only as a startup charge, and only 160 kg of MPT will be needed to be added to DC-2 per hour through S-26. To avoid a buildup of MPT within the recycle loop and DC-2 in the simulation, DEC-2 removes all MPT from S-35 (approximately 1,330 kg of MPT) and recycles all other components in S-35 to DC-2 via S-37. This way, S-26 in the simulation can continue to operate with an inlet stream of 1,500 kg of MPT. The phase rich in glycols from DC-2 is sent to a subsequent distillation column, which produces a 99.1 wt% pure glycols bottoms product and a purge overhead product containing MPT and a small amount of EG and DEG. In an ideal process, S-33 would be recycled back to DC-2 to prevent the loss of any MPT and potential EG product. However, simulating this recycle stream in ASPEN proved to be difficult and a compromise was made for our final simulation to purge S-33 rather than recycle it.

16.4 Process Optimizations

A number of optimizations to our current process could be considered if this process is to be further explored. First, heat exchanger integration may be possible with the four shown heat exchangers on the flowsheet and potentially the condensers and reboilers for the distillation columns.

US patent 5,391,263 also suggests recycling S-33 back to DEC-2, which would recover most of the MPT lost in our process, as well as a small amount of EG and DEG. This was not completed for our Aspen simulation due to compilation difficulties with the added recycle stream this produces in the flowsheet, and the loss in glycol product and MPT is included in our

financial analysis of the process. If it is desired to increase the profits of our process, however, recycling S-36 is a simple way to decrease our feed material costs by recycling MPT and slightly increasing the amount of glycol product we produce.

17. Energy Balances and Utility Requirements

17.1 Summary of Energy Balances

Table 17.1.1 shows the energy balance for the process. The enthalpy flows were taken into consideration for the streams while heat duty, power, and other equivalent energy balance notations were taken into account for unit operations that affected the energy balance. Breakdowns of this energy balance for the preprocess, reactor, and separation sections can be found in the subsequent tables. Energy balances were calculated using the following equation.

Table 17.1.1 Overall Process Energy Balance

	MMBtu/hr	MW
Total In	-79907	-25431
Total Out	-79907	-25431
BALANCE	0	0

Table 17.1.2 describes the energy balance for the preprocessing section. This section is absent of rigorous chemical transformations or heat input into the system. The equipment power is separately displayed because it is not energy input into the system but used to filter out feedstock such as scrap metals, HDPE, PE, and other undesired feed streams. The energy balance is in the error range of 0.5% which is assumed acceptable considering how it incorporates information from both ASPEN PLUS and equipment power inputs.

Table 17.1.2 Preprocessing Section Energy Balance

	MMBtu/hr	MW
flow in (PPS-1, PPS-8, PPS-17, PPS-21, PPS-24, PPS-29, PPS-30-2)	-450	-132
flow out (PPS-2, PPS-4, PPS-6, PPS-13, PPS-15, PPS-19, PPS-22, PPS-25, PPS-30, PPS-33, PPS-34)	-436	-128
Flow Out - Flow In	-14	-4
Equipment Power	11.40	3.34
BALANCE	-2.2	-0.7

Table 17.1.3 displays the energy balance of the reactor section. Utility requirements including steam and electricity to power the pumps and maintain 160°C for the reactors are included. 6757 MW and 165 MW of heat duty is required for the first and second reactor respectively, both of which are heated by steam.

Table 17.1.3 Reactor Section Energy Balance

	MMBtu/hr	MW
flow in (PPS-33-2, S-1, S-7, S-20-2, S-47)	-407.25	-119.35
flow out (S-5, S-10)	-383.90	-112.51
Flow Out - Flow In	-23.35	-6.84
Pumps	0.15	0.05
Net Power	0.15	0.05
Reactors	23.07	6.92
Net Heat Duty	23.07	6.92
BALANCE	0	0

Table 17.1.4 summarizes the energy balance in the separations section. It includes enthalpy from input and output streams in addition to the heat duty of pumps, compressors, distillation columns, and evaporator. Pumps and compressor are powered through electricity while the evaporator, and reboilers and condensers in the distillation columns. Utility values for the heat exchangers and separators are not included in the table because they were incorporated into the enthalpies of the inlet and outlet streams.

Table 17.1.4 Separations Section Energy Balance

	MMBtu/hr	**MW**
flow in (S-10, S-14, S-18, S-26, S-29, S-43)	-86366	-25311
flow out (S-15, S-19, S-20, S-24, S-30, S-33, S-34, S-36, S-40, S-44, S-46, S-47)	-86295	-25291
Flow Out - Flow In	-70.19	-20.57
Pumps	0.07	0.02
Compressor	21.29	6.24
Heat Exchangers	-	-
Net Power	21.36	6.26
Distillation Columns	9.50	2.79
Separators	-	-
Evaporator	37.21	10.90
Net Heat Duty	46.71	13.69
BALANCE	-2.1	-0.6

17.2 Summary of utility requirements

The PET recycling process can be summarized as three major blocks: preprocessing, reaction, and separations. For simplicity, as the overall process contains over 60 pieces of equipment, the utility requirements of each block are summarized in separate tables (Tables 17.2.1, 17.2.2, and 17.2.3).

Table 17.2.1 Summary of utility requirements for the preprocessing block.

Equipment	Utility	Energy Requirement (kW)	Quantity of Utility	Unit
BALL MILL	Electricity	48.5		
BELT CONVEYOR 1	Electricity	14.8		
BELT CONVEYOR 2	Electricity	14.8		
BELT CONVEYOR 3	Electricity	21.0		
BELT CONVEYOR 4	Electricity	51.8		
BELT CONVEYOR FOR WAST	Electricity	8.80		
BELT MAGNET	Electricity	2.24		
CONE CRUSHER	Electricity	20.1		
CYCLONE SEPARATOR				
DE-WATERING MACHINE	Electricity	525		
DEBALER	Electricity	11.0		
ELECTRIC PANEL				
FILM AND FLAKE SEPARATOR				
FINISHED PRODUCT SILO				
HIGH SPEED FRICTION WAS	Electricity	259		
HOT BOILER WASHER	Electricity	997		
JAW CRUSHER	Electricity	5.22		
SCREW CONVEYOR 1	Electricity	25.9		
SCREW CONVEYOR 2	Electricity	25.9		
SCREW CONVEYOR 3	Electricity	25.9		
SINK FLOAT SEPARATOR	Electricity	319		
SORTING CONVEYOR	Electricity	12.0		
STORAGE FOR LABELS				
THERMAL DRYER	Electricity	497		
TROMMEL	Electricity	22.0		
WATER	Process Water		7,397	gal/hr
WIND SENDING SYSTEM	Electricity	21.0		

Table 17.2.2 Summary of utility requirements for the reactor block.

Equipment		Utility	Energy Requirement (kW)	Quantity of Utility	Unit
M-1					
M-2					
P-1	Pump/Motor	Electricity	46.3		
R-1	Agitation	Electricity	172		
R-1	Heating	Steam (150 psig)	6,634	26,262,199	lb/hr
R-2	Agitation	Electricity	172		
R-2	Heating	Steam (150 psig)	160	640,195	lb/hr
SEP-1					
SLURMIX	Agitation	Electricity	179		

Table 17.2.3 Summary of utility requirements for the separations block

Equipment		Utility	Energy Requirement (kW)	Quantity of Utility	Unit	Cost ($/hr)
BHETREC CW	HX	Cooling Water	639	8,769	gal/hr	0.88
COMP	Compressor	Electricity	6,274			439.2
CW	HX	Refrigerant (10°F)	1,941	23.0	ton-day	45.2
DC-1	Condenser	Cooling Water	17,899	245,829	gal/hr	24.58
DC-1	Pump/Motor	Electricity	55.9			3.91
DC-1	Reboiler	Steam (450 psig)	20,845	93,080	lb/hr	744.64
DC-2	Condenser	Cooling Water	17,427	239,339	gal/hr	23.93
DC-2	Pump/Motor	Electricity	55.9			3.91
DC-2	Vacuum	Electricity	6.88			0.48
DC-2	Reboiler	Steam (450 psig)	18,065	80,670	lb/hr	645.36
DC-3	Condenser	Cooling Water	1,725	23,690	gal/hr	2.37
DC-3	Pump/Motor	Electricity	55.9			3.91
DC-3	Vacuum	Electricity	2.03			0.14
DC-3	Reboiler	Steam (150 psig)	2,571	10,230	lb/hr	71.61
DC-4	Condenser	Cooling Water	1,614	22,163	gal/hr	2.22
DC-4	Pump/Motor	Electricity	55.9			3.91
DC-4	Vacuum	Electricity	24.3			1.7
DC-4	Reboiler	Steam (450 psig)	1,551	6,927	lb/hr	55.42
DEC-1						
DEC-2						
DMT RAIL	Pump/Motor	Electricity	3.59			0.25
DMT STORAGE	Pump/Motor	Electricity	0.790			0.06
DMT STORAGE	Heating	Electricity	55.9			3.91
EG RAIL	Pump/Motor	Electricity	3.69			0.26
EG STORAGE	Pump/Motor	Electricity	0.507			0.04
EG STORAGE	Heating	Electricity	55.9			3.91
EVAP	Vacuum	Electricity	196			13.73
EVAP	Evaporator	Steam (150 psig)	10,992	41,587	lb/hr	291.11
EVAPOUT CW	HX	Cooling Water	23,479	322,455	gal/hr	32.25
M-3						
MEOHREC CW	HX	Cooling Water	786	10,791	gal/hr	1.08
P-2						0
P-3	Pump/Motor	Electricity	0.656			0.05
P-4	Pump/Motor	Electricity	2.19			0.15
P-5	Pump/Motor	Electricity	0.614			0.04
P-6	Pump/Motor	Electricity	0.559			0.04
PREPROCESSING WASTE	Disposal	Landfill/Wastewater				216.26
PURGE DISPOSAL	Disposal	Landfill/Wastewater				125.4
PURGE RAIL	Pump/Motor	Electricity	1.93			0.14
PURGE STORAGE	Pump/Motor	Electricity	0.400			0.03
PURGE STORAGE	Heating	Electricity	55.9			3.91
SLSEP						

18. Equipment List and Unit Descriptions

Apart from the equipment in the preprocessing section, reactors, and filter candles, equipment specifications were designed using results from Aspen Plus. The pricing of each piece of equipment can be found in Section 18. Equipment in contact with the chemical streams is composed of stainless steel to prevent rust from being introduced into the system due to the high temperatures throughout the system flow. When additional specifications are required, stainless steel 316 is used. Detailed information regarding equipment specifications and calculations can be found in Section 19 and the Appendix, Section 28.

18.1 General Equipment

18.1.1 Pumps

Pumps are used throughout the system to either provide driving force for the transfer of streams or decrease pressure before entering low pressure equipment. A total of six pumps (P-1 ~ P-6) operating with electricity are shown explicitly in the full process flow diagram. The total cost of these pumps is $0.57MM.

An additional four are included implicitly with each distillation column. For DC-1, this pump increases the pressure of the stream out of the reflux drum and back into the column, and for DC-2 ~ 4, the pump increases the pressure of the liquid distillate out of the condenser to be able to enter the reflux drum. Each of these pumps is a single-stage centrifugal pump and were costed alongside an explosion-proof enclosure electric motor. This type of motor was chosen to avoid the possibility of flammable methanol exploding anywhere in the process. The total cost of these four pumps and their motors is $0.05MM.

An additional six are included implicitly with DMT, EG, and purge outlet streams (S-40, S-34, and S-24). The DMT product pump increases the pressure of stream S-40 from –12.5 psig to 0 psig for inlet to the DMT storage tank. The EG product pump increases the pressure of stream S-34 from –10.7 psig to 0 psig for inlet to the EG storage tank. The DMT and EG rail pumps increase the pressure of the storage outlet streams from 0 psig to 7.3 psig. These two pumps are designed to fill an 82,000 kg railcar in a 30-minute timeframe, as advised by Mr. Tieri and within federal regulations ("Tanker Car Capacity and Gross Weight Limitation", 2016). Each of these four pumps are a single-stage centrifugal pump and were costed alongside an explosion-proof enclosure electric motor. The purge waste pump decreases the pressure of stream S-24 from 43.3 psig to 0 psig for inlet to the purge storage tank. The purge rail pump increases the pressure of the storage outlet stream from 0 psig to 7.3 psig. This pump is designed to fill a 5,000 gal tanker truck in a 30-minute timeframe, as advised by Mr. Tieri. These two pumps are stainless steel reciprocating plunger pumps, allowing for flow of the high-solids content stream (Guo & Liu, 2011), and were costed alongside an explosion-proof enclosure electric motor. The total cost of all six pumps and their motors is $0.26MM.

18.1.2 DMT Storage Vessel

The liquid DMT product stream is pumped into a storage tank at a rate of 11,900 kg/hr and at 210℃ and atmospheric pressure. The vapor pressure of the liquid stream is 1.9 psia at this temperature (Organisation for Economic Co-operation and Development, 2001). It should be noted that vapor pressure was determined assuming a pure stream of DMT considering that S-40 is 99.5% DMT. At this vapor pressure, EPA regulations require the use of a floating-roof tank (Seider et al., 2017). Aspen Plus indicates a volumetric flow rate of about 51 gallons per minute,

meaning that the tank size needed for one week's worth of storage is 513,000 gallons. The tank is made of stainless steel and includes heat tracing. From Liquid Handling Equipment Inc., shown in Appendix 28.19.1, the total cost is determined to be $6MM.

18.1.3 EG Storage Vessel

The liquid EG product stream is pumped into a storage tank at a rate of 7,000 kg/hr and at 158℃ and atmospheric pressure. The vapor pressure of the liquid stream is approximately 4 psia, assuming a pure stream of EG. Since the stream is 97.5% EG, this assumption should be reasonable. At this high of a vapor pressure, EPA regulations (Seider et al., 2017) require the use of a floating-roof tank. Aspen Plus indicates a volumetric flow rate of approximately 31 gallons per minute, meaning that the tank size needed is 315,000 gallons for one week's worth of storage. The tank is made of stainless steel and includes heat tracing. From Liquid Handling Equipment Inc., shown in Appendix 28.19.1, the total cost is determined to be $4.4MM.

18.1.4 Purge Waste Storage Vessel

The purge stream is pumped into a storage tank at a rate of 595 kg/hr and at 140℃ and atmospheric pressure. The vapor pressure of the sludge is assumed to be low enough at this temperature to allow for a cone roof tank. Aspen Plus indicates a volumetric flow rate of 1.2 gallons per minute, meaning that the tank size needed is 12,000 gallons for one week's worth of storage. The tank is made of stainless steel and includes heat tracing. From Liquid Handling Equipment Inc., shown in Appendix 28.19.1, the total cost is determined to be $3MM.

18.2 Preprocessing

All equipment within the preprocessing sequence, unless otherwise specified, was costed and designed using quotes from ASG Recycling Machinery's PET washing line ("PET Bottle Washing Line (2019 Update)", n.d.). As mentioned in Section 16, all equipment, unless otherwise specified, is operated at ambient temperature and pressure. All equipment uses solid conveyance to transport the streams. Belt conveyors, sorting conveyors, and screw conveyors are detailed in Section 19.39, 19.40, and 19.41 respectively.

18.2.1 Debaler

Post-consumer PET bottle bales are used as the feedstock for the process and must be first debaled to allow for the bottles to freely flow through the conveyors. To accomplish this, the debaler uses slowly moving hooks to grapple onto the wires holding the bale together to free the PET bottles. Metal wires are collected and stored in the waste storage bin. Due to the feed rate requirement of about 14,000 kg/hr, two debalers are needed ("PET Bottle Washing Line (2019 Update)", n.d..). These debalers are made of Q235 steel, as determined by ASG Recycling Machinery, with a feed opening of 1.8 m x 2.2 m ("PET Bottle Washing Line (2019 Update)", n.d.) that has plenty of room for the bottle bales. The two debalers are powered by electric motors for a total power requirement of 11 KW. The total cost is $0.10MM.

18.2.2 Suspended Belt Magnet

Freed bottles are conveyed under a suspended belt magnet to remove any magnetic metals. The suspended belt magnet is mounted above the conveyor belt, perpendicularly so that removed magnetic metals may be transported away into the waste storage bin. The POW-R

CLEAN suspended belt magnet is designed and costed by Puritan Magnetics Inc. The main material of construction will be ceramic permanent magnet material, chosen by Puritan Magnetics Inc. so that demagnetization does not occur ("Suspended Belt Magnets", n.d.). The equipment is sized at 610 mm x 762 mm and has a power requirement of about 2.2 KW. Only one unit is needed to handle the required feed rate of the system. The total cost is $0.04MM.

18.2.3 Trommel Separator

Bottles are slowly transported through a trommel separator to remove small contaminants like glass, metals, wood, and paper. The trommel is a large cylindrical mesh tunnel that slowly rotates. The trommel contains interior flaps that continuously flip to push the PET bottles forward, with a set up at a slight tilt helping this process as well. As the PET bottles move through the tunnel, the small contaminants fall through the mesh and are collected in the waste storage bin. The trommel is made out of carbon steel and will be set at a 5° tilt ("PET Bottle Washing Line (2019 Update)", n.d.). The trommel has a diameter of 1.5 m and a length of 4.5 m ("PET Bottle Washing Line (2019 Update)", n.d.). In order to meet the feed rate requirements of the system, four trommels are needed. This creates a total power demand of 22 kW and a total cost of $0.21MM.

18.2.4 Jaw Crusher

The first step of size reduction of the PET bottles takes place in a jaw crusher. The addition of a jaw crusher to the process allows for a wider variety of post-consumer PET to be fed into the system as jaw crushers can handle feed sizes of up to 1 m (Seider et al., 2017) and will output flakes at a size of 25 mm (Seider et al., 2017). As described in Section 16, water is

sprayed into the jaw crusher to allow for wet granulation to occur. Wet granulation is preferred as a way to reduce the risk of dust accumulation and explosions as well as reduce power demands of the equipment. The introduction of water to the PET bottles does not pose a concern as the bottles will later be wet from sink float separation. However, it should be noted that water may corrode the equipment and possible equipment replacements may be needed eventually. The jaw crusher is assumed to be made of carbon steel and is sized to handle a feed rate of 16,000 kg/hr so that it operates at less than 90% capacity. Using the guidelines in Chapter 16 of Seider et al. (2017), the power requirement is estimated to be 5.2 kW, due to the low hardness of the bottles and based on suggestions by professors Bruce Vrana and Warren Seider. Furthermore, Chapter 16 of Seider et al. (2017) was used, shown in appendix, to determine the total cost of $0.15MM.

18.2.5 Cone Crusher

The PET bottle flakes are then sent into a cone crusher to further reduce the feed size of 25 mm to 5 mm (Seider et al., 2017). Similar to the jaw crusher, water will be mixed in to allow for wet granulation and its above-mentioned benefits and disadvantages. The cone crusher is composed of carbon steel and is sized to handle a feed rate of 16,000 kg/hr so that it operates at less than 90% capacity. Similar to the jaw crusher, a power requirement of 20.1 kW is estimated using guidelines in Chapter 16 of Seider et al. (2017). Furthermore, Chapter 16 of Seider et al. (2017) was used, shown in appendix, to determine the total cost of $0.19MM.

18.2.6 Ball Mill

PET bottle flakes of the size of 5 mm are fed into the ball mill and are further reduced to the desired size of 1 mm (Ligorati et al., 1970). The ball mill is assumed to be made of carbon steel and sized to handle a feed rate of 16,000 kg/hr so that it operates at less than 90% capacity. The ball mill also operates with water to perform wet granulation. It should be noted that wet granulation within this piece of equipment creates a slurry, which is easier to remove, compared to dry material, from ball mills (Walas, 1990). Similar to the previous crushers, a power requirement of 48.5 kW is assumed using guidelines in Chapter 16 of Seider et al. (2017). Furthermore, Chapter 16 of Seider et al. (2017) was used, shown in appendix, to determine the total cost of $2.12MM.

18.2.7 Film and Flake Separator

PET bottle flakes are dropped through a film and flake separator to remove lighter PP particles by a winnowing process. The mixture enters a sorting chamber, containing a column of rising air. The lighter PP particles are caught by the air stream and separated from the heavier HDPE and PET particle mixture. The separated waste is then transported to the waste storage bin. The PET and HDPE particles fall to the bottom of the chamber, where they are transported to the next piece of equipment. The film and flake separator are made of stainless steel (“PET Bottle Washing Line (2019 Update)”, n.d.). Due to the high feed rate requirement of the system, a total of eight film and flake separators will be needed. This creates a total power requirement of 24 kW and a total cost of $0.14MM.

18.2.8 Sink Float Separation Tank

The bottle flakes are then transported to a sink float separation tank to remove HDPE particles from the PET bottle flakes. The tank uses the density of process water to accomplish this separation. PET bottle flakes have a higher density than water and will sink to the bottom of the tank to be collected and transported forward. However, HDPE will float and thus be separated from the PET. Rotating drums move floating material to be transported to the waste storage bin. The sink float separation tank is composed of 304 stainless steel to avoid corrosion and oxidation from the large amount of water and is 1.5 m wide and 5 m long ("PET Bottle Washing Line (2019 Update)", n.d.). To meet the feed rate requirements of the system, a total of 24 sink float separation tanks are needed. This creates a total power requirement of 365 kW and a total cost of $2.62MM.

18.2.9 Hot Washer

PET bottle flakes are brought through a hot washer by a screw auger to remove glues, oils, and grease. The large screw auger transmits the PET bottle flakes horizontally through a boiling water bath. Surrounding the screw auger is a mesh screen tunnel to allow for small contaminants to fall through while holding the PET bottle flakes in place. Small holes on the transmit auger allow for hot water from the bath to be sprayed onto the flakes. The hot washer is constructed of 304 stainless steel to avoid corrosion from the large amount of water. The process water is fed into the bath and electrically heated ("PET Bottle Washing Line (2019 Update)", n.d.). To meet the feed rate requirements of the system, a total of 16 hot washers will be needed. This creates a total power requirement of 1,140 kW and a total cost of $0.82MM.

18.2.10 High Speed Friction Washer

After hot washing, PET bottle flakes are transferred to a high-speed friction washer that uses supplied process water to remove any dirt or debris remaining. The high-speed friction washer contains a rotating shaft, powered by an electric motor, with many tilted paddles mounted to mix the flakes at high speeds of 960 rpm ("PET Bottle Washing Line (2019 Update)", n.d.) and cause friction between flakes for dirt removal. Surrounding the shaft is a large mesh screen tunnel used for dewatering and filtering out small contaminants such as dirt. The tunnel is then surrounded by a rectangular case, where water jets are aimed to spray cool process water at the mesh screen, which allows for cleaning of the PET bottle flake and prevents clogging in the mesh. The high-speed friction washer body is made of stainless steel, while the rotor shaft is made of carbon steel with 24 paddles ("PET Bottle Washing Line (2019 Update)", n.d.). The high-speed friction washer is also 2.8 m long and set at a 15° inclination ("PET Bottle Washing Line (2019 Update)", n.d.). To meet the feed rate requirements of the system, a total of eight high-speed friction washers are needed. This creates a total power requirement of 296 kW and a total cost of $0.56MM.

18.2.11 Dewatering Machine

The slurry of clean PET flakes is transported into a dewatering machine to greatly reduce the water content down to 15-20% by using centrifugal force to spin water outwards while the PET flakes are contained within it ("PET Bottle Washing Line (2019 Update)", n.d.). The dewatering machine contains a long shaft that is mounted with many paddles and is powered by an electric motor. The shaft rotates at nearly 1,000 rpm, throwing fed PET flakes against a surrounding mesh screen tunnel. Water passes through the mesh screen and is collected to be

recycled into the preprocessing sequence. The dewatering machine is made of stainless steel, while the rotor is made of carbon steel (“PET Bottle Washing Line (2019 Update)”, n.d.). To meet the feed rate requirements of the system, a total of eight dewatering machines are needed. This creates a total power requirement of 600 kW and a total cost of $0.51MM.

18.2.12 Thermal Dryer

The partially dry PET flakes are transported to a thermal dryer to further reduce the water content down to less than 1% using hot air (“PET Bottle Washing Line (2019 Update)”, n.d.). After the dewatering machine, PET flakes are vacuumed out by a transport blower and mixed with electrically heated air traveling through a long set of stainless steel tubing that winds back and forth. The hot air dehydrates moisture within the PET flakes. The thermal dryer piping is made of 304 stainless steel and has a pipe diameter of 159 mm (“PET Bottle Washing Line (2019 Update)”, n.d.). To meet the feed rate requirements of the system, a total of 16 thermal dryers are needed. This creates a total power requirement of 568 kW and a total cost of $0.10MM.

18.2.13 Cyclone Separator

The drying system ends with a cyclone separator to mix cold air with the hot air stream of PET flakes, further reducing the residual water content and (“PET Bottle Washing Line (2019 Update)”, n.d.). The cyclone separator acts to separate the PET flakes from the hot air stream and allows it to be collected in a product silo. The cyclone separator is stainless steel and has a 1 m diameter (“PET Bottle Washing Line (2019 Update)”, n.d.). To meet the feed rate requirements

of the system, a total of eight cyclone separators are needed. This creates a total cost of $0.09MM.

18.2.14 PET Flake Product Silo

Dried pure PET bottle flakes are transported to a PET flake product silo, which serves as temporary storage during operation downtime. While the plant is in operation, purified PET flakes from the product silo are conveyed into the slurry mixer. The PET flake product silo is made of stainless steel and has a volume of about 264 gallons ("PET Bottle Washing Line (2019 Update)", n.d.). To meet the feed rate requirements of the system, a total of eight PET flake product silos are needed. This creates a total cost of $0.09MM.

18.2.15 Preprocessing Waste Storage Bin

All of the contaminants and waste separated from the PET bottle flakes are collected and transported to one large storage bin. This bin will contain HDPE, PP, glass, paper, metal, wood, and other contaminants that are non-hazardous and can be disposed of through landfilling. The bin is made of carbon steel and operates at ambient temperature and pressure. Using a bale density of 15 lbs/ft^3 ("The Association of Plastic Recyclers", n.d.) and assuming that 10% of the feed will be waste, shown in appendix, a volume of 260,000 gallons would be required for a week's worth of storage. Using guidelines from Chapter 16 of Seider et al. (2017), shown in appendix, a total cost is determined to be $0.36MM.

18.3 Reactor Section

18.3.1 Reactors

The methanolysis reaction takes place in two agitated reactors in series. The flow rate of the feed stream is 66,292 kg/hr of a slurry of PET solid flakes, liquid methanol, and liquid

BHET. Sodium carbonate is used to catalyze the reaction, which leads to a 77.7 fractional conversion of the PET to its products. The temperature of the reactor during the reaction is held at 160°C. Due to the reaction being endothermic, additional heat duty must be added to each reactor. The first reactor requires 6.6 MW while the second requires 0.16 MW. A pressure of 249 psig is maintained to prevent methanol from vaporizing, which has a vapor pressure of 235 psig. The high heat duty for the first reactor and its thick walls to maintain high pressure required installation of heating coils inside the reactor in addition to the installed heat jacket. The second reactor's heat duty can be accommodated by a steam heat jacket. The volume capacity of each tank is 59,100 L based on approximately an 85% liquid level on the straight side of the reactor. In addition to the desired transesterification between PET and methanol to produce DMT and EG, dimerization of EG to form DEG occurs in the reactors. A 5% fractional conversion of EG to DEG is observed. This reaction is important because the presence of DEG in the mixture introduces azeotropes, causing additional separation steps to be installed. The total cost of the reactors and its associated heating instruments and agitation device is $9.80MM.

18.3.2 Slurry Mixer

The slurry mixer mixes feed PET flakes, methanol, sodium carbonate catalyst, and recycled BHET before the mixture is pumped into the reactors. PET flakes are dropped into the mixer through a conveyor belt. Liquid methanol, sodium carbonate, and liquid BHET are pumped into the mixer vessel. Having a slurry is essential for the process in order to transfer the solid PET flakes into the 265 psig reactor. To do this, the input feed's pressure must be greater than the reactor which thus requires a feed in the form of a transferable slurry. The mixer vessel is kept at ambient conditions of 25°C and atmospheric pressure. The volume capacity of the

slurry mixer tank is 109,000 L when at 70% liquid level on the straight side of the vessel. This is a slightly more conservative storage capacity assumption compared to the reactors because the slurry mixer serves as the buffer zone before going into the reactor. To properly mix the PET flakes, methanol, and BHET uniformly, an agitation device is implemented. The total cost is $0.36MM.

18.4 Separations Section

18.4.1 Compressor

The compressor increases the pressure of the vapor stream (S-13) from the evaporator (EVAP) from –12.5 psig 21.6 psig. Doing so allows the vapor stream from the evaporator to enter a heat exchanger (HX-1) that condenses the stream. The mass flow rate of S-13 is 61127 kg/hr. The volumetric flow rate decreases from 316 kcm^3/hr to 28 kcm^3/hr after being compressed. Due to the high vapor flow rate and its initially low pressure, the compressor requires 7811 hp. The high power duty and stainless steel material requirement cause the purchase cost of the compressor to be the highest of all equipment in the process. The total cost is $20.3MM.

18.4.2 Evaporator

The evaporator is a forced circulation evaporator, chosen because of the high viscosity of the leftover liquid in the evaporator. The evaporator operates at 140°C and 2.18 psig. It must be operated in a vacuum because enough MeOH must vaporize from the inlet liquid so that most of the Na2CO3 is crystallized out of the solution, but the temperature within the evaporator cannot exceed 170°C, which is when DMT and EG polymerize (US EPA, 1991). When pricing the

evaporator, a vacuum three-stage rotary lobe vacuum system was included, which maintains the evaporator at the desired pressure. It is assumed that 155°C steam is used to heat the evaporator, which is obtained from buying 150 psig steam and decreasing its pressure using a valve. An overall heat transfer coefficient of 650 Btu/hr-ft^2-°F was used following estimations from Seider et al. (2017) about a typical overall heat transfer coefficient for forced circulation evaporators with a boiling point at 104°C. While our evaporator has a higher boiling point than that of the heat transfer coefficient provided by Seider et al. (2017), it was assumed that the estimate would provide an appropriate value for an estimation of the sizing and cost of the evaporator. More detailed information on the evaporator can be found in specification sheet 19.15 and Appendix 28.16. The total cost is $2.22MM.

18.4.3 Heat Exchangers

Four heat exchangers are shown explicitly in Figure 15.2, but eight additional heat exchangers are designed and priced for the process for the condensers and reboilers for each distillation column. In total, there are 12 heat exchangers in the process.

The four explicit heat exchangers in the process (HX-1, HX-2, HX-3, HX-4) were designed using the rigorous shell-and-tube HEATX method in ASPEN PLUS and refined using Aspen Exchanger Design and Rating (EDR). HX-1 condenses S-13 from a total vapor to a total liquid stream. HX-2 reduces the temperature of the liquid distillate from DC-2 to of 60°C, HX-3 reduces the liquid bottoms product from DC-4 to 34°C, and HX-4 reduces the overhead liquid product from DC-2 to 10°C. HX-1 ~ 3 use cooling water bought at 32°C and heated to 49°C. HX-4 uses refrigeration at -12°C, which was costed using Table 17.1 in Seider et al. (2017). The heat transfer coefficient for each heat exchanger was estimated by Aspen EDR. Difficulties with

the design calculations for HX-1 came from vibrational warnings calculated by Aspen EDR - triple segmental baffles were included in the design for HX-1 to combat this. Additional details about the heat exchanger sizes can be found in specification sheets 19.17 ~ 20 and Appendix 28.18. The total cost of these three heat exchangers is $1.99MM.

The distillation column heat exchangers were designed using the required heat duty required for the condensers and reboilers provided by ASPEN PLUS simulations of the columns. All condensers are designed to be floating head heat exchangers due to the ease of which floating head heat exchangers can be cleaned over fixed head and U-tube heat exchangers. All reboilers are designed to be kettle vaporizers. To estimate the sizes of these heat exchangers, the required surface area was calculated using the required heat duty for each unit and the known inlet and outlet temperatures of both the hot and cold streams. It was assumed that there is no temperature change for either hot or cold streams for the reboilers, and that the cooling water for the condensers would be bought at 32°C and heated to 49°C. A heat transfer coefficient of 100 Btu/ft^2-hr-°C was used in these calculations by using the value provided for shell-side organic solvent and tube-side water heat exchangers in Seider et al. (2017). Cost calculations for these heat exchangers assumed a maximum tube-length correction factor of 1.25 for 8-ft long tubes as the actual tube lengths were not designed. The maximum correction factor was used to ensure that enough money would be allocated to buying the necessary heat exchangers once they are fully designed. Additional details about these heat exchangers can be found in specification sheets 19.11 and 19.12 for condensers and reboilers respectively, and in Appendix 28.11 and 28.12 for condensers and reboilers respectively. The total cost of these eight heat exchangers is $5.91MM.

18.4.4 Reflux Drums

Reflux drums were designed for each distillation column. Each reflux drum was designed to have a 10-minute holding time and a 2:1 length to diameter ratio. This ratio was chosen as a recommendation from industry consultants and for ease of a preliminary design. Changes to the designed drum diameters and lengths can be made accordingly, as long as the necessary volume capacity of the drum is met, if commercially available drums do not match what has been designed. All of the drums are horizontal pressure vessels because they are cheaper than vertical pressure vessels. They also all operate at 14.7 psig to avoid the need for vacuum systems, and a fractional weld efficiency of 0.85 was assumed due to their small required wall thicknesses. The calculated wall thicknesses for all the drums of using the method for horizontal pressure vessels in Seider et al. (2017) was small (less than or equal to 0.07 inches), so a larger thickness of 1/4 inches as recommended for vessels with inside diameters of up to 4 feet and 5/16 inches as recommended for vessels with inside diameters of 4-6 feet by Seider et al. (2017) was used as appropriate. Additional details about these drums can be found in specification sheets 19.10 and in Appendix 28.10. The total cost is $0.23MM.

18.4.5 Decanter

The decanter was designed as a vertical pressure vessel with a 30-minute holding time. The decanter has a 2:1 length to diameter ratio for the same reason as the reflux drums. The drum operates at 14.5 psig to avoid the need for a vacuum system, and a fractional weld efficiency of 0.85 was assumed due to the drum's small required wall thicknesses. The calculated wall thickness of using the method for vertical pressure vessels in Seider et al. (2017) was small

(0.05 inches), so a larger thickness of 5/16 inches as recommended for vessels with inside diameters of 4-6 feet by Seider et al. (2017) was used.

Note that the decanter's purpose is to hold liquid distillate from DC-2 so that it can phase separate into a MPT-rich phase and a glycols-rich phase. While U.S. patent 5,391,263 mentions that this phase separation occurs, it does not describe the states at which it occurs, nor its extent. An ASPEN PLUS simulation, separate from that of our full process flow, was conducted to estimate the conditions for and extent of phase separation from a stream containing MPT, EG, DEG, and trace amounts of water and DMT. Phase separation was found to occur in a decanter operating at 10°C and 35 psig. However, the existence of the phase separation is fickle in ASPEN PLUS and is quickly lost with changes to any part of the simulated process, including MPT mass fraction and temperature. To circumvent these Aspen Plus problems but still estimate a degree of phase separation in our final process, the observed phase separation outlet mass fractions were manually added to DEC-1 in our full process flow diagram. This is only a rough estimate however and is based on component properties generated by ASPEN. For a more accurate estimation of the phase separation of a stream containing MPT and glycols, it is recommended that further simulations and experiments are conducted.

Additional details about the decanter can be found in specification sheet 19.14 and Appendix 28.15. The total cost is $0.07MM.

18.4.6 Filter Candles

The filter candles are capable of filtering 100 micron solids with 98% efficiency. The filters designed for this process are from MAAG and are capable of handling inlet flows at over 265 psig. Additional details about these filters can be found in specification sheets 19.16 and

Appendix 28.17. The quote received from MAAG initially required 169 filters to handle an inlet flow of 56,000 kg per hour, but over an iteration of our separation process where we decided to include the evaporator and remove methanol from the process before filtering a liquid through the filters, the required inlet flow of the filters became 5,200 kg per hour instead. A linear interpolation was completed from the initial quote to scale down the number of filters needed, which is 16. The filters are reusable, so two sets are priced to be rotated out and cleaned when needed. The total cost is $0.03MM.

18.4.7 Distillation Columns

Four distillation columns were designed for this process. All columns were designed using ASPEN PLUS, and their sizes were calculated via the column internals option. Column wall thicknesses are calculated using the method for vertical pressure vessels and adjusted as necessary for vacuum pressure vessels as described in Seider et al (2017). For columns with a wall thickness greater than 1 inch, a fractional weld efficiency of 1 was used; otherwise, a fractional weld efficiency of 0.85 was used, as recommended in Seider et al (2017).

DC-1 is a tray distillation column operating at 29 psig. It uses 14 trays spaced 2 feet apart, and its height includes 15 feet for top and bottom disengagement. The trays used are stainless steel 316 sieve trays. Additional details about these columns can be found in specification sheet 19.6 and Appendix 28.6.

DC-2, DC-3, and DC-4 are all vacuum-packed columns operating at 2.18 psig. This pressure is required to ensure that the bottoms products of each column is under 240°C so that polymerization between DMT and EG and decomposition of the stream components does not occur. The operating pressure used when calculating costs is set at 10 psig, as recommended by

Seider et al (2017). They all have a height of 41 feet. This height was estimated for DC-2 and DC-4 based on the 7 theoretical stages that Aspen simulated the column to require. Estimating that the column would need 14 real trays if it were a trayed column and including 15 feet for top and bottom disengagement like in DC-1, the height becomes 41 feet. While DC-3 is simulated in ASPEN with 14 stages, it is assumed that the small diameter and inlet rate of DC-3 would be similarly proportional to the height of 41 feet rather than the 67 feet that the column would be if it followed the same estimation method as the other packed columns. Based on this height, two liquid distributors are included for each packed column based on the heuristic by Seider et al. (2017) that a distributor should be at the feed point and at every 20 feet along the column. The packings used are structured packings to offer reduced pressure drop in the column. The installed cost of stainless steel packing is estimated at $\$285/ft^3$ and the installed cost of a liquid distributor is estimated at $\$140/ft^2$ of column cross-sectional area, as estimated by Seider et al. (2017). Additional details about these columns can be found in specification sheets 19.7 ~ 9 and Appendices 28.7 ~ 9. The total cost for the columns and their trays and packings is $4.55MM.

18.4.8 Vacuum Systems

Four vacuum systems are used in the process: one each for DC-2, DC-3, and DC-4, and one for the evaporator. All vacuum systems used are dry pumps, which avoid the addition of liquid contaminants of both steam ejectors and liquid-ring pumps. All of the dry pumps are three-stage rotary lobes, which have a lower limit of suction of 0.029 psig, as shown in Table 16.30 of Seider et al., which is sufficient for our needs. Each system is priced assuming that the leakage rate from each unit is only due to air leakage. The purchase cost correlation provided for three-stage rotary lobes in Seider et al. requires a leakage rate into the system between 60 and 270

ft^3/min - the calculated air leakage rates for DC-3 and DC4 are below 60 ft^3/min, but the correlation is still used replacing the calculated leakage rates for DC-3 and DC-4 with 60 ft^3/min. The leakage rate for the evaporator vacuum system is also above the range provided by Seider et al. but is still used in the calculation. Additional details about the distillation column systems can be found in specification sheets 19.13 and Appendix 28.14. Additional details about the heat exchanger system can be found in specification sheets 19.13 and Appendix 28.16.

19. Specification Sheets

Any specification sheets with asterisks in the item number are not explicitly represented in the process flow diagram, Figure 15.2.

19.1 Pumps

19.1.1 P-1

Pumps			
Identification:	**Item**	*Pump 1*	Date: *12-Apr-22*
	Item No.	P-1	By: *Hyuck Choi*
	No. required	1	
Function:	Increase pressure for transportation of slurry		
Operation:	Continuous		
Materials handled:	Feed (S-3)	Effluent (S-4)	
Temperature (C)	55	56	
Mass Flow(kg/hr)	66292	66292	
Volumetric Flow (L/hr)	61634	61634	
Pressure (psig)	0	250	
Design Data:	Net Work (kW): 45		
	Pressure Head (m): 156		
	Material of construction: Stainless steel		
	Centrifugal pump driven by electric motor		
Utilities: Electricity			
Comments and drawings: Pump and motor costs shown in Section 18.1.1			

19.1.2 P-2

Pumps			
Identification:	**Item**	*Pump 2*	Date: *12-Apr-22*
	Item No.	P-2	By: *Hyuck Choi*
	No. required	1	
Function:	Decrease pressure		
Operation:	Continuous		
Materials handled:	Feed (S-10)	Effluent (S-11)	
Temperature (C)	160	160	
Mass Flow(kg/hr)	66419	66419	
Volumetric Flow (L/hr)	86740	86674	
Pressure (psig)	250	0	
Design Data:	Net Work (kW): -29		
	Pressure Head (m): 229		
	Material of construction: Stainless steel		
	Centrifugal pump driven by electric motor		
Utilities: Electricity			
Comments and drawings: Pump and motor costs shown in Section 18.1.1			

19.1.3 P-3

Pumps			
Identification:	**Item**	*Pump 3*	Date: *12-Apr-22*
	Item No.	P-3	By: *Hyuck Choi*
	No. required	1	
Function:	Increase pressure		
Operation:	Continuous		
Materials handled:	Feed (S-22)	Effluent (S-23)	
Temperature (C)	140	140	
Mass Flow(kg/hr)	5109	5109	
Volumetric Flow (L/hr)	4291	4292	
Pressure (psig)	-12.5	43.3	
Design Data:	Net Work (kW): 0.7		
	Pressure Head (m): 33		
	Material of construction: Stainless steel		
	Centrifugal pump driven by electric motor		
Utilities: Electricity			
Comments and drawings: Pump and motor costs shown in Section 18.1.1			

19.1.4 P-4

Pumps			
Identification:	**Item**	*Pump 4*	Date: *12-Apr-22*
	Item No.	P-4	By: *Hyuck Choi*
	No. required	1	
Function:	Increase pressure		
Operation:	Continuous		
Materials handled:	Feed (S-27)	Effluent (S-28)	
Temperature (C)	132	132	
Mass Flow(kg/hr)	23115	23115	
Volumetric Flow (L/hr)	22917	22917	
Pressure (psig)	-12.5	14.3	
Design Data:	Net Work (kW): 2		
	Pressure Head (m): 19		
	Material of construction: Stainless steel		
	Centrifugal pump driven by electric motor		
Utilities: Electricity			
Comments and drawings: Pump and motor costs shown in Section 18.1.1			

19.1.5 P-5

Pumps			
Identification:	**Item**	*Pump 5*	Date: *12-Apr-22*
	Item No.	P-5	By: *Hyuck Choi*
	No. required	1	
Function:	Increase pressure		
Operation:	Continuous		
Materials handled:	Feed (S-38)	Effluent (S-39)	
Temperature (C)	223	223	
Mass Flow(kg/hr)	20000	20000	
Volumetric Flow (L/hr)	19550	19549	
Pressure (psig)	-11.7	-0.2	
Design Data:	Net Work (kW): 0.6		
	Pressure Head (m): 8		
	Material of construction: Stainless steel		
	Centrifugal pump driven by electric motor		
Utilities: Electricity			
Comments and drawings: Pump and motor costs shown in Section 18.1.1			

19.1.6 P-6

Pumps			
Identification:	**Item**	*Pump 6*	Date: *12-Apr-22*
	Item No.	P-6	By: *Hyuck Choi*
	No. required	1	
Function:	Increase pressure		
Operation:	Continuous		
Materials handled:	Feed (S-41)	Effluent (S-42)	
Temperature (C)	225	226	
Mass Flow(kg/hr)	8100	8100	
Volumetric Flow (L/hr)	7857	7856	
Pressure (psig)	-11.7	14.3	
Design Data:	Net Work (kW): 0.6		
	Pressure Head (m): 18		
	Material of construction: Stainless steel		
	Centrifugal pump driven by electric motor		
Utilities: Electricity			
Comments and drawings: Pump and motor costs shown in Section 18.1.1			

19.1.7 DMT Product

		Pumps		
Identification:	**Item**	*DMT Product*	Date:	*17-Apr-22*
	Item No.	DMT Product	By:	*Christopher Kline*
	No. required	1		
Function:	Increase pressure			
Operation:	Continuous			
Materials handled:	Feed (S-41)		Effluent	
Temperature (C)	210		210	
Mass Flow(kg/hr)	11900		11900	
Volumetric Flow (L/hr)	11555		11555	
Pressure (psig)	-12.5		0	
Design Data:	Net Work (kW): 0.8			
	Pressure Head (m): 8.6			
	Material of construction: Stainless steel			
	Centrifugal pump driven by electric motor			
Utilities: Electricity				
Comments and drawings: Pump and motor costs shown in Section 18.1.1				

19.1.8 DMT Rail

		Pumps		
Identification:	**Item**	*DMT Rail*	Date:	*17-Apr-22*
	Item No.	DMT Rail	By:	*Christopher Kline*
	No. required	1		
Function:	Increase pressure			
Operation:	Continuous			
Materials handled:	Feed		Effluent	
Temperature (C)	210		210	
Mass Flow(kg/hr)	163242		163242	
Volumetric Flow (L/hr)	158522		158522	
Pressure (psig)	0		7.3	
Design Data:	Net Work (kW): 3.6			
	Pressure Head (m): 5			
	Material of construction: Stainless steel			
	Centrifugal pump driven by electric motor			
Utilities: Electricity				
Comments and drawings: Pump and motor costs shown in Section 18.1.1				

19.1.9 EG Product

		Pumps		
Identification:	**Item**	*EG Product*	Date:	*17-Apr-22*
	Item No.	EG Product	By:	*Christopher Kline*
	No. required	1		
Function:	Increase pressure			
Operation:	Continuous			
Materials handled:	Feed (S-34)		Effluent	
Temperature (C)	158		158	
Mass Flow(kg/hr)	7000		7000	
Volumetric Flow (L/hr)	7071		7071	
Pressure (psig)	-10.7		0	
Design Data:	Net Work (kW): 0.5			
	Pressure Head (m): 7.6			
	Material of construction: Stainless steel			
	Centrifugal pump driven by electric motor			
Utilities: Electricity				
Comments and drawings: Pump and motor costs shown in Section 18.1.1				

19.1.10 EG Rail

		Pumps		
Identification:	**Item**	*EG Rail*	Date:	*17-Apr-22*
	Item No.	EG Rail	By:	*Christopher Kline*
	No. required	1		
Function:	Increase pressure			
Operation:	Continuous			
Materials handled:	Feed		Effluent	
Temperature (C)	158		158	
Mass Flow(kg/hr)	163276		163276	
Volumetric Flow (L/hr)	164951		164951	
Pressure (psig)	0		7.3	
Design Data:	Net Work (kW): 3.7			
	Pressure Head (m): 5.2			
	Material of construction: Stainless steel			
	Centrifugal pump driven by electric motor			
Utilities: Electricity				
Comments and drawings: Pump and motor costs shown in Section 18.1.1				

19.1.11 Purge Waste

		Pumps		
Identification:	**Item**	*Purge Waste*	Date:	*17-Apr-22*
	Item No.	Purge Waste	By:	*Christopher Kline*
	No. required	1		
Function:	Decrease pressure			
Operation:	Continuous			
Materials handled:	Feed (S-24)		Effluent	
Temperature (C)	140		140	
Mass Flow(kg/hr)	592		592	
Volumetric Flow (L/hr)	7071		7071	
Pressure (psig)	43.3		0	
Design Data:	Net Work (kW): -0.01			
	Pressure Head (m): 14.2			
	Material of construction: Stainless steel			
	Reciprocating plunger pump driven by electric motor			
Utilities: Electricity				
Comments and drawings: Pump and motor costs shown in Section 18.1.1				

19.1.12 Purge Rail

		Pumps		
Identification:	**Item**	*Purge Rail*	Date:	*17-Apr-22*
	Item No.	Purge Rail	By:	*Christopher Kline*
	No. required	1		
Function:	Increase pressure			
Operation:	Continuous			
Materials handled:	Feed		Effluent	
Temperature (C)	140		140	
Mass Flow(kg/hr)	81173		81173	
Volumetric Flow (L/hr)	37850		37850	
Pressure (psig)	0		7.3	
Design Data:	Net Work (kW): 4.8			
	Pressure Head (m): 4.8			
	Material of construction: Stainless steel			
	Reciprocating plunger pump driven by electric motor			
Utilities: Electricity				
Comments and drawings: Pump and motor costs shown in Section 18.1.1				

19.2 SLURMIX Slurry Mixer

Slurry Mixer					
Identification:	**Item**	*Slurry Mixer*		Date:	*12-Apr-22*
	Item No.	SLURMIX		By:	*Hyuck Choi*
	No. required	1			
Function:	Tank for mixing methanol, PET, and recycled stream into slurry form				
Operation:	Continuous				
Materials handled:	Feed 1 (S-2)	Feed 2 (PPS-33-2)	Feed 3 (S-47)	Effluent (S-2)	
Quantity (kg/hr):	12626	41967	7695	62288	
Composition:					
Methanol	0	41667	0	41667	
Ethylene glycol	0	130	0	130	
DMT	0	0	6882	6882	
PET	12626	0	0	12626	
Na2CO3	0	170	0	170	
HDPE	0	0	0	0	
PVC	0	0	0	0	
Aluminum	0	0	0	0	
Water	0	0	0	0	
Diethylene glycol	0	0	0.0003	0.0003	
BHET	0	0	813	813	
MPT	0	0	0.00019	0.00019	
Temperature (C):	57	57	34	55	
Design Data:	Operating Temperature: 25°C				
	Pressure: atmospheric pressure				
	Agitation Method: Turbine				
	Agitation Power: 240 hp				
	Material of construction: Stainless steel				
	Volume: 108788 L				
	Orientation: Horizontal				
Utilities: Electricity					
Comments and drawings: See Process Flow Sheet and Section 18.3.2.					

19.3 R-1 Reactor

Reactor				
Identification:	**Item**	*Reactor*	Date:	*12-Apr-22*
	Item No.	R-1	By:	*Hyuck Choi*
	No. required	1		
Function:	Reactor vessel for depolymerization of PET to DMT and EG			
Operation:	Continuous			
Materials handled:	Feed (S-8)		Effluent (S-9)	
Quantity (kg/hr):	66292		66292	
Composition:				
Methanol	41667		38296	
Ethylene glycol	130		6654	
DMT	6882		17097	
PET + BHET	17443		4069	
Na2CO3	170		170	
HDPE	0		0	
PVC	0		0	
Aluminum	0		0	
Water	0		0.9	
Diethylene glycol	0.003		5.6	
MPT	0.00019		0.00019	
Volume Flow (L/hr)	75461		86684	
Design Data:	Operating Temperature: 160°C			
	Pressure: 265 psig			
	Residence Time: 1 hour			
	Material of construction: Stainless steel			
	Volume: 97989 L			
	Orientation: Vertical			
	Steam Heat Jacket and Inner Steam Heating Coils			
	Heat Release: 6.6 MW			
	Agitation Power: 230 hp			
Utilities: Steam				
Comments and drawings: See Process Flow Sheet and Section 18.3.1.				

19.4 R-2 Reactor

Reactor				
Identification:	**Item**	*Reactor*	Date:	*12-Apr-22*
	Item No.	R-2	By:	*Hyuck Choi*
	No. required	1		
Function:	Reactor vessel for depolymerization of PET to DMT and EG			
Operation:	Continuous			
Materials handled:	Feed (S-9)		Effluent (S-10)	
Quantity (kg/hr):	66292		66292	
Composition:				
Methanol	38296		37544	
Ethylene glycol	6654		7777	
DMT	17097		19375	
PET + BHET	4069		1086	
Na2CO3	170		170	
HDPE	0		0	
PVC	0		0	
Aluminum	0		0	
Water	0.9		49	
Diethylene glycol	5.6		290	
MPT	0.00019		0.00019	
Volume Flow (L/hr)	86684		86567	
Design Data:	Operating Temperature: 160°C			
	Pressure: 265 psig			
	Residence Time: 1 hour			
	Material of construction: Stainless steel			
	Volume: 97989 L			
	Orientation: Vertical			
	Steam Heat Jacket			
	Heat Release: 6.6 MW			
	Agitation Power: 230 hp			
Utilities: Steam				
Comments and drawings: See Process Flow Sheet and Section 18.3.1.				

19.5 COMP Compressor

Compressor			
Identification:	**Item**	*Compressor*	Date: *12-Apr-22*
	Item No.	COMP	By: *Hyuck Choi*
	No. required	1	
Function:	Compress gaseous effluent from evaporator to higher pressure		
Operation:	Continuous		
Materials handled:	Feed (S-12)	Effluent (S-13)	
Temperature (C)	140	347	
Mass Flow(kg/hr)	1388	1388	
Volumetric Flow (kcum/hr)	318	29	
Pressure (psig)	-12.5	21.6	
Liquid Phase Mass Fraction	0	0	
Vapor Phase Mass Fraction	1	1	
Design Data:	Discharge pressure: 21.6 psig Type: Isentropic Isentropic efficiency: 70% Material of construction: Stainless steel Power (kW): 6274		
Utilities: Electricity			
Comments and drawings: See Process Flow Sheet and Section 18.4.1.			

19.6 DC-1 Distillation Column

Distillation Column						
Identification:	**Item**	*Distillation Column*			Date:	*12-Apr-22*
	Item No.	*DC-1*			By:	*Shannon Zhang*
	No. required	1				
Function:	Separate methanol from DMT, EG, and DEG.					
Operation:	Continuous					
Materials handled:	*Feed*	*Feed 2*	*Liquid Distillate*	*Bottoms*	*Vapor Distillate*	
Quantity (kg/hr):	61310.46		37723.00	23587.46		
Composition:						
METHANOL	37533.791		37523.410	10.381		
EG	7662.112		38.738	7623.374		
DMT	15658.740		0.001	15658.739		
PET	trace		trace	trace		
NA2CO3	trace		trace	trace		
HDPE	trace		trace	trace		
ALUM	trace		trace	trace		
WATER	176.623		160.851	15.772		
DEG	278.879		1 PPM	278.879		
BIS-2-01	0.317		trace	0.317		
MPT	173 PPM		2 PPB	173 PPM		
IRON	trace		trace	trace		
POLY(-01	trace		trace	trace		
AIR	trace		trace	trace		
Temperature (°C):	76.11		83.02	231.97		
Design Data:	Number of trays: 14					
	Pressure: 29.0 psig					
	Functional height: 41.0 ft					
	Material of construction: Stainless steel					
	Recommended inside diameter: 9.0 ft					
	Tray efficiency: 0.5					
	Feed stage: 6					
	Feed 2 stage:					
	Molar reflux ratio: 0.6					
	Tray spacing: 2.0 ft					
	Skirt height: 10.0 ft					
Utilities: Cooling water at 246 M gal/hr and 450 psig steam at 93 M lb/hr.						
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.6.						

19.7 DC-2 Distillation Column

Vacuum Packed Distillation Column						
Identification:	**Item**	*Distillation Column*			Date: *12-Apr-22*	
	Item No.	*DC-2*			By: *Shannon Zhang*	
	No. required	1				
Function:	Separate glycols from DMT and BHET.					
Operation:	Continuous					
Materials handled:	*Feed*	*Feed 2*	*Feed 3*	*Feed 4*	*Liquid Distillate*	*Bottoms*
Quantity (kg/hr):	23587.46	4516.38	1500.00	13510.85	23114.69	20000.00
Composition:						
METHANOL	10.38	9.67	trace	21.24	41.29	trace
EG	7623.37	109.60	trace	12809.60	20538.44	4.14
DMT	15658.74	3530.77	trace	305.33	365.70	19129.12
PET	trace	trace	trace	trace	trace	trace
NA2CO3	trace	trace	trace	trace	trace	trace
HDPE	trace	trace	trace	trace	trace	trace
ALUM	trace	trace	trace	trace	trace	trace
WATER	15.77	0.130	trace	42.84	58.74	34 PPB
DEG	278.88	10.54	trace	331.84	611.34	9.92
BIS-2-01	0.32	855.68	trace	17 PPB	17 PPB	855.99
MPT	173 PPM	5 PPM	1500.00	trace	1499.18	0.82
IRON	trace	trace	trace	trace	trace	trace
POLY(-01	trace	trace	trace	trace	trace	trace
AIR	trace	trace	trace	trace	trace	trace
Temperature (°C):	231.97	140.30	25.00	22.47	131.77	222.98
Design Data:	Packing type: Structured FLEXIGRID					
	Pressure: 2.2 psig					
	Functional height: 41.0 ft					
	Material of construction: Stainless steel					
	Material of packing: Stainless steel					
	Recommended inside diameter: 13.7 ft					
	Feed stage: 6					
	Feed 2 stage: 6					
	Feed 3 stage: 6					
	Feed 4 stage: 6					
	Molar reflux ratio: 2.0					
	No. liquid distributors: 2					
	Skirt height: 10.0 ft					
Utilities: Cooling water at 239 M gal/hr and 450 psig steam at 81 M lb/hr.						
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.7.						

19.8 DC-3 Distillation Column

	Vacuum Packed Distillation Column				
Identification:	**Item**	*Distillation Column*		Date:	*15-Apr-22*
	Item No.	*DC-3*		By:	*Shannon Zhang*
	No. required	1			
Function:	Separate glycol product from MPT and other impurities.				
Operation:	Continuous				
Materials handled:	*Feed*	*Feed 2*	*Liquid Distillate*	*Bottoms*	*Vapor Distillate*
Quantity (kg/hr):	8267.06		1267.06	7000.00	
Composition:					
METHANOL	20.05		20.05	trace	
EG	7728.84		1039.07	6689.765	
DMT	60.37		0.19	60.183	
PET	trace		trace	trace	
NA2CO3	trace		trace	trace	
HDPE	trace		trace	trace	
ALUM	trace		trace	trace	
WATER	15.90		15.90	trace	
DEG	279.50		29.45	250.052	
BIS-2-01	trace		trace	trace	
MPT	162.39		162.39	127 PPM	
IRON	trace		trace	trace	
POLY(-01	trace		trace	trace	
AIR	trace		trace	trace	
Temperature (°C):	22.47		98.38	157.93	
Design Data:	Packing type: Structured PALL				
	Pressure: 2.2 psig				
	Functional height: 41.0 ft				
	Material of construction: Stainless steel				
	Material of packing: Stainless steel				
	Recommended inside diameter: 4.9 ft				
	Feed stage: 6				
	Feed 2 stage:				
	Molar reflux ratio: 4.0				
	No. liquid distributors: 2				
	Skirt height: 10.0 ft				
Utilities: Cooling water at 81 M gal/hr and 150 psig steam at 10 M lb/hr.					
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.8.					

19.9 DC-4 Distillation Column

Vacuum Packed Distillation Column					
Identification:	**Item**	*Distillation Column*		Date:	*15-Apr-22*
	Item No.	*DC-4*		By:	*Shannon Zhang*
	No. required	1			
Function:	Separate DMT product from BHET and any heavy impurities.				
Operation:	Continuous				
Materials handled:	*Feed*	*Feed 2*	*Liquid Distillate*	*Bottoms*	*Vapor Distillate*
Quantity (kg/hr):	20000.00		11900.00	8100.00	
Composition:					
METHANOL	trace		trace	trace	
EG	4.14		4.14	7 PPM	
DMT	19129.12		11885.11	7244.01	
PET	trace		trace	trace	
NA2CO3	trace		trace	trace	
HDPE	trace		trace	trace	
ALUM	trace		trace	trace	
WATER	34 PPB		34 PPB	trace	
DEG	9.92		9.92	291 PPM	
BIS-2-01	855.99		0.01	855.99	
MPT	0.82		0.82	187 PPM	
IRON	trace		trace	trace	
POLY(-01	trace		trace	trace	
AIR	trace		trace	trace	
Temperature (°C):	223.04		210.38	225.39	
Design Data:	Packing type: Structured PALL				
	Pressure: 2.2 psig				
	Functional height: 41.0 ft				
	Material of construction: Stainless steel				
	Material of packing: Stainless steel				
	Recommended inside diameter: 9.8 ft				
	Feed stage: 6				
	Feed 2 stage:				
	Molar reflux ratio: 0.6				
	No. liquid distributors: 2				
	Skirt height: 10.0 ft				
Utilities: Cooling water at 22 M gal/hr and 450 psig steam at 7 M lb/hr.					
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.9.					

19.10 Reflux Drums

		Reflux Drum	
Identification:	**Item**	*Vacuum Vessel*	Date: *15-Apr-22*
	Item No.	*DC-1 Reflux Drum**	By: *Shannon Zhang*
	No. required	1	
Function:	Contain liquid overhead product from DC-1.		
Operation:	Continuous		
	Materials handled:	*Feed*	
	Quantity (kg/hr):	60356.80	
	Composition:		
	METHANOL	60037.46	
	EG	61.98	
	DMT	1626 PPM	
	PET	trace	
	NA2CO3	trace	
	HDPE	trace	
	ALUM	trace	
	WATER	257.36	
	DEG	2 PPM	
	BIS-2-01	trace	
	MPT	3 PPB	
	IRON	trace	
	POLY(-01	trace	
	AIR	trace	
	Temperature (°C):	83.00	
Design Data:	Orientation: Horizontal		
	Pressure: 14.7 psig		
	Volum: 492.7 ft3		
	Functional length: 13.6 ft		
	Functional diameter: 6.8 ft		
	Material of construction: Stainless steel		
Utilities:			
Comments and drawings: See Appendix 28.10.			

		Reflux Drum	
Identification:	**Item**	*Vacuum Vessel*	Date: *15-Apr-22*
	Item No.	*DC-2 Reflux Drum**	By: *Shannon Zhang*
	No. required	1	
Function:	Contain liquid overhead product from DC-2.		
Operation:	Continuous		
	Materials handled:	*Feed*	
	Quantity (kg/hr):	69344.0889	
	Composition:		
	METHANOL	123.8760477	
	EG	61615.32125	
	DMT	1097.111713	
	PET	trace	
	NA2CO3	trace	
	HDPE	trace	
	ALUM	trace	
	WATER	176.2174368	
	DEG	1834.031	
	BIS-2-01	trace	
	MPT	4497.532	
	IRON	trace	
	POLY(-01	trace	
	AIR	trace	
	Temperature (°C):	131.77	
Design Data:	Orientation: Horizontal		
	Pressure: 14.7 psig		
	Volume: 1201.7 ft3		
	Functional length: 18.3 ft		
	Functional diameter: 9.2 ft		
	Material of construction: Stainless steel		
Utilities:			
Comments and drawings: See Appendix 28.10.			

		Reflux Drum	
Identification:	**Item**	*Vacuum Vessel*	Date: *15-Apr-22*
	Item No.	*DC-3 Reflux Drum**	By: *Shannon Zhang*
	No. required	1	
Function:	Contain liquid overhead product from DC-3.		
Operation:	Continuous		
	Materials handled:		
	Quantity (kg/hr):	6335.28	
	Composition:		
	METHANOL	100.24	
	EG	5195.37	
	DMT	0.95	
	PET	trace	
	NA2CO3	trace	
	HDPE	trace	
	ALUM	trace	
	WATER	79.51	
	DEG	147.23	
	BIS-2-01	trace	
	MPT	811.97	
	IRON	trace	
	POLY(-01	trace	
	AIR	trace	
	Temperature (°C):	98.38	
Design Data:	Orientation: Horizontal		
	Pressure: 14.7 psig		
	Volume: 33.1 ft3		
	Functional length: 5.5 ft		
	Functional diameter: 2.8 ft		
	Material of construction: Stainless steel		
Utilities:			
Comments and drawings: See Process Flow Sheet and Appendix 28.10.			

		Reflux Drum	
Identification:	**Item**	*Vacuum Vessel*	Date: *15-Apr-22*
	Item No.	*DC-4 Reflux Drum**	By: *Shannon Zhang*
	No. required	1	
Function:	Contain liquid overhead product from DC-4.		
Operation:	Continuous		
	Materials handled:		
	Quantity (kg/hr):	19040	
	Composition:		
	METHANOL	trace	
	EG	6.62	
	DMT	19016.18	
	PET	trace	
	NA2CO3	trace	
	HDPE	trace	
	ALUM	trace	
	WATER	54 PPB	
	DEG	15.88	
	BIS-2-01	0.01	
	MPT	1.32	
	IRON	trace	
	POLY(-01	trace	
	AIR	trace	
	Temperature (°C):	210.38	
Design Data:	Orientation: Horizontal		
	Pressure: 14.7 psig		
	Volume: 108.8 ft3		
	Functional length: 8.2 ft		
	Functional diameter: 4.1 ft		
	Material of construction: Stainless steel		
Utilities:			
Comments and drawings: See Process Flow Sheet and Appendix 28.10.			

19.11 Condensers

		Condenser		
Identification:	**Item**	*Heat Exchanger*	Date:	*15-Apr-22*
	Item No.	*DC-1 Condenser**	By:	*Shannon Zhang*
	No. required	1		
Function:	Fully condense overhead vapor product from DC-1.			
Operation:	Continuous			
Materials handled:	*Hot in*	*Hot out*	*Cold in*	*Cold out*
Quantity (kg/hr):	60356.80	60356.80	931691.91	931691.91
Composition:				
METHANOL	60037.46	60037.46	0.00	0.00
EG	61.98	61.98	0.00	0.00
DMT	1626 PPM	1626 PPM	0.00	0.00
PET	trace	trace	0.00	0.00
NA2CO3	trace	trace	0.00	0.00
HDPE	trace	trace	0.00	0.00
ALUM	trace	trace	0.00	0.00
WATER	257.36	257.36	931691.91	931691.91
DEG	2 PPM	2 PPM	0.00	0.00
BIS-2-01	trace	trace	0.00	0.00
MPT	3 PPB	3 PPB	0.00	0.00
IRON	trace	trace	0.00	0.00
POLY(-01	trace	trace	0.00	0.00
AIR	trace	trace	0.00	0.00
Temperature (°C):	83.00	83.00	32.20	48.89
Design Data:	Type: Floating head shell-and-tube			
	Heat duty: 61 MMBtu/hr			
	Pressure: 29.0 psig			
	Shell material of construction: Stainless steel			
	Tube material of construction: Stainless steel			
	Heat transfer coefficient: 100 Btu/ft2-hr-F			
	Heat transfer area: 8100 ft2			
Utilities: Cooling water at 246 M gal/hr.				
Comments and drawings: See Appendix 28.11.				

		Condenser		
Identification:	**Item**	*Heat Exchanger*	Date:	*15-Apr-22*
	Item No.	*DC-2 Condenser**	By:	*Shannon Zhang*
	No. required	1		
Function:	Fully condense overhead vapor product from DC-2.			
Operation:	Continuous			

Materials handled:	*Hot in*	*Hot out*	*Cold in*	*Cold out*
Quantity (kg/hr):	69344.09	69344.09	907094.81	907094.81
Composition:				
METHANOL	123.88	123.88	0.00	0.00
EG	61615.32	61615.32	0.00	0.00
DMT	1097.11	1097.11	0.00	0.00
PET	trace	trace	0.00	0.00
NA2CO3	trace	trace	0.00	0.00
HDPE	trace	trace	0.00	0.00
ALUM	trace	trace	0.00	0.00
WATER	176.22	176.22	907094.81	907094.81
DEG	1834.03	1834.03	0.00	0.00
BIS-2-01	trace	trace	0.00	0.00
MPT	4497.53	4497.53	0.00	0.00
IRON	trace	trace	0.00	0.00
POLY(-01	trace	trace	0.00	0.00
AIR	trace	trace	0.00	0.00
Temperature (°C):	131.77	131.77	32.20	48.89

Design Data:
Type: Floating head shell-and-tube
Heat duty: 60 MMBtu/hr
Pressure: 29.0 psig
Shell material of construction: Stainless steel
Tube material of construction: Stainless steel
Heat transfer coefficient: 100 Btu/ft2-hr-F
Heat transfer area: 3600 ft2

Utilities: Cooling water at 239 M gal/hr.
Comments and drawings: See Appendix 28.11.

		Condenser		
Identification:	**Item**	*Heat Exchanger*	Date:	*15-Apr-22*
	Item No.	*DC-3 Condenser**	By:	*Shannon Zhang*
	No. required	1		
Function:	Fully condense overhead vapor product from DC-3.			
Operation:	Continuous			
Materials handled:	*Hot in*	*Hot out*	*Cold in*	*Cold out*
Quantity (kg/hr):	69344.0889	69344.0889	83997.77	83997.77
Composition:				
METHANOL	123.8760477	123.8760477	0.00	0.00
EG	61615.32125	61615.32125	0.00	0.00
DMT	1097.111713	1097.111713	0.00	0.00
PET	trace	0	0.00	0.00
NA2CO3	0	0	0.00	0.00
HDPE	0	0	0.00	0.00
ALUM	0	0	0.00	0.00
WATER	176.2174368	176.2174368	83997.77	83997.77
DEG	1834.030836	1834.030836	0.00	0.00
BIS-2-01	4.95E-08	4.95E-08	0.00	0.00
MPT	4497.531619	4497.531619	0.00	0.00
IRON	0	0	0.00	0.00
POLY(-01	0	0	0.00	0.00
AIR	0	0	0.00	0.00
Temperature (°C):	131.77	131.767359	32.20	48.89
Design Data:	Type: Floating head shell-and-tube			
	Heat duty: 5.9 MMBtu/hr			
	Pressure: 29.0 psig			
	Shell material of construction: Stainless steel			
	Tube material of construction: Stainless steel			
	Heat transfer coefficient: 100 Btu/ft2-hr-F			
	Heat transfer area: 570 ft2			
Utilities: Cooling water at 24 M gal/hr.				
Comments and drawings: See Appendix 28.11.				

		Condenser		
Identification:	**Item**	*Heat Exchanger*	Date:	*15-Apr-22*
	Item No.	*DC-4 Condenser**	By:	*Shannon Zhang*
	No. required	1		
Function:	Fully condense overhead vapor product from DC-4.			
Operation:	Continuous			
Materials handled:	*Hot in*	*Hot out*	*Cold in*	*Cold out*
Quantity (kg/hr):	19040.00	19040.00	83997.77	83997.77
Composition:				
METHANOL	trace	trace	0.00	0.00
EG	6.62	6.62	0.00	0.00
DMT	19016.18	19016.18	0.00	0.00
PET	trace	trace	0.00	0.00
NA2CO3	trace	trace	0.00	0.00
HDPE	trace	trace	0.00	0.00
ALUM	trace	trace	0.00	0.00
WATER	54 PPB	54 PPB	83997.77	83997.77
DEG	15.88	15.88	0.00	0.00
BIS-2-01	0.01	0.01	0.00	0.00
MPT	1.32	1.32	0.00	0.00
IRON	trace	trace	0.00	0.00
POLY(-01	trace	trace	0.00	0.00
AIR	trace	trace	0.00	0.00
Temperature (°C):	98.38	98.38	32.22	48.89
Design Data:	Type: Floating head shell-and-tube			
	Heat duty: 5.5 MMBtu/hr			
	Pressure: 29.0 psig			
	Shell material of construction: Stainless steel			
	Tube material of construction: Stainless steel			
	Heat transfer coefficient: 100 Btu/ft2-hr-F			
	Heat transfer area: 180 ft2			
Utilities: Cooling water at 22 M gal/hr.				
Comments and drawings: See Process Flow Sheet and Appendix 28.11.				

19.12 Reboilers

		Reboiler		
Identification:	**Item**	*Heat Exchanger*	Date:	*15-Apr-22*
	Item No.	*DC-1 Reboiler**	By:	*Shannon Zhang*
	No. required	1		
Function:	Boil up liquid bottoms product from DC-1.			
Operation:	Continuous			
Materials handled:	*Hot in*	*Hot out*	*Cold in*	*Cold out*
Quantity (kg/hr):	42220.34	42220.34	112584.01	112584.01
Composition:				
METHANOL	0.00	0.00	49.55	49.55
EG	0.00	0.00	36386.70	36386.70
DMT	0.00	0.00	74739.86	74739.86
PET	0.00	0.00	trace	trace
NA2CO3	0.00	0.00	trace	trace
HDPE	0.00	0.00	trace	trace
ALUM	0.00	0.00	trace	trace
WATER	42220.34	42220.34	75.28	75.28
DEG	0.00	0.00	1331.10	1331.10
BIS-2-01	0.00	0.00	1.51	1.51
MPT	0.00	0.00	0.001	0.001
IRON	0.00	0.00	trace	trace
POLY(-01	0.00	0.00	trace	trace
AIR	0.00	0.00	trace	trace
Temperature (°C):	248.76	248.76	231.97	231.97
Design Data:	Type: Kettle vaporizer			
	Heat duty: 72 MMBtu/hr			
	Pressure: 29.0 psig			
	Shell material of construction: Stainless steel			
	Tube material of construction: Stainless steel			
	Heat transfer coefficient: 100 Btu/ft2-hr-F			
	Heat transfer area: 23500 ft2			
Utilities: 450 psig steam at 93 M lb/hr.				
Comments and drawings: See Appendix 28.12.				

		Reboiler		
Identification:	**Item**	*Heat Exchanger*	Date:	*15-Apr-22*
	Item No.	*DC-2 Reboiler**	By:	*Shannon Zhang*
	No. required	1		
Function:	Boil up liquid bottoms product from DC-2.			
Operation:	Continuous			
Materials handled:	*Hot in*	*Hot out*	*Cold in*	*Cold out*
Quantity (kg/hr):	36591.27	36591.27	227168.60	227168.60
Composition:				
METHANOL	0.00	0.00	3 PPB	3 PPB
EG	0.00	0.00	46.969	46.969
DMT	0.00	0.00	217276.824	217276.824
PET	0.00	0.00	trace	trace
NA2CO3	0.00	0.00	trace	trace
HDPE	0.00	0.00	trace	trace
ALUM	0.00	0.00	trace	trace
WATER	36591.27	36591.27	385 PPB	385 PPB
DEG	0.00	0.00	112.718	112.718
BIS-2-01	0.00	0.00	9722.743	9722.743
MPT	0.00	0.00	9.348	9.348
IRON	0.00	0.00	trace	trace
POLY(-01	0.00	0.00	trace	trace
AIR	0.00	0.00	trace	trace
Temperature (°C):	222.98	222.98	248.76	248.76
Design Data:	Type: Kettle vaporizer			
	Heat duty: 62 MMBtu/hr			
	Pressure: 29.0 psig			
	Shell material of construction: Stainless steel			
	Tube material of construction: Stainless steel			
	Heat transfer coefficient: 100 Btu/ft2-hr-F			
	Heat transfer area: 13300 ft2			
Utilities: 450 psig steam at 81 M lb/hr.				
Comments and drawings: See Appendix 28.12.				

Identification:		Reboiler		
	Item	*Heat Exchanger*	Date:	*15-Apr-22*
	Item No.	*DC-3 Reboiler**	By:	*Shannon Zhang*
	No. required	1		
Function:	Boil up liquid bottoms product from DC-3.			
Operation:	Continuous			
Materials handled:	*Hot in*	*Hot out*	*Cold in*	*Cold out*
Quantity (kg/hr):	4640.27	4640.27	6335.28	6335.28
Composition:				
METHANOL	0.00	0.00	100.238	100.238
EG	0.00	0.00	5195.370	5195.370
DMT	0.00	0.00	0.950	0.950
PET	0.00	0.00	trace	trace
NA2CO3	0.00	0.00	trace	trace
HDPE	0.00	0.00	trace	trace
ALUM	0.00	0.00	trace	trace
WATER	4640.27	4640.27	79.512	79.512
DEG	0.00	0.00	147.234	147.234
BIS-2-01	0.00	0.00	trace	trace
MPT	0.00	0.00	811.972	811.972
IRON	0.00	0.00	trace	trace
POLY(-01	0.00	0.00	trace	trace
AIR	0.00	0.00	trace	trace
Temperature (°C):	182.93	182.933333	157.93	157.93
Design Data:	Type: Kettle vaporizer			
	Heat duty: 8.8 MMBtu/hr			
	Pressure: 29.0 psig			
	Shell material of construction: Stainless steel			
	Tube material of construction: Stainless steel			
	Heat transfer coefficient: 100 Btu/ft2-hr-F			
	Heat transfer area: 1950 ft2			
Utilities: 150 psig steam at 10 M lb/hr.				
Comments and drawings: See Appendix 28.12.				

		Reboiler		
Identification:	**Item**	*Heat Exchanger*	Date:	*15-Apr-22*
	Item No.	*DC-4 Reboiler**	By:	*Shannon Zhang*
	No. required	1		
Function:	Boil up liquid bottoms product from DC-4.			
Operation:	Continuous			
Materials handled:	*Hot in*	*Hot out*	*Cold in*	*Cold out*
Quantity (kg/hr):	3142.03	3142.03	19040.00	19040.00
Composition:				
METHANOL	0.00	0.00	trace	trace
EG	0.00	0.00	6.62	6.62
DMT	0.00	0.00	19016.18	19016.18
PET	0.00	0.00	trace	trace
NA2CO3	0.00	0.00	trace	trace
HDPE	0.00	0.00	trace	trace
ALUM	0.00	0.00	trace	trace
WATER	3142.03	3142.03	54 PPB	54 PPB
DEG	0.00	0.00	15.88	15.88
BIS-2-01	0.00	0.00	0.01	0.01
MPT	0.00	0.00	1.32	1.32
IRON	0.00	0.00	trace	trace
POLY(-01	0.00	0.00	trace	trace
AIR	0.00	0.00	trace	trace
Temperature (°C):	182.93	182.93	157.93	157.93
Design Data:	Type: Floating head shell-and-tube			
	Heat duty: 5.3 MMBtu/hr			
	Pressure: 29.0 psig			
	Shell material of construction: Stainless steel			
	Tube material of construction: Stainless steel			
	Heat transfer coefficient: 100 Btu/ft2-hr-F			
	Heat transfer area: 2400 ft2			
Utilities: 450 psig steam at 7 M lb/hr.				
Comments and drawings: See Process Flow Sheet and Appendix 28.12.				

19.13 Vacuum Systems

		Vacuum System	
Identification:	**Item**	*Vacuum System*	Date: *15-Apr-22*
	Item No.	*EVAP Vacuum Sys.**	By: *Shannon Zhang*
	No. required	1	
Function:	Create a vacuum in the evaporator.		
Operation:	Continuous		
Design Data:	Temperature: 140°C		
	Volume: 52700000 L		
	Pressure: 0.02 psig		
	Holding time: 10 minutes		
	Leakage rate: 4700 ft3/min		
Utilities: Electricity at 196 kW.			
Comments and drawings: See Appendix 28.16.			

		Vacuum System	
Identification:	**Item**	*Vacuum System*	Date: *15-Apr-22*
	Item No.	*DC-2 Vacuum Sys.**	By: *Shannon Zhang*
	No. required	1	
Function:	Create a vacuum in DC-2.		
Operation:	Continuous		
Design Data:	Temperature: 132°C		
	Volume: 6073 ft3		
	Pressure: 0.02 psig		
	Leakage rate: 116 ft3/min		
Utilities: Electricity at 7 kW.			
Comments and drawings: See Appendix 28.14.			

		Vacuum System	
Identification:	**Item**	*Vacuum System*	Date: *15-Apr-22*
	Item No.	*DC-3 Vacuum Sys.**	By: *Shannon Zhang*
	No. required	1	
Function:	Create a vacuum in DC-3.		
Operation:	Continuous		
Design Data:	Temperature: 98°C		
	Volume: 765 ft3		
	Pressure: 0.02 psig		
	Leakage rate: 34 ft3/min		
Utilities: Electricity at 2 kW.			
Comments and drawings: See Appendix 28.14.			

		Vacuum System	
Identification:	**Item**	*Vacuum System*	Date: *15-Apr-22*
	Item No.	*DC-4 Vacuum Sys.**	By: *Shannon Zhang*
	No. required	1	
Function:	Create a vacuum in DC-3.		
Operation:	Continuous		
Design Data:	Temperature: 132°C		
	Volume: 900 ft3		
	Pressure: 0.02 psig		
	Leakage rate: 26 ft3/min		
Utilities: Electricity at 24 kW.			
Comments and drawings: See Appendix 28.14.			

19.14 DEC-1 Decanter

		Decanter		
Identification:	**Item**	*Decanter*	Date:	*15-Apr-22*
	Item No.	*DEC-1*	By:	*Shannon Zhang*
	No. required	1		
Function:	Separate methanol from DMT, EG, DEG, and other organics.			
Operation:	Continuous			
Materials handled:	*Feed*	*Feed 2*	*Glycol-rich phase*	*MPT-rich phase*
Quantity (kg/hr):	23114.69		8267.06	14847.64
Composition:				
METHANOL	41.292		20.048	21.244
EG	20538.435		7728.839	12809.596
DMT	365.704		60.373	305.331
PET	trace		trace	trace
NA2CO3	trace		trace	trace
HDPE	trace		trace	trace
ALUM	trace		trace	trace
WATER	58.739		15.902	42.837
DEG	611.343		279.499	331.845
BIS-2-01	17 PPB		trace	17 PPB
MPT	1499.177		162.395	1336.782
IRON	trace		trace	trace
POLY(-01	trace		trace	trace
AIR	trace		trace	trace
Temperature (°C):	22.47		22.47	22.47
Design Data:	Type: Vertical tank			
	Required volume: 367 ft3			
	Functional length: 41.0 ft			
	Functional diameter: 6.2 ft			
	Pressure: 14.5 psig			
	Holding time: 30 minutes			
Utilities:				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.15.				

19.15 EVAP Evaporator

		Evaporator		
Identification:	**Item**	*Evaporator*	Date:	*15-Apr-22*
	Item No.	*EVAP*	By:	*Shannon Zhang*
	No. required	1		
Function:	Crystallize sodium carbonate from inlet solution by vaporizing methanol.			
Operation:	Continuous			
Materials handled:	*Feed*	*Feed 2*	*Vapor*	*Liquid*
Quantity (kg/hr):	66419.30		61310.46	5108.84
Composition:				
METHANOL	37543.97		37533.79	10.175
EG	7777.48		7662.11	115.367
DMT	19375.34		15658.74	3716.603
PET	229.79		trace	229.793
NA2CO3	170.00		trace	170.000
HDPE	trace		trace	trace
ALUM	trace		trace	trace
WATER	176.76		176.62	0.137
DEG	289.97		278.88	11.090
BIS-2-01	855.99		0.32	855.677
MPT	177 PPM		173 PPM	4 PPM
IRON	trace		trace	trace
POLY(-01	trace		trace	trace
AIR	trace		trace	trace
Temperature (°C):	159.60		140.00	140.00
Design Data:	Type: Forced circulation evaporator			
	Heat duty: 38 MMBtu			
	Pressure: 2.18 psig			
	Heat transfer coefficient: 650 Btu/ft2-hr-F			
	Heat transfer area: 2100 ft2			
Utilities: 150 psig steam at 11 M lb/hr and electricity at 196 kW.				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.16.				

19.16 SLSEP Filter Candles

		Filter Candles		
Identification:	**Item**	*Filter Candles*	Date:	*15-Apr-22*
	Item No.	*SLSEP*	By:	*Shannon Zhang*
	No. required	16		
Function:	Separate solid insoluble PET and catalyst from liquid product out of reactor.			
Operation:	Continuous			
Materials handled:	*Feed*	*Feed 2*	*Purge*	*Outlet*
Quantity (kg/hr):	5108.84		592.46	4516.38
Composition:				
METHANOL	10.17		0.51	9.666
EG	115.37		5.77	109.598
DMT	3716.60		185.83	3530.773
PET	229.79		229.79	trace
NA2CO3	170.00		170.00	trace
HDPE	trace		trace	trace
ALUM	trace		trace	trace
WATER	0.14		0.01	0.130
DEG	11.09		0.55	10.536
BIS-2-01	855.68		trace	855.677
MPT	4 PPM		trace	4 PPM
IRON	trace		trace	trace
POLY(-01	trace		trace	trace
AIR	trace		trace	trace
Temperature (°C):	140.30		140.30	140.30
Design Data:	Filtration area: 1.4 m2			
	Filtration: 100 micron			
	Efficiency: 0.98			
	Length: 1.45 m			

Utilities: 150 psig steam at 11 M lb/hr and electricity at 196 kW.

Comments and drawings: Two sets of 16 filter candles are purchased for a total of 32 filter candles. See Appendix 28.17.

19.17 HX-1 Heat Exchanger

Heat Exchanger Specification Sheet

1	Company:							
2	Location:							
3	Service of Unit:		Our Reference:					
4	Item No.:		Your Reference:					
5	Date:	Rev No.:	Job No.:					
6	Size 16.2598 - 230.315	in	Type:	BEM	Horizontal	Connected in:	1 parallel	1 series
7	Surf/unit(eff.)	6116.2	ft²	Shells/unit	1	Surf/shell(eff.)	6116.2	ft²
8	**PERFORMANCE OF ONE UNIT**							
9	Fluid allocation			Shell Side		Tube Side		
10	Fluid name			S11		S8		
11	Fluid quantity, Total		lb/h	135166.4		8236607		
12	Vapor (In/Out)		lb/h	135166.4	0	0	0	
13	Liquid		lb/h	0	135166.4	8236607	8236607	
14	Noncondensable		lb/h	0	0	0	0	
15								
16	Temperature (In/Out)		°F	657.04	168.76	90	99.8	
17	Bubble / Dew point		°F	194.24 / 419.82	189.81 / 414.46	/	/	
18	Density	Vapor/Liquid	lb/ft³	0.134 /	/ 53.346	/ 61.614	/ 61.283	
19	Viscosity		cp	0.0194 /	/ 0.4467	/ 0.7827	/ 0.702	
20	Molecular wt, Vap			44.17				
21	Molecular wt, NC							
22	Specific heat		BTU/(lb-F)	0.4784 /	/ 1.1258	/ 0.9905	/ 0.996	
23	Thermal conductivity		BTU/(ft-h-F)	0.029 /	/ 0.103	/ 0.356	/ 0.36	
24	Latent heat		BTU/lb	143	478.8			
25	Pressure (abs)		psi	36.26	33.23	14.7	4.28	
26	Velocity (Mean/Max)		ft/s	26.15 / 108		10.7 / 10.73		
27	Pressure drop, allow./calc.		psi	3.77	3.03	10.42	10.42	
28	Fouling resistance (min)		ft²-h-F/BTU	0.002		0.003	0.0036 Ao based	
29	Heat exchanged	80131680	BTU/h			MTD (corrected)	147.85	°F
30	Transfer rate, Service	88.62		Dirty	88.63	Clean	176.89	BTU/(h-ft²-F)
31	**CONSTRUCTION OF ONE SHELL**						**Sketch**	
32				Shell Side		Tube Side		
33	Design/Vacuum/test pressure		psi	43.51 / /		43.51 / /		
34	Design temperature / MDMT		°F	725 /		725 /		
35	Number passes per shell			1		1		
36	Corrosion allowance		in	0		0		
37	Connections	In	in	1 23.25 / -		1 19.25 / -		
38	Size/Rating	Out		1 7.981 / -		1 17.25 / -		
39	ID	Intermediate		/ -		/ -		
40	Tube #: 1659	OD: 0.75	Tks. Average 0.065	in	Length:230.315	in	Pitch: 1	in Tube pattern:60
41	Tube type: Plain		Insert:None		Fin#:	#/in	Material:SS 316	
42	Shell SS 316	ID 46.2598	OD 47.2835	in	Shell cover	-		
43	Channel or bonnet	SS 316			Channel cover	-		
44	Tubesheet-stationary	SS 316	-		Tubesheet-floating	-		
45	Floating head cover	-			Impingement protection	None		
46	Baffle-cross SS 316	Type	Triple segmental	Cut(%d)	10.01	Verti Spacing: c/c	8.6614	in
47	Baffle-long -	Seal Type				Inlet	27.0394	in
48	Supports-tube	U-bend	0		Type			
49	Bypass seal		Tube-tubesheet joint		Expanded only (2 grooves)(App.A 'i')			
50	Expansion joint	-	Type	None				
51	RhoV2-Inlet nozzle	1213	Bundle entrance	3170	Bundle exit	81		lb/(ft-s²)
52	Gaskets - Shell side	-	Tube side		Flat Metal Jacket Fibe			
53	Floating head	-						
54	Code requirements	ASME Code Sec VIII Div 1		TEMA class	R - refinery service			
55	Weight/Shell	26694.6	Filled with water	42886.8	Bundle	18467.7	lb	
56	Remarks							
57								
58								

19.18 HX-2 Heat Exchanger

Heat Exchanger Specification Sheet

1	Company:								
2	Location:								
3	Service of Unit:		Our Reference:						
4	Item No.:		Your Reference:						
5	Date:	Rev No.:	Job No.:						
6	Size: 15.2362 - 200.787	in	Type: BEM	Horizontal		Connected in: 1	parallel	1	series
7	Surf/unit(eff.)	537.1	ft²	Shells/unit 1		Surf/shell(eff.)	537.1	ft²	
8	**PERFORMANCE OF ONE UNIT**								
9	Fluid allocation			Shell Side		Tube Side			
10	Fluid name			S26		S14			
11	Fluid quantity, Total		lb/h	83165		81952.6			
12	Vapor (In/Out)		lb/h	0	0	0	0		
13	Liquid		lb/h	83165	83165	81952.6	81952.6		
14	Noncondensable		lb/h	0	0	0	0		
15									
16	Temperature (In/Out)		°F	181.43	142.73	90	122.72		
17	Bubble / Dew point		°F	181.43 / 181.56	179.78 / 179.92	/	/		
18	Density	Vapor/Liquid	lb/ft³	/ 44.982	/ 46.717	/ 61.614	/ 60.499		
19	Viscosity		cp	/ 0.2923	/ 0.3603	/ 0.7827	/ 0.5557		
20	Molecular wt, Vap								
21	Molecular wt, NC								
22	Specific heat		BTU/(lb-F)	/ 0.9057	/ 0.8191	/ 0.9905	/ 1.0102		
23	Thermal conductivity		BTU/(ft-h-F)	/ 0.106	/ 0.11	/ 0.356	/ 0.369		
24	Latent heat		BTU/lb						
25	Pressure (abs)		psi	29.01	28.09	29.39	28.34		
26	Velocity (Mean/Max)		ft/s	1.11 / 1.45		2.41 / 2.44			
27	Pressure drop, allow./calc.		psi	2.9	0.91	5.8	1.05		
28	Fouling resistance (min)		ft²-h-F/BTU	0.002		0.003	0.0039	Ao based	
29	Heat exchanged	2681535	BTU/h			MTD (corrected)	52.03	°F	
30	Transfer rate, Service	95.94		Dirty 95.91		Clean	218.66	BTU/(h-ft²-F)	
31	**CONSTRUCTION OF ONE SHELL**							**Sketch**	
32				Shell Side		Tube Side			
33	Design/Vacuum/test pressure		psi	43.51 / /		43.51 / /			
34	Design temperature / MDMT		°F	248 /		248 /			
35	Number passes per shell			1		2			
36	Corrosion allowance		in	0.125		0.125			
37	Connections	In	in	1 4.026 / -		1 4.026 / -			
38	Size/Rating	Out		1 6.065 / -		1 3.548 / -			
39	ID	Intermediate		/ -		/ -			
40	Tube #: 166	OD: 0.75	Tks. Average 0.083	in	Length:00.7874	in	Pitch: 1	in	Tube pattern:45
41	Tube type: Plain		Insert:None		Fin#:	#/in	Material:Carbon Steel		
42	Shell Carbon Steel	ID 15.25	OD 16	in	Shell cover -				
43	Channel or bonnet	Carbon Steel			Channel cover -				
44	Tubesheet-stationary	Carbon Steel	-		Tubesheet-floating -				
45	Floating head cover	-			Impingement protection None				
46	Baffle-cross Carbon Steel	Type	Single segmental	Cut(%d) 40.86	Horiz Spacing: c/c 8.6614	in			
47	Baffle-long -	Seal Type			Inlet 16.5935	in			
48	Supports-tube	U-bend	0		Type				
49	Bypass seal		Tube-tubesheet joint		Expanded only (2 grooves)(App.A 'i')				
50	Expansion joint	-	Type None						
51	RhoV2-Inlet nozzle 1518		Bundle entrance 54		Bundle exit 52		lb/(ft-s²)		
52	Gaskets - Shell side	-	Tube side		Flat Metal Jacket Fibe				
53	Floating head	-							
54	Code requirements	ASME Code Sec VIII Div 1		TEMA class	R - refinery service				
55	Weight/Shell	3422.3	Filled with water 4625		Bundle 1929.6		lb		
56	Remarks								
57									
58									

19.19 HX-3 Heat Exchanger

Heat Exchanger Specification Sheet

1	Company:							
2	Location:							
3	Service of Unit:		Our Reference:					
4	Item No.:		Your Reference:					
5	Date:	Rev No.:	Job No.:					
6	Size: 32.4803 - 64.9606 in	Type: BEM	Horizontal	Connected in: 1 parallel	1 series			
7	Surf/unit(eff.) 1008.1 ft²	Shells/unit 1	Surf/shell(eff.) 1008.1 ft²					
8	**PERFORMANCE OF ONE UNIT**							
9	Fluid allocation	Shell Side		Tube Side				
10	Fluid name	S10		S24				
11	Fluid quantity, Total lb/h	17857.4		4118303				
12	Vapor (In/Out) lb/h	0	0	0	0			
13	Liquid lb/h	17857.4	17857.4	4118303	4118303			
14	Noncondensable lb/h	0	0	0	0			
15								
16	Temperature (In/Out) °F	437.96	93.66	90	90.53			
17	Bubble / Dew point °F	/	/	/	/			
18	Density Vapor/Liquid lb/ft³	/ 64.364	/ 76.288	/ 61.614	/ 61.596			
19	Viscosity cp	/ 0.4882	/ 6.6369	/ 0.7827	/ 0.778			
20	Molecular wt, Vap							
21	Molecular wt, NC							
22	Specific heat BTU/(lb-F)	/ 0.4259	/ 0.2829	/ 0.9905	/ 0.9908			
23	Thermal conductivity BTU/(ft-h-F)	/ 0.066	/ 0.088	/ 0.356	/ 0.356			
24	Latent heat BTU/lb							
25	Pressure (abs) psi	29.01	28.85	14.7	11.93			
26	Velocity (Mean/Max) ft/s	0.1 / 0.14		9.89 / 9.9				
27	Pressure drop, allow./calc. psi	2.9	0.16	2.9	2.76			
28	Fouling resistance (min) ft²-h-F/BTU	0.002		0.003	0.0039 Ao based			
29	Heat exchanged 2179200 BTU/h			MTD (corrected) 86.04 °F				
30	Transfer rate, Service 25.12	Dirty 24.99		Clean 29.28 BTU/(h-ft²-F)				
31	**CONSTRUCTION OF ONE SHELL**			**Sketch**				
32		Shell Side		Tube Side				
33	Design/Vacuum/test pressure psi	43.51 / /		43.51 / /				
34	Design temperature / MDMT °F	509 /		509 /				
35	Number passes per shell	1		1				
36	Corrosion allowance in	0.125		0.125				
37	Connections In in	1 2.067 / -		1 23.25 / -				
38	Size/Rating Out	1 2.067 / -		1 23.25 / -				
39	ID Intermediate	/ -		/ -				
40	Tube #: 1009 OD: 0.75 Tks. Average 0.083 in	Length: 64.9606 in	Pitch: 1 in	Tube pattern: 30				
41	Tube type: Plain	Insert: None	Fin#: #/in	Material: Carbon Steel				
42	Shell Carbon Steel ID 32.4803 OD 33.4252 in		Shell cover -					
43	Channel or bonnet Carbon Steel		Channel cover -					
44	Tubesheet-stationary Carbon Steel -		Tubesheet-floating -					
45	Floating head cover -		Impingement protection None					
46	Baffle-cross Carbon Steel Type Single segmental	Cut(%d) 20.67	Horiz Spacing: c/c 7.874 in					
47	Baffle-long - Seal Type		Inlet 10.8455 in					
48	Supports-tube U-bend 0		Type					
49	Bypass seal	Tube-tubesheet joint	Expanded only (2 grooves)(App.A 'i')					
50	Expansion joint -	Type None						
51	RhoV2-Inlet nozzle 704	Bundle entrance 6	Bundle exit 5 lb/(ft-s²)					
52	Gaskets - Shell side -	Tube side	Flat Metal Jacket Fibe					
53	Floating head -							
54	Code requirements ASME Code Sec VIII Div 1	TEMA class R - refinery service						
55	Weight/Shell 7566.1 Filled with water 11826.4	Bundle 4064.8 lb						
56	Remarks							
57								
58								

19.20 HX-4 Heat Exchanger

Heat Exchanger Specification Sheet

1	Company:								
2	Location:								
3	Service of Unit:		Our Reference:						
4	Item No.:		Your Reference:						
5	Date:	Rev No.:	Job No.:						
6	Size 31.4961 - 236.220	in	Type:	BEM	Horizontal		Connected in:	1 parallel	1 series
7	Surf/unit(eff.)	1916.5	ft²	Shells/unit	1		Surf/shell(eff.)	1916.5	ft²
8	**PERFORMANCE OF ONE UNIT**								
9	Fluid allocation			Shell Side			Tube Side		
10	Fluid name			S-34			S2		
11	Fluid quantity, Total		lb/h	50959.2			194408.3		
12	Vapor (In/Out)		lb/h	0	0		0	0	
13	Liquid		lb/h	50959.2	50959.2		194408.3	194408.3	
14	Noncondensable		lb/h	0	0		0	0	
15									
16	Temperature (In/Out)		°F	269.39	72.46		40	74.93	
17	Bubble / Dew point		°F	/	/		/	/	
18	Density	Vapor/Liquid	lb/ft³	/ 62.967	/ 69.489		/ 63.275	/ 62.12	
19	Viscosity		cp	/ 1.1576	/ 17.1734		/ 1.5059	/ 0.9361	
20	Molecular wt, Vap								
21	Molecular wt, NC								
22	Specific heat		BTU/(lb-F)	/ 0.6905	/ 0.6738		/ 0.9687	/ 0.983	
23	Thermal conductivity		BTU/(ft-h-F)	/ 0.13	/ 0.134		/ 0.332	/ 0.349	
24	Latent heat		BTU/lb						
25	Pressure (abs)		psi	29.01	28.29		14.7	9.2	
26	Velocity (Mean/Max)		ft/s	0.27 / 0.3			3.68 / 3.7		
27	Pressure drop, allow./calc.		psi	2.9	0.72		5.49	5.49	
28	Fouling resistance (min)		ft²-h-F/BTU	0.002			0.003	0.0039	Ao based
29	Heat exchanged	6623386	BTU/h			MTD (corrected)	72.34	°F	
30	Transfer rate, Service	47.77		Dirty	48.24		Clean	67.22	BTU/(h-ft²-F)
31	**CONSTRUCTION OF ONE SHELL**							**Sketch**	
32				Shell Side		Tube Side			
33	Design/Vacuum/test pressure		psi	43.51 / /		43.51 / /			
34	Design temperature / MDMT		°F	338 /		338 /			
35	Number passes per shell			1		4			
36	Corrosion allowance		in	0.125		0.125			
37	Connections	In	in	1 3.068 / -		1 4.026 / -			
38	Size/Rating	Out		1 3.068 / -		1 6.065 / -			
39	ID	Intermediate		/ -		/ -			
40	Tube #: 504	OD: 0.75	Tks. Average 0.083	in	Length: 36.2205	in	Pitch: 1.25	in	Tube pattern: 30
41	Tube type: Plain		Insert: None		Fin#:	#/in	Material: Carbon Steel		
42	Shell Carbon Steel	ID 31.4961	OD 32.4409	in	Shell cover	-			
43	Channel or bonnet	Carbon Steel			Channel cover	-			
44	Tubesheet-stationary	Carbon Steel	-		Tubesheet-floating	-			
45	Floating head cover	-			Impingement protection	None			
46	Baffle-cross Carbon Steel	Type	Single segmental	Cut(%d)	21.18	Horiz. Spacing: c/c	6.8898	in	
47	Baffle-long -	Seal Type			Inlet	9.4085	in		
48	Supports-tube	U-bend	0	Type					
49	Bypass seal		Tube-tubesheet joint	Expanded only (2 grooves)(App.A 'i')					
50	Expansion joint	-	Type	None					
51	RhoV2-Inlet nozzle	1207	Bundle entrance	34	Bundle exit	31	lb/(ft-s²)		
52	Gaskets - Shell side	-	Tube side	Flat Metal Jacket Fibe					
53	Floating head	-							
54	Code requirements	ASME Code Sec VIII Div 1		TEMA class	R - refinery service				
55	Weight/Shell	12466.7	Filled with water	19049.1	Bundle	7887.6	lb		
56	Remarks								
57									
58									

19.21 Debaler

		Debaler		
Identification:	**Item**	*Debaler*	Date:	*17-Apr-22*
	Item No.	*DEBALER*	By:	*Christopher Kline*
	No. required	2		
Function:	Remove wires from the PET bale feedstock			
Operation:	Continuous			
Materials handled:	*Feed (PPS-1)*		*Outlet (PPS-2)*	*Outlet (PPS-3)*
Quantity (kg/hr):	14029.00		210.51	13818.49
Composition:				
METHANOL	0.000		0	0.000
EG	0.000		0	0.000
DMT	0.000		0	0.000
PET	12626.000		0	12626.000
NA2CO3	0.000		0	0.000
HDPE	561.160		0	561.160
ALUM	140.290		0	140.290
WATER	0.000		0	0.000
DEG	0.000		0	0.000
BIS-2-01	0.000		0	0.000
MPT	0.000		0	0.000
IRON	280.680		210.51	70.170
POLY(-01	420.870		0	420.870
AIR	0.000		0	0.000
Temperature (°C):	25.00		25	25.00
Design Data:	Capacity: 10,000 kg/hr			
	Pressure: 0 psig			
	Feeder dimensions: 1.8 m x 2.2 m			
	Putting platform dimensions: 1.9 m x 2.5 m			
	Material of construction: Q235 Steel			
	Main shaft rotating speed: 42 rpm			
	Individual power requirement: 5.5 kW			
Utilities: Total electricity at 11 kW/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.				

19.22 POW-R CLEAN Suspended Belt Magnet

POW-R CLEAN Suspended Belt Magnet				
Identification:	**Item**	*Belt Magnet*	Date:	*17-Apr-22*
	Item No.	*METALDET*	By:	*Christopher Kline*
	No. required	1		
Function:	Remove magnetic metals from PET bottles			
Operation:	Continuous			
Materials handled:	*Feed (PPS-3)*		*Outlet (PPS-4)*	*Outlet (PPS-5)*
Quantity (kg/hr):	13818.49		70.17	13748.32
Composition:				
METHANOL	0.000		0	0.000
EG	0.000		0	0.000
DMT	0.000		0	0.000
PET	12626.000		0	12626.000
NA2CO3	0.000		0	0.000
HDPE	561.160		0	561.160
ALUM	140.290		0	140.290
WATER	0.000		0	0.000
DEG	0.000		0	0.000
BIS-2-01	0.000		0	0.000
MPT	0.000		0	0.000
IRON	70.170		70.17	0.000
POLY(-01	420.870		0	420.870
AIR	0.000		0	0.000
Temperature (°C):	25.00		25	25.00
Design Data:	Equipment dimensions: 610 mm x 762 mm			
	Pressure: 0 psig			
	Material of construction: Ceramic permanent magnetic material			
	Individual power requirement: 2.2 kW			
Utilities: Total electricity at 2.2 kW/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.23.				

19.23 Trommel Separator

		Trommel Separator		
Identification:	**Item**	*Trommel*	Date:	*17-Apr-22*
	Item No.	*TROMMEL*	By:	*Christopher Kline*
	No. required	4		
Function:	Remove small contaminants from PET bottles			
Operation:	Continuous			
Materials handled:	*Feed (PPS-5)*		*Outlet (PPS-6)*	*Outlet (PPS-7)*
Quantity (kg/hr):	13748.32		140.29	13608.03
Composition:				
METHANOL	0.000		0	0.000
EG	0.000		0	0.000
DMT	0.000		0	0.000
PET	12626.000		0	12626.000
NA2CO3	0.000		0	0.000
HDPE	561.160		0	561.160
ALUM	140.290		140.29	0.000
WATER	0.000		0	0.000
DEG	0.000		0	0.000
BIS-2-01	0.000		0	0.000
MPT	0.000		0	0.000
IRON	0.000		0	0.000
POLY(-01	420.870		0	420.870
AIR	0.000		0	0.000
Temperature (°C):	25.00		25	25.00
Design Data:	Pressure: 0 psig			
	Tunnel diameter: 1.5 m			
	Length: 4.5 m			
	Material of construction: Carbon steel			
	Tilt angle: 5°			
	Individual power requirement: 5.5 KW			
Utilities: Total electricity at 22 kW/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.				

19.24 Jaw Crusher

Jaw Crusher					
Identification:	**Item**	*Jaw Crusher*		Date:	*17-Apr-22*
	Item No.	*JAWCRUSH*		By:	*Christopher Kline*
	No. required	1			
Function:	Reduce PET bottle size				
Operation:	Continuous				
Materials handled:	*Feed (PPS-9)*		*Outlet (PPS-10)*		
Quantity (kg/hr):	18018.03		18018.03		
Composition:					
METHANOL	0.000		0		
EG	0.000		0		
DMT	0.000		0		
PET	12626.000		12626		
NA2CO3	0.000		0		
HDPE	561.160		561.16		
ALUM	0.000		0		
WATER	4410.000		4410		
DEG	0.000		0		
BIS-2-01	0.000		0		
MPT	0.000		0		
IRON	0.000		0		
POLY(-01	420.870		420.87		
AIR	0.000		0		
Temperature (°C):	25.00		116		
Design Data:	Pressure: 0 psig				
	Inlet D50: 63.55 mm				
	Outlet D50: 53.71 mm				
	Material of construction: Carbon steel				
	Individual power requirement: 5.22 kW				
Utilities: Total electricity at 5.22 kW/hr					
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.20.1.					

19.25 Cone Crusher

Cone Crusher					
Identification:	**Item**	*Cone Crusher*		Date:	*17-Apr-22*
	Item No.	*CONCRUSH*		By:	*Christopher Kline*
	No. required	1			
Function:	Reduce PET bottle size				
Operation:	Continuous				
Materials handled:	*Feed (PPS-10)*		*Outlet (PPS-11)*		
Quantity (kg/hr):	18018.03		18018.03		
Composition:					
METHANOL	0.000		0		
EG	0.000		0		
DMT	0.000		0		
PET	12626.000		12626		
NA2CO3	0.000		0		
HDPE	561.160		561.16		
ALUM	0.000		0		
WATER	4410.000		4410		
DEG	0.000		0		
BIS-2-01	0.000		0		
MPT	0.000		0		
IRON	0.000		0		
POLY(-01	420.870		420.87		
AIR	0.000		0		
Temperature (°C):	116.00		116		
Design Data:	Pressure: 0 psig				
	Inlet D50: 53.71 mm				
	Outlet D50: 5.25 mm				
	Material of construction: Carbon steel				
	Individual power requirement: 20.1 kW				
Utilities: Total electricity at 20.1 kW/hr					
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.20.2.					

19.26 Ball Mill

Ball Mill				
Identification:	**Item**	*Ball Mill*	Date:	*17-Apr-22*
	Item No.	*BALLMILL*	By:	*Christopher Kline*
	No. required	1		
Function:	Reduce PET bottle size			
Operation:	Continuous			
Materials handled:	*Feed (PPS-11)*		*Outlet (PPS-12)*	
Quantity (kg/hr):	18018.03		18018.03	
Composition:				
METHANOL	0.000		0	
EG	0.000		0	
DMT	0.000		0	
PET	12626.000		12626	
NA2CO3	0.000		0	
HDPE	561.160		561.16	
ALUM	0.000		0	
WATER	4410.000		4410	
DEG	0.000		0	
BIS-2-01	0.000		0	
MPT	0.000		0	
IRON	0.000		0	
POLY(-01	420.870		420.87	
AIR	0.000		0	
Temperature (°C):	116.00		117	
Design Data:	Pressure: 0 psig			
	Inlet D50: 5.25 mm			
	Outlet D50: 1.07 mm			
	Material of construction: Carbon steel			
	Individual power requirement: 48.5 kW			
Utilities: Total electricity at 48.5 kW/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.20.3.				

19.27 Film and Flake Separator

Film and Flake Separator				
Identification:	**Item**	*Film and Flake*	Date:	*17-Apr-22*
	Item No.	*FILMFLAK*	By:	*Christopher Kline*
	No. required	8		
Function:	Remove PP from PET flakes			
Operation:	Continuous			
Materials handled:	*Feed (PPS-14)*		*Outlet (PPS-15)*	*Outlet (PPS-16)*
Quantity (kg/hr):	18018.03		4830.87	13187.16
Composition:				
METHANOL	0.000		0	0.000
EG	0.000		0	0.000
DMT	0.000		0	0.000
PET	12626.000		0	12626.000
NA2CO3	0.000		0	0.000
HDPE	561.160		0	561.160
ALUM	0.000		0	0.000
WATER	4410.000		4410	0.000
DEG	0.000		0	0.000
BIS-2-01	0.000		0	0.000
MPT	0.000		0	0.000
IRON	0.000		0	0.000
POLY(-01	420.870		420.87	0.000
AIR	0.000		0	0.000
Temperature (°C):	117.00		117	117.00
Design Data:	Pressure: 0 psig			
	Pipe diameter: 159 mm			
	Material of construction: Stainless steel			
	Individual power requirement: 3 kW			
Utilities: Total electricity at 24 kW/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.				

19.28 Sink Float Separation Tank

Sink Float Separation Tank				
Identification:	**Item**	*Sink Float Tank*	Date:	*17-Apr-22*
	Item No.	*SINK*	By:	*Christopher Kline*
	No. required	24		
Function:	Remove HDPE from PET flakes			
Operation:	Continuous			
Materials handled:	*Feed (PPS-16)*	*Feed (PPS-18)*	*Outlet (PPS-19)*	*Outlet (PPS-20)*
Quantity (kg/hr):	13187.16	14863.9	561.16	27489.90
Composition:				
METHANOL	0.000	0	0	0.000
EG	0.000	0	0	0.000
DMT	0.000	0	0	0.000
PET	12626.000	0	0	12626.000
NA2CO3	0.000	0	0	0.000
HDPE	561.160	0	561.16	0.000
ALUM	0.000	0	0	0.000
WATER	0.000	14863.9	0	14863.900
DEG	0.000	0	0	0.000
BIS-2-01	0.000	0	0	0.000
MPT	0.000	0	0	0.000
IRON	0.000	0	0	0.000
POLY(-01	0.000	0	0	0.000
AIR	0.000	0	0	0.000
Temperature (°C):	117.00	78.4	80.8	80.60
Design Data:	Pressure: 0 psig			
	Tank length: 5 m			
	Tank width: 1.5 m			
	Material of construction: 304 Stainless steel			
	Individual power requirement: 15.2 kW			
Utilities: Total electricity at 364.8 kW/hr and process water at 2393 gal/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.				

19.29 Hot Washer

Hot Washer				
Identification:	**Item**	*Hot Washer*	Date:	*17-Apr-22*
	Item No.	*HOTWASH*	By:	*Christopher Kline*
	No. required	16		
Function:	Clean any glues, oils, and grease from PET bottle flake			
Operation:	Continuous			

Materials handled:	*Feed (PPS-20)*	*Feed (PPS-21)*	*Outlet (PPS-22)*	*Outlet (PPS-23)*
Quantity (kg/hr):	27289.90	7257.48	14864	19883.40
Composition:				
METHANOL	0.000	0	0	0.000
EG	0.000	0	0	0.000
DMT	0.000	0	0	0.000
PET	12626.000	0	0	12626.000
NA2CO3	0.000	0	0	0.000
HDPE	0.000	0	0	0.000
ALUM	0.000	0	0	0.000
WATER	14863.900	7257.48	14864	7257.430
DEG	0.000	0	0	0.000
BIS-2-01	0.000	0	0	0.000
MPT	0.000	0	0	0.000
IRON	0.000	0	0	0.000
POLY(-01	0.000	0	0	0.000
AIR	0.000	0	0	0.000
Temperature (°C):	80.60	100	86.85	86.85

Design Data:	Pressure: 0 psig
	Agitation speed: 20 rpm
	Screw vane diameter: 290 mm
	Screw rotating speed: Adjustable from 20-72.5 rpm
	Material of construction: 304 Stainless steel
	Individual power requirement: 71.2 kW

Utilities: Total electricity at 1139 kW/hr and process water at 1917 gal/hr

Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.

19.30 High Speed Friction Washer

High Speed Friction Washer				
Identification:	**Item**	*Friction Washer*	Date:	*17-Apr-22*
	Item No.	*FRICWASH*	By:	*Christopher Kline*
	No. required	8		
Function:	Clean any dirt or debris from PET bottle flake			
Operation:	Continuous			
Materials handled:	*Feed (PPS-23)*	*Feed (PPS-24)*	*Outlet (PPS-25)*	*Outlet (PPS-26)*
Quantity (kg/hr):	19883.40	7257.48	7257.48	19883.40
Composition:				
METHANOL	0.000	0	0	0.000
EG	0.000	0	0	0.000
DMT	0.000	0	0	0.000
PET	12626.000	0	0	12626.000
NA2CO3	0.000	0	0	0.000
HDPE	0.000	0	0	0.000
ALUM	0.000	0	0	0.000
WATER	7257.430	7257.48	7257.48	7257.430
DEG	0.000	0	0	0.000
BIS-2-01	0.000	0	0	0.000
MPT	0.000	0	0	0.000
IRON	0.000	0	0	0.000
POLY(-01	0.000	0	0	0.000
AIR	0.000	0	0	0.000
Temperature (°C):	80.85	100	93.17	93.17
Design Data:	Pressure: 0 psig Rotor rotating speed: 960 rpm Rotor diameter: 524 mm No. of rotor vane: 24 Length: 2.8 m Inclination angle: 15° Material of construction: Stainless steel body and carbon steel shaft Individual power requirement: 37 kW			
Utilities: Total electricity at 296 kW/hr and process water at 1917 gal/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.				

19.31 Dewatering Machine

Dewatering Machine				
Identification:	**Item**	*Dewatering Machine*	Date:	*17-Apr-22*
	Item No.	*DEWATER*	By:	*Christopher Kline*
	No. required	8		
Function:	Dry PET bottle flake			
Operation:	Continuous			
Materials handled:	*Feed (PPS-26)*		*Outlet (PPS-27)*	*Outlet (PPS-28)*
Quantity (kg/hr):	19883.40		5805.94	14077.49
Composition:				
METHANOL	0.000		0	0.000
EG	0.000		0	0.000
DMT	0.000		0	0.000
PET	12626.000		0	12626.000
NA2CO3	0.000		0	0.000
HDPE	0.000		0	0.000
ALUM	0.000		0	0.000
WATER	7257.430		5805.94	1451.490
DEG	0.000		0	0.000
BIS-2-01	0.000		0	0.000
MPT	0.000		0	0.000
IRON	0.000		0	0.000
POLY(-01	0.000		0	0.000
AIR	0.000		0	0.000
Temperature (°C):	93.17		100	100.00
Design Data:	Pressure: 0 psig			
	Drying method: Centrifuge			
	Rotor rotating speed: 1000 rpm			
	Rotor diameter: 850 mm			
	Material of construction: Stainless steel body and carbon steel shaft			
	Individual power requirement: 75 kW			
Utilities: Total electricity at 600 kW/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.				

19.32 Thermal Dryer

		Thermal Dryer		
Identification:	**Item**	*Thermal Dryer*	Date:	*17-Apr-22*
	Item No.	*THERMDRY*	By:	*Christopher Kline*
	No. required	16		
Function:	Dry PET bottle flake			
Operation:	Continuous			
Materials handled:	*Feed (PPS-28)*	*Feed (PPS-29)*	*Outlet (PPS-30)*	*Outlet (PPS-31)*
Quantity (kg/hr):	19883.40	4851	6174.95	12753.54
Composition:				
METHANOL	0.000	0	0	0.000
EG	0.000	0	0	0.000
DMT	0.000	0	0	0.000
PET	12626.000	0	0	12626.000
NA2CO3	0.000	0	0	0.000
HDPE	0.000	0	0	0.000
ALUM	0.000	0	0	0.000
WATER	1451.490	0	1323.95	127.535
DEG	0.000	0	0	0.000
BIS-2-01	0.000	0	0	0.000
MPT	0.000	0	0	0.000
IRON	0.000	0	0	0.000
POLY(-01	0.000	0	0	0.000
AIR	0.000	4851	4851	0.000
Temperature (°C):	93.17	25	48.19	48.19
Design Data:	Pressure: 0 psig			
	Drying method: Pneumatic conveyance			
	Pipe diameter: 159 mm			
	Material of construction: 304 Stainless steel			
	Individual power requirement: 35.5 kW			
Utilities: Total electricity at 568 kW/hr				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.				

19.33 Cyclone Separator

		Cyclone Separator		
Identification:	**Item**	*Cyclone*	Date:	*17-Apr-22*
	Item No.	*CYC*	By:	*Christopher Kline*
	No. required	8		
Function:	Dry PET bottle flake and separate flakes from air stream			
Operation:	Continuous			
Materials handled:	*Feed (PPS-32)*		*Outlet (PPS-33)*	*Outlet (PPS-34)*
Quantity (kg/hr):	17604.54		12753.535	4851.00
Composition:				
METHANOL	0.000		0	0.000
EG	0.000		0	0.000
DMT	0.000		0	0.000
PET	12626.000		12626	0.000
NA2CO3	0.000		0	0.000
HDPE	0.000		0	0.000
ALUM	0.000		0	0.000
WATER	127.535		127.535	0.000
DEG	0.000		0	0.000
BIS-2-01	0.000		0	0.000
MPT	0.000		0	0.000
IRON	0.000		0	0.000
POLY(-01	0.000		0	0.000
AIR	4851.000		0	4851.000
Temperature (°C):	34.77		25	25.00
Design Data:	Pressure: 0 psig			
	Diameter: 1 m			
	Material of construction: Stainless steel			
Utilities:				
Comments and drawings: See Process Flow Sheet Figure 15.2 and Appendix 28.21.				

19.34 PET Flake Product Silo

		PET Flake Product Silo		
Identification:	**Item**	*PET Flake Silo*	Date:	*17-Apr-22*
	Item No.	*PET Flake Silo*	By:	*Christopher Kline*
	No. required	8		
Function:	Intermediary storage for clean PET flakes before reactor			
Operation:	Continuous			
Materials handled:	*Feed (PPS-33)*		*Outlet (PPS-33-2)*	
Quantity (kg/hr):	12753.50		12753.5	
Composition:				
METHANOL	0.000		0	
EG	0.000		0	
DMT	0.000		0	
PET	12626.000		12626	
NA2CO3	0.000		0	
HDPE	0.000		0	
ALUM	0.000		0	
WATER	127.500		127.5	
DEG	0.000		0	
BIS-2-01	0.000		0	
MPT	0.000		0	
IRON	0.000		0	
POLY(-01	0.000		0	
AIR	0.000		0	
Temperature (°C):	25.00		25	
Design Data:	Pressure: 0 psig			
	Volume: 264 gal			
	Material of construction: Stainless steel			
Utilities:				
Comments and drawings: See Appendix 28.21.				

19.35 Preprocessing Waste Storage Bin

Preprocessing Waste Storage Bin						
Identification:	**Item**	*Waste Bin*			Date:	*17-Apr-22*
	Item No.	*Waste Bin*			By:	*Christopher Kline*
	No. required	1				
Function:	Store preprocessing waste					
Operation:	Continuous					
Materials handled:	*Feed (PPS-2)*	*Feed (PPS-4)*	*Feed (PPS-6)*	*Feed (PPS-15)*	*Feed (PPS-19)*	
Quantity (kg/hr):	210.51	70.17	140.29	4830.87	561.16	
Composition:						
METHANOL	0.000	0	0	0	0.000	
EG	0.000	0	0	0	0.000	
DMT	0.000	0	0	0	0.000	
PET	0.000	0	0	0	0.000	
NA2CO3	0.000	0	0	0	0.000	
HDPE	0.000	0	0	0	561.160	
ALUM	0.000	0	140.29	0	0.000	
WATER	0.000	0	0	4410	0.000	
DEG	0.000	0	0	0	0.000	
BIS-2-01	0.000	0	0	0	0.000	
MPT	0.000	0	0	0	0.000	
IRON	210.510	70.17	0	0	0.000	
POLY(-01	0.000	0	0	420.87	0.000	
AIR	0.000	0	0	0	0.000	
Temperature (°C):	25.00	25	25	117	80.60	
Design Data:	Pressure: 0 psig					
	Bin volume: 259,205 gal					
	Open to environment					
	Material of construction: Carbon steel					
Utilities:						
Comments and drawings: See Appendix 28.19.2.						

19.36 DMT Product Storage Vessel

DMT Product Storage Vessel			
Identification:	**Item**	*DMT Storage*	Date: *17-Apr-22*
	Item No.	*DMT Storage*	By: *Christopher Kline*
	No. required	1	
Function:	Store DMT product		
Operation:	Continuous		
Materials handled:		*Feed (S-40)*	
Quantity (kg/hr):		11900	
Composition:			
METHANOL		trace	
EG		4.14	
DMT		11885	
PET		0	
NA2CO3		0	
HDPE		0	
ALUM		0	
WATER		trace	
DEG		9.92	
BIS-2-01		0.005	
MPT		0.822	
IRON		0	
POLY(-01		0	
AIR		0	
Temperature (°C):		210	
Design Data:	Pressure: 0 psig		
	Vessel type: Floating roof		
	Insulation: Heat tracing		
	Volume: 513,000 gal		
	Material of construction: Stainless steel		
	Individual power requirement: 56 kW		
Utilities: Total electricity at 56 kW/hr			
Comments and drawings: See Appendix 28.19.1.			

19.37 EG Product Storage Vessel

EG Product Storage Vessel			
Identification:	**Item**	*EG Storage*	Date: *17-Apr-22*
	Item No.	*EG Storage*	By: *Christopher Kline*
	No. required	1	
Function:	Store EG product		
Operation:	Continuous		
Materials handled:		*Feed (S-34)*	
Quantity (kg/hr):		7000	
Composition:			
METHANOL		trace	
EG		6690	
DMT		60	
PET		0	
NA2CO3		0	
HDPE		0	
ALUM		0	
WATER		trace	
DEG		250	
BIS-2-01		0	
MPT		trace	
IRON		0	
POLY(-01		0	
AIR		0	
Temperature (°C):		158	
Design Data:	Pressure: 0 psig		
	Vessel type: Floating roof		
	Insulation: Heat tracing		
	Volume: 315,000 gal		
	Material of construction: Stainless steel		
	Individual power requirement: 56 kW		
Utilities: Total electricity at 56 kW/hr			
Comments and drawings: See Appendix 28.19.1.			

19.38 Purge Waste Storage Vessel

Purge Waste Storage Vessel			
Identification:	**Item**	*Purge Storage*	Date: *17-Apr-22*
	Item No.	*Purge Storage*	By: *Christopher Kline*
	No. required	1	
Function:	Store purge waste		
Operation:	Continuous		
Materials handled:		*Feed (S-24)*	
Quantity (kg/hr):		592	
Composition:			
METHANOL		0.5	
EG		5.8	
DMT		185.8	
PET		229.8	
NA2CO3		170	
HDPE		0	
ALUM		0	
WATER		trace	
DEG		0.6	
BIS-2-01		0	
MPT		0	
IRON		0	
POLY(-01		0	
AIR		0	
Temperature (°C):		140	
Design Data:	Pressure: 0 psig		
	Vessel type: Cone roof		
	Insulation: Heat tracing		
	Volume: 12,000 gal		
	Material of construction: Stainless steel		
	Individual power requirement: 56 kW		
Utilities: Total electricity at 56 kW/hr			
Comments and drawings: See Appendix 28.19.1.			

19.39 Belt Conveyor

Identification:		Belt Conveyor	
	Item	*Belt*	Date: *17-Apr-22*
	Item No.	*Belt*	By: *Christopher Kline*
	No. required	40	
Function:	Transport solids		
Operation:	Continuous		
Materials handled:			*Varied*
Quantity (kg/hr):			Varied
Composition:			
METHANOL			0
EG			0
DMT			0
PET			12626
NA2CO3			0
HDPE			Varied
ALUM			Varied
WATER			Varied
DEG			0
BIS-2-01			0
MPT			0
IRON			Varied
POLY(-01			Varied
AIR			0
Temperature (°C):			25
Design Data:	Pressure: 0 psig		
	Belt width: 1 m		
	Belt velocity: 0.63 m/s		
	Material of construction: PVC		
Utilities: Total electricity at 122 kW/hr			
Comments and drawings: See Appendix 28.21.			

19.40 Sorting Conveyor

Identification:		Sorting Conveyor	
	Item	*Sort*	Date: *17-Apr-22*
	Item No.	*Sort*	By: *Christopher Kline*
	No. required	4	
Function:	Transport solids		
Operation:	Continuous		
Materials handled:		*Varied*	
Quantity (kg/hr):		Varied	
Composition:			
METHANOL		0	
EG		0	
DMT		0	
PET		12626	
NA2CO3		0	
HDPE		Varied	
ALUM		Varied	
WATER		0	
DEG		0	
BIS-2-01		0	
MPT		0	
IRON		Varied	
POLY(-01		Varied	
AIR		0	
Temperature (°C):		25	
Design Data:	Pressure: 0 psig		
	Belt length: 11.6 m		
	Belt width: 600 mm		
	Belt velocity: 0 to 1.25 m/s		
	Material of construction: PVC		
Utilities: Total electricity at 12 kW/hr			
Comments and drawings: See Appendix 28.21.			

19.41 Screw Conveyor

		Screw Conveyor	
Identification:	**Item**	*Screw*	Date: *17-Apr-22*
	Item No.	*Screw*	By: *Christopher Kline*
	No. required	24	
Function:	Transport solids		
Operation:	Continuous		
Materials handled:		*Varied*	
Quantity (kg/hr):		Varied	
Composition:			
METHANOL		0	
EG		0	
DMT		0	
PET		12626	
NA2CO3		0	
HDPE		Varied	
ALUM		Varied	
WATER		Varied	
DEG		0	
BIS-2-01		0	
MPT		0	
IRON		Varied	
POLY(-01		Varied	
AIR		0	
Temperature (°C):		25	
Design Data:	Pressure: 0 psig		
	Screw diameter: 390 mm		
	Belt velocity: 0 to 1.25 m/s		
	Material of construction: Stainless steel screw and carbon steel frame		
Utilities: Total electricity at 89 kW/hr			
Comments and drawings: See Appendix 28.21.			

20. Equipment Cost Summary

The total bare module cost for all equipment is $107MM. Tables 20.1 ~ 3 show the equipment cost for the process. All equipment includes the subordinate parts (e.g. heating jacket for the reactor) in the tables. Table 20.1 shows costs for fabrication equipment. Such fabrication equipment cost a total bare module cost of $107MM and is the most expensive category of the equipment. Vacuum distillation columns and the compressor contribute most to the cost due to the rigorous conditions in which they are exposed to. Stainless steel is used for all equipment that is directly in contact with the streams, increasing the price of many items.

Table 20.1 Fabricated Equipment Costs Table

ID	Equipment Name	Purchase Cost (USD)	Bare Module Factor	Bare Module Cost (USD)
R-1, R-2	Reactors	$3,053,851	3.21	$9,800,000
DEC-1	Decanter	$70,557	3.21	$226,000
DC-1	Distillation Column 1	$347,226	3.21	$11,200,000
DC-2	Distillation Column 2 (Vacuum)	$5,220,382	3.21	$16,800,000
DC-3	Distillation Column 3 (Vacuum)	$1,143,079	3.21	$3,700,000
DC-4	Distillation Column 4 (Vacuum)	$1,233,166	3.21	$4,000,000
EVAP	Evaporator	$2,223,056	3.21	$7,100,000
-	DC Vacuum Systems	$202,113	3.21	$650,000
HX-1	Heat Exchangers (EVAP)	$649,729	3.21	$1,800,000
HX-2	Heat Exchangers (MeOH cool)	$131,499	3.21	$400,000
HX-3	Heat Exchangers (recycle)	$883,617	3.21	$2,800,000
HX-4	Heat Exchangers (Decanter)	$320,875	3.21	$1,030,000
SLSEP	Filter Candles	$13,716	3.21	$44,000
COMP	Compressor	$9,461,247	2.15	$20,300,000
Total				$79,900,000

Table 20.2 shows processing equipment necessary for the transfer of material. The preprocessing equipment indicates the cost for the whole preprocessing unit which is sold as a bundle including the installment price, thus a bare module factor of 1. Other pumps, such as the waste pump, storage pumps, and rail pumps, do not have ID names because they are not explicitly shown in the flowsheet. The slurry mixer's components such as the agitator and tank used different bare module factors in the range of the indicated bare module factor in the table.

Table 20.2 Processing Equipment Costs Table

ID	Equipment Name	Purchase Cost (USD)	Bare Module Factor	Bare Module Cost (USD)
-	Pre-process equipment	$3,037,952	3.21	$9,800,000
-	Conveyor Belt	$6,000	3.21	$19,000
SLURMIX	Slurry Mixer	$95,998	3.3-4	$360,000
-	Purge Waste Pump	$7,546	3.3	$25,000
-	Purge Rail Pump	$11,073	3.3	$37,000
-	DMT Storage Pump	$13,840	3.3	$46,000
-	EG Storage Pump	$15,945	3.3	$53,000
-	DMT Rail Pump	$15,250	3.3	$50,000
-	EG Rail Pump	$15,445	3.3	$51,000
P-1	Pump 1	$50,428	3.3	$166,000
P-2	Pump 2	$48,891	3.3	$161,000
P-3	Pump 3	$14,468	3.3	$48,000
P-4	Pump 4	$12,741	3.3	$42,000
P-5	Pump 5	$13,001	3.3	$43,000
P-6	Pump 6	$13,928	3.3	$46,000
Total				$11,000,000

Table 20.3 displays equipment cost related to storage of material. All items are designed to hold seven days' worth of their respective material and are costed accordingly.

Table 20.3 Storage Equipment Costs Table

Equipment Name	Purchase Cost (USD)	Bare Module Factor	Bare Module Cost (USD)
DMT Storage Column	$1,500,000	4	$6,000,000
EG Storage Column	$1,100,000	4	$4,400,000
Methanol Feed Storage	$282,963	4	$1,100,000
Purge Storage Column	$750,000	4	$3,000,000
Pre-process Waste Storage I	$111,685	3.21	$400,000
Total			$14,900,000

Table 20.4 shows spare parts of equipment that are in multiple quantities throughout the process. Pump parts are cost equivalent to two pumps while the other two items are cost for one heat exchanger or filtration set.

Table 20.4 Spare Equipment Costs Table

Equipment Name	Purchase Cost (USD)	Bare Module Factor	Bare Module Cost (USD)
HX Parts	$883,615	1	$884,000
Pump Parts	$63,429	1	$63,000
Filter Candles Parts	$13,716	1	$14,000
Total			$961,000

Section 28 in the Appendix details the costing calculations of the equipment. The spreadsheet used was put together by Professor Ressell Dunn at Vanderbilt University. The specific equations used in the spreadsheet are explained in detail in Chapter 16 of Seider et al (2017). Other sources include direct quotes from specific companies or approximations using conventional estimation tools such as the “sixth tenth rule” when increasing or decreasing the size of equipment.

21. Fixed Capital Investment Summary

Using the methods presented in Chapter 16 of Seider et al.'s *Product and Process Design Principles* and the Equipment Costing v5 Excel spreadsheet, the total permanent investment of this plant was calculated to be $169 million. Table 21.1 shows the assumptions made for the calculations of total permanent investment.

Table 21.1 Assumptions for Total Permanent Investment.

Site Factor:	1.10 US Appalachian
Year of Total Permanent Invesment	100% in 2023
Cost of Site Preparation:	5.00% of Total Bare Module Costs
Cost of Service Facilities	5.00% of Total Bare Module Costs
Allocated Costs for Utility Plants:	$0
Cost of Contingencies and Contractor's Fees:	18.00% of Direct Permanent Investment
Cost of Land:	2.00% of Total Depreciable Capital
Cost of Royalties:	$0
Cost of Plant Startup:	10.00% of Total Depreciable Capital

With the assumptions made, the total permanent investment was calculated in Table 21.2.

Table 21.2 Summary of total permanent investment

Investment Summary			
Total Bare Module Costs:			
Fabricated Equipment	$	80,114,659	
Process Machinery	$	10,964,804	
Spares	$	959,660	
Storage	$	14,978,591	
Other Equipment	$	-	
Catalysts	$	-	
Computers, Software, Etc.	$	-	
Total Bare Module Costs:			**$ 107,017,714**
Direct Permanent Investment			
Cost of Site Preparations:	$	5,350,886	
Cost of Service Facilities:	$	5,350,886	
Allocated Costs for utility plants and related facilities:	$	-	
Direct Permanent Investment			**$ 117,719,485**
Total Depreciable Capital			
Cost of Contingencies & Contractor Fees	$	21,189,507	
Total Depreciable Capital			**$ 138,908,993**
Total Permanent Investment			
Cost of Land:	$	2,778,180	
Cost of Royalties:	$	-	
Cost of Plant Start-Up:	$	13,890,899	
Total Permanent Investment - Unadjusted			$ 155,578,072
Site Factor			1.10
Total Permanent Investment			**$ 171,135,879**

22. Operating Cost – Cost of Manufacture

22.1 Raw Materials

The primary feedstock required for this process is PET post-consumer waste. In addition, the process will require methanol as a solvent and reagent, sodium carbonate as a catalyst, and MPT as an azeotrope-breaking agent. The costs of each are shown in Table 22.1.

Table 22.1.1 Costs of raw materials in 2025 dollars

Raw Material	Cost (USD/kg)	Cost (USD/kg DMT)	Annual Cost (USD)
PET	$0.87	$0.90	$87,100,000
MeOH	$0.41	$0.12	$11,833,908
Sodium Carbonate	$0.40	$0.01	$564,871
MPT	$31.84	$0.10	$21,048,729
Total*		$1.13	$120,548,000

* Rounding was foregone until the total was tabulated to prevent earlier rounding errors from accumulating

22.2 Product costs

The depolymerization of PET creates two monomers: DMT and EG. In the profitability analysis, DMT is treated as a main product and EG is treated as a byproduct. In addition, there will be some DEG created as a byproduct of EG dimerization. The sale prices of each in 2022 are shown in Table 22.2.1.

Table 22.2.1 Prices of products

Product	Price (USD/kg)	Annual Revenue (USD)
DMT	$1.59	$153,386,597.22
EG	$0.89	$26,874,510.95
DEG	$3.28	$2,538,970.95
Total*		$183,000,000

* Rounding was foregone until the total was tabulated to prevent earlier rounding errors from accumulating

22.3 Utility costs

Utilities comprised a large portion of variable costs for this process. Table 22.3.1 shows the utility costs for the process. Utility prices were found in Chapter 17 of Seider et al.'s *Product and Process Design Principles.*

Table 22.3.1 Costs of utilities

Cost Factor	Typical Factor in American Engineering Units	Cost (USD/hr)	Annual Cost (USD)
Electricity	$0.07/kWh	$728.45	$5,769,324
Steam (150 psig)	$7.00/1,000 lb	$552.01	$4,371,890
Steam (450 psig)	$8.00/1,000 lb	$1,445.41	$11,447,682
Refrigeration (10°F)	$2.00/ton-day	$45.20	$357,997
Cooling Water	$0.10/1,000 gal	$87.30	$691,445
Process Water	$0.80/1,000 gal	$7.56	$59,875
Landfill	$0.08/dry lb	$216.26	$1,712,779
Wastewater	$0.15/lb organic removed	$125.40	$993,168
Total*		$3,207.60	$25,000,000

* Rounding was foregone until the total was tabulated to prevent earlier rounding errors from accumulating

22.4 Other Variable Costs

Default values were input for other variable costs, according to the Economic Analysis v5 spreadsheet. The plant will be designed over one year and constructed over two. Table 22.4.1 shows the values input for the general expenses and Table 22.4.2 shows the calculation of the total variable costs.

Table 22.4.1 Other variable costs

General Expenses	
Selling/Transfer Expenses	3.00% of Sales
Direct Research	4.80% of Sales
Allocated Research	0.50% of Sales
Administrative Expense	2.00% of Sales
Management Incentive Compensation	1.25% of Sales

Table 22.4.2 Total variable costs

Variable Costs at 100% Capacity:

General Expenses

Selling / Transfer Expenses:		$	2,175,639
Direct Research:		$	3,481,023
Allocated Research:		$	362,607
Administrative Expense:		$	1,450,426
Management Incentive Compensation:		$	906,516
Total General Expenses		$	8,376,211
Raw Materials	$1.213332 per kg of DMT		$114,211,052
Byproducts	$0.921492 per kg of DMT		($86,740,147)
Utilities	$0.346910 per kg of DMT		$32,654,672
Total Variable Costs		**$**	**68,501,788**

22.5 Fixed Costs

Similar to the methods above, fixed costs were mostly kept as default values in the spreadsheet. The process will require 8 operators per shift, each earning $40 per hour, for 5 shifts. There will also be 2 technical assistance engineers and 1 control laboratory engineer, each earning a salary of $200,000 per year, including benefits. Table 22.5 shows the fixed costs of the plant.

Table 22.5.1 Fixed costs

Operations		
Operators per Shift:	8	(assuming 5 shifts)
Direct Wages and Benefits:	$40	per Operator Hour
Direct Salaries and Benefits:	15%	of Direct Wages and Benefits
Operating Supplies and Services:	6%	of Direct Wages and Benefits
Technical Assistance to Manufacturing:	$10,000	per year, for each Operator per Shift
Control Laboratory:	$5,000	per year, for each Operator per Shift
Maintenance		
Wages and Benefits:	4.50%	of Total Depreciable Capital
Salaries and Benefits:	25.00%	of Maintenance Wages and Benefits
Materials and Services:	100.00%	of Maintenance Wages and Benefits
Maintenance Overhead:	5.00%	of Maintenance Wages and Benefits
Operating Overhead		
General Plant Overhead:	7.10%	of Maintenance and Operations Wages and Benefits
Mechanical Department Services:	2.40%	of Maintenance and Operations Wages and Benefits
Employee Relations Department	5.90%	of Maintenance and Operations Wages and Benefits
Business Services	7.40%	of Maintenance and Operations Wages and Benefits
Property Taxes and Insurance		
Property Taxes and Insurance:	2.00%	of Total Depreciable Capital
Straight Line Depreciation		
Direct Plant:	8.00%	of Total Depreciable Capital, less 1.18 times the Allocated Costs for Utility Plants and Related Facilities
Allocated Plant:	6.00%	of 1.18 times the Allocated Costs for Utility Plants and Related Facilities
Other Expenses		
Rental Fees (Office and Laboratory Space)	$0	
Licensing Fees:	$0	
Miscellaneous:	$0	
Annual Depletion Allowance	$0	

22.6 Working Capital

Table 22.6.1 shows the tabulation of working capital changes from 2024 to 2026.

Table 22.6.1 Working Capital Required In The First 3 years of Plant Operations.

	2024	2025	2026
Accounts Receivable	$ 5,537,203	$ 2,768,601	$ 2,768,601
Cash Reserves	$ 2,111,582	$ 1,055,791	$ 1,055,791
Accounts Payable	$ (6,460,333)	$ (3,230,166)	$ (3,230,166)
DMT Inventory	$ 1,292,014	$ 646,007	$ 646,007
Raw Materials	$ 1,225,597	$ 612,798	$ 612,798
Total	**$ 3,706,062**	**$ 1,853,031**	**$ 1,853,031**
Present Value at 15%	*$ 2,802,316*	*$ 1,218,398*	*$ 1,059,477*

Total Capital Investment	**$ 176,216,069**

22.7 Total Capital Investment

Overall, the total permanent investment in the plant is $171MM. This is tabulated in Table 22.7.1.

Table 22.7.1 Total Permanent Investment For The Plant

Total Bare Module Costs:				
Fabricated Equipment	$	80,114,659		
Process Machinery	$	10,964,804		
Spares	$	959,660		
Storage	$	14,978,591		
Other Equipment	$	-		
Catalysts	$	-		
Computers, Software, Etc.	$	-		
Total Bare Module Costs:			$	107,017,714
Direct Permanent Investment				
Cost of Site Preparations:	$	5,350,886		
Cost of Service Facilities:	$	5,350,886		
Allocated Costs for utility plants and related facilities:	$	-		
Direct Permanent Investment			$	117,719,485
Total Depreciable Capital				
Cost of Contingencies & Contractor Fees	$	21,189,507		
Total Depreciable Capital			$	138,908,993
Total Permanent Investment				
Cost of Land:	$	2,778,180		
Cost of Royalties:	$	-		
Cost of Plant Start-Up:	$	13,890,899		
Total Permanent Investment - Unadjusted			$	155,578,072
Site Factor				1.10
Total Permanent Investment			$	171,135,879

23. Other Important Considerations

23.1 Greenhouse Gas Emissions

A major goal of recycling PET is to create a circular plastics economy, with the hope of making a positive impact on the global environment by reducing our need for fossil fuels to create virgin PET. Processing fossil fuels to produce PET negatively impacts the environment by, among other factors, emitting excessive amounts of greenhouse gasses that cause climate change and contribute to increasing levels of smog and air pollution around the world (Nunez, 2019

Analysis for the emissions of mechanically recycled PET was completed using information about the energy usages of rPET pellet sorting and processing from Benavides et al. (2018). This energy is reported as energy input required to process 1 kg of PET and is summarized in Table 23.1.1lb per kg of PET, the total NOX emissions are 0.001 lb per kg of PET, and the total CO2 emissions are 1.005 kg per kg of PET. In total, the process emits 1.006 lb of emissions per kg of PET processed. This data is found in Table 23.1.2.

Analysis for the emissions of our process is also calculated per kg of PET processed. Energy usages are also summarized in Table 23.1.1. It is assumed that all steam energy is produced by natural gas. The total SO2 emissions for our process is 0.001 lb per kg of PET, the total NOX emissions are 0.002 lb per kg of PET, and the total CO2 emissions are 3.502 lb per kg of PET. In total, the process emits 3.506 lb of emissions per kg of PET processed. This data is also found in Table 23.1.2.

Compared to mechanically recycling 1 kg of PET via injection and blow molding, our process of chemically recycling 1 kg of PET releases 248% more emissions. This is due to the difficult and lengthy separations process required of chemically recycling PET, which requires

the use of significantly more natural gas (steam) than the mechanical recycling process. As discussed in Section 16.4, integrating heat exchangers in the process would likely greatly reduce the total amount of steam required for the process, and thus its greenhouse gas emissions. It is also notable that mechanically recycled PET is not infinitely recyclable due to degradation of the PET that occurs during the recycling process, while chemically recycled PET is. Although our recycling process emits more emissions versus mechanical recycling processes, our process is more capable of reducing the amount of PET in landfills.

It is impossible to quantitatively determine whether our process would reduce emissions in producing recycled PET versus the process of producing PET via fossil fuels because our process does not include energy usage for the re-polymerization of DMT and EG into PET. However, Benavides et al. (2018) does find that a cradle-to-grave analysis of mechanically recycling PET to produce 1 kg of recycled PET has a 19% reduction in greenhouse gas emissions versus producing 1 kg of virgin PET from fossil fuels. Benavides et al. (2018) provides energy consumption values for injection and blow molding mechanically produced rPET, which is shown in Table 23.1.3. By combining the energy usage of sorting, processing, injection molding, and blow molding, the sorting to final production of mechanically recycled rPET emits 5.876 lb of emissions per kg of PET produced. This is composed of 0.003 lb of SO2, 0.003 lb of NOX, and 5.869 lb of CO2. If we assume that the emissions related to transporting waste PET to either mechanical or chemical recycling facilities are the same, as well as that both the mechanical and chemical recycling of 1 kg of PET produces 1 kg of recycled PET, we can conclude that as long as the process of re-polymerizing DMT and EG emits less than 2.363 lb of greenhouse gases per kg of PET produced, chemically recycling PET via our process will emit less greenhouse gases than producing virgin PET.

Table 23.1.1 Energy usages of mechanically and chemically recycling 1 kg of PET in MJ. The energy for mechanically recycling PET refers to only energy required for sorting and processing PET pellets. The energy for chemically recycling PET refers to only energy required for sorting, cleaning, and depolymerizing PET.

Fuel type	Mechanical recycling energy usage (MJ/kg)	Chemical recycling energy usage (MJ/kg)
Diesel	0.15	–
Electricity	1.3	2.97
Natural Gas	2.6	17.34

Table 23.1.2 Greenhouse gas emissions for mechanically and chemically recycling 1 kg of PET in lb per kg of PET.

Emission type	Mechanical recycling emission rate (lb/kg)	Chemical recycling emission rate (lb/kg)
SO2	0.000	0.001
NOX	0.001	0.002
CO2	1.005	3.502

Table 23.1.3 Energy usage of injection and blow molding mechanically processed PET pellets from Benavides et al. (2018).

Fuel type	Injection molding (MJ/kg)	Blow molding (MJ/kg)
Diesel	0	0.01
Liquefied petroleum gas	0	0.02
Electricity	2.9	6.2

23.2 Waste Disposal

Along with greenhouse gas emissions, proper waste disposal methods should be considered. Two major waste streams are produced by the plant.

The first is waste stream is from the preprocessing sequence. This waste consists of HDPE, PP, glass, wood, metals, paper, oils, grease, and any food residue. The waste is classified as wet non-hazardous waste and is collected in the preprocessing waste storage bin at ambient temperature and pressure. 33,700 kg per day of this non-hazardous waste needs to be disposed of through the use of a disposal company, Clean Management Environmental Group, Inc., hereafter mentioned as Clean Management (Appendix 28.22). Clean Management landfills the solid wet non-hazardous waste at a rate of $59 per ton and a $750 transportation fee for each truck. Due to the large waste production, 4 trucks are needed daily and create a total cost of $5,190 per day.

The second waste stream comes from the purge within the system. The purge waste produced will be 11,900 gallons per week consisting of a sludge of mixed hazardous chemical waste. Data from Aspen Plus indicates the sludge will be at 140℃ and atmospheric pressure, consisting of 38.6 wt% solid PET, 31.7 wt% liquid DMT, 28.6 wt% sodium carbonate, 1 wt% EG, 0.1 wt% methanol, 0.1 wt% DEG, and 0.0003 wt% water. Clean Management would again be used to properly dispose of this hazardous chemical waste at a price of $1.32 per gallon and $1,800 transportation fee for each truck. Due to the large waste production, 3 trucks are needed weekly to dispose of the waste, creating a total cost of $3,000 per day.

There will be greenhouse gas emissions and environmental effects from using Clean Management to landfill the non-hazardous waste, however this is not considered in this report. Other greenhouse gas emissions and fossil fuel use from waste disposal transportation were also not considered in this report. Clean Management also did not describe their method of disposal of the hazardous chemical waste, meaning that these environmental effects were not considered in this report.

23.3 Social Considerations

Increased social concern for environmentally friendly products has increased the demand for recycled PET plastics, which aids the viability of this project. Unfortunately, the process designed in this project does not emit less greenhouse gas than a mechanical PET recycling process would, as discussed in Section 23.1. However, it is still capable of reducing the amount of PET that is disposed of to landfills because of its capability of infinitely recycling PET, which distinguishes it from mechanical recycling techniques. Reducing the volume of landfills is also crucial to reducing the amount of greenhouse gases produced from the PET lifecycle, as once landfill areas become full, waste must be disposed of in other ways including incineration. Infinitely recycling PET to be reused prevents the potential incineration of waste PET, which would release not only typical greenhouse gases into the atmosphere, but also toxic chemicals like acid gases and heavy metals (Royte, 2019). Furthermore, as described in Section 23.1, this process can release fewer emissions than producing vPET from fossil fuels, provided that the process of re-polymerizing DMT and EG emits less than 2.363 lb. of greenhouse gases per kg of PET produced. However, we recognize that our process is still not emission neutral and should be further optimized for a more sustainable plastic recycling process.

23.4 Location Considerations

The plant will be located in Charleston, West Virginia, upon recommendation by industrial consultants, for four main reasons. First, feedstock is the largest component, weight-wise, of streams entering and exiting the plant. As such, it is most economical to weigh the proximity of materials recovery facilities (MRFs) that will supply the bottle bales needed for this

process. As noted in Recycling Today (2022), there is a cluster of large MRFs located in the Northeast.

Second, this process produces EG and DMT that is suitable for repolymerization. Thus, proximity to resin suppliers is the second greatest consideration. Several large PET resin producers, including DAK Americas and Indorama, have their facilities in the Carolinas. Additionally, many of the USA's largest beverage bottle manufacturers are also located in the northeast. Specifically, Lehigh County houses several major bottle plants for corporations such as Nestle (Salamone, 2015) and Ocean Spray (Petty, 2014). There are also other bottle plants in the area, such as Coca-Cola's in Indiana, Illinois, Kentucky, Maryland, and Missouri. Meanwhile, some of the USA's largest polyester textile mills are in Georgia (Mohawk Industries, Shaw Industries) and Alabama (Shaw Industries) (IndustrySelect, 2021).

Third, this process will produce waste that must either be incinerated or placed in landfill. There is an incinerator facility in Lorton, VA (Energy Justice Network, n.d.) and readily available landfills across the country. Fourth, Charleston is a transportation hub with infrastructure available to support railways and barges. As a brownfield site, it provides the most pre-existing infrastructure to reduce capital investments.

23.5 Safety Considerations

While not considered in this report, a full HAZOP analysis should be performed on the process to identify, prevent, and mitigate hazards. Standard operating procedures should be well documented and taught to operators on site. Due to the large quantities of chemicals used and produced, minimization should be done to reduce the amount of stored chemical on site. Minimization can be done by ensuring more frequent product shipping and waste disposal. A full

SDS database of the chemicals at the site should be widely available, along with any PPE equipment needed, for operators and engineers. Proper ventilation and detection systems should also be installed to mitigate the hazard of chemical releases. Installation of containment dikes for large storage tanks would also reduce hazards from a chemical release. While the designs and implementation of these safety considerations are not detailed in this report, proper investigation should be done to ensure the AIChE Code of Ethics, federal and local regulations, and other industrial standards are being followed and maintained with a proper safety culture.

Additional safety considerations about chemical toxicity are included in Section 14.2.

24. Profitability Analysis – Business Case

Profitability analyses of the plant were conducted with the Profitability Analysis v5 spreadsheet. The plant will commence production in 2025 at 45% capacity. Production will be ramped to 67.5% in 2026, and reach 90% capacity in 2027.

Tables 24.1 and 24.2 show the profitability measures of the PET recycling plant with a cost of capital of 15%. At current utilities, feedstock and product prices, capital investment, and fixed costs, the plant will have a NPV of -$198MM, an ROI of –12.18% in the 3rd year, and a negative IRR.

Table 24.1 Third year ROI of the PET recycling plant

Annual Sales	140,182,039
Annual Costs	(154,738,612)
Depreciation	(13,690,870)
Income Tax	6,496,912
Net Earnings	(21,750,531)
Total Capital Investment	178,548,004
ROI	-12.18%

Table 24.2 Cash flows for 21 years of plant operations and initial design and construction years

Cash Flow Summary

Year	Percentage of Design Capacity	Product Unit Price	Sales	Capital Costs	Working Capital	Var Costs	Fixed Costs	Depreciation	Depletion Allowance	Taxible Income	Taxes	Net Earnings	Cash Flow	Cumulative Net Present Value at 15%
2022	0%		-	-	-	-	-	-	-	-	-	-	-	-
2023	0%		-	(171,135,900)	-	-	-	-	-	-	-	-	(171,135,900)	(148,813,800)
2024	0%		-	-	(3,706,100)	-	-	-	-	-	-	-	(3,706,100)	(151,616,100)
2025	45%	$1.59	67,369,300	-	(1,853,000)	(62,146,800)	(24,436,300)	(27,781,800)	-	(46,995,600)	10,809,000	(36,186,600)	(10,257,800)	(158,360,800)
2026	68%	$1.62	103,075,000	-	(1,853,000)	(95,084,700)	(24,925,000)	(44,450,900)	-	(61,385,500)	14,118,700	(47,266,800)	(4,669,000)	(161,030,300)
2027	90%	$1.65	140,182,000	-	-	(129,315,100)	(25,423,500)	(26,670,500)	-	(41,227,100)	9,482,200	(31,744,900)	(5,074,300)	(163,553,200)
2028	90%	$1.69	142,985,700	-	-	(131,901,400)	(25,931,900)	(16,002,300)	-	(30,850,000)	7,095,500	(23,754,500)	(7,752,200)	(166,904,700)
2029	90%	$1.72	145,845,400	-	-	(134,539,500)	(26,450,600)	(16,002,300)	-	(31,147,000)	7,163,800	(23,983,200)	(7,980,900)	(169,905,000)
2030	90%	$1.76	148,762,300	-	-	(137,230,300)	(26,979,600)	(8,001,200)	-	(23,448,700)	5,393,200	(18,055,500)	(10,054,300)	(173,191,700)
2031	90%	$1.79	151,737,500	-	-	(139,974,900)	(27,519,200)	-	-	(15,756,500)	3,624,000	(12,132,500)	(12,132,500)	(176,640,600)
2032	90%	$1.83	154,772,300	-	-	(142,774,400)	(28,069,600)	-	-	(16,071,600)	3,696,500	(12,375,200)	(12,375,200)	(179,699,500)
2033	90%	$1.86	157,867,700	-	-	(145,629,800)	(28,631,000)	-	-	(16,393,100)	3,770,400	(12,622,700)	(12,622,700)	(182,412,700)
2034	90%	$1.90	161,025,100	-	-	(148,542,400)	(29,203,600)	-	-	(16,720,900)	3,845,800	(12,875,100)	(12,875,100)	(184,819,100)
2035	90%	$1.94	164,245,600	-	-	(151,513,300)	(29,787,700)	-	-	(17,055,300)	3,922,700	(13,132,600)	(13,132,600)	(186,953,500)
2036	90%	$1.98	167,530,500	-	-	(154,543,600)	(30,383,400)	-	-	(17,396,500)	4,001,200	(13,395,300)	(13,395,300)	(188,846,700)
2037	90%	$2.02	170,881,100	-	-	(157,634,400)	(30,991,100)	-	-	(17,744,400)	4,081,200	(13,663,200)	(13,663,200)	(190,525,800)
2038	90%	$2.06	174,298,700	-	-	(160,787,100)	(31,610,900)	-	-	(18,099,300)	4,162,800	(13,936,400)	(13,936,400)	(192,015,100)
2039	90%	$2.10	177,784,700	-	-	(164,002,900)	(32,243,100)	-	-	(18,461,300)	4,246,100	(14,215,200)	(14,215,200)	(193,336,100)
2040	90%	$2.14	181,340,400	-	-	(167,282,900)	(32,888,000)	-	-	(18,830,500)	4,331,000	(14,499,500)	(14,499,500)	(194,507,700)
2041	90%	$2.18	184,967,200	-	-	(170,628,600)	(33,545,700)	-	-	(19,207,100)	4,417,600	(14,789,500)	(14,789,500)	(195,546,900)
2042	90%	$2.23	188,666,600	-	-	(174,041,100)	(34,216,600)	-	-	(19,591,200)	4,506,000	(15,085,200)	(15,085,200)	(196,468,600)
2043	90%	$2.27	192,439,900	-	-	(177,522,000)	(34,901,000)	-	-	(19,983,100)	4,596,100	(15,387,000)	(15,387,000)	(197,286,100)
2044	90%	$2.32	196,288,700	-	-	(181,072,400)	(35,599,000)	-	-	(20,382,700)	4,688,000	(15,694,700)	(15,694,700)	(198,011,200)
2045	90%	$2.36	200,214,500	-	7,412,100	(184,693,900)	(36,311,000)	-	-	(20,790,400)	4,781,800	(16,008,600)	(8,596,500)	(198,356,600)

Table 24.3 Sensitivity analysis of plant operations

Product Price	Variable Costs										
	$69,052,040	$82,862,449	$96,672,857	$110,483,265	$124,293,673	***$138,104,081***	$151,914,489	$165,724,897	$179,535,305	$193,345,713	$207,156,121
$0.80	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR
$0.95	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR
$1.11	-0.20%	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR
$1.27	8.20%	0.70%	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR
$1.43	13.61%	8.63%	1.51%	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR
$1.59	17.95%	13.92%	9.05%	2.26%	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR
$1.75	21.70%	18.19%	14.22%	9.46%	2.95%	-14.23%	Negative IRR	Negative IRR	Negative IRR	Negative IRR	Negative IRR
$1.91	25.05%	21.90%	18.43%	14.52%	9.86%	3.60%	-10.20%	Negative IRR	Negative IRR	Negative IRR	Negative IRR
$2.07	28.13%	25.23%	22.10%	18.67%	14.81%	10.24%	4.21%	-7.67%	Negative IRR	Negative IRR	Negative IRR
$2.23	31.00%	28.28%	25.40%	22.29%	18.90%	15.09%	10.61%	4.78%	-5.79%	Negative IRR	Negative IRR
$2.39	33.69%	31.13%	28.43%	25.57%	22.49%	19.13%	15.37%	10.97%	5.32%	-4.29%	Negative IRR

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As shown in the above sensitivity analysis, with current plant operations and variable costs, it would require a product price of $1.91/kg DMT to attain a positive IRR; alternatively, a reduction in variable costs to $110MM would also result in a positive IRR. Other adjustments may be made to attain a breakeven point (NPV of 0) as well; for example, 2025 prices of DMT could be raised to $2.32 per kg.

One key element of the profitability analysis is the inflation rate; currently, the inflation rate is estimated at a conservative 2%. However, if the increase in price of rPET is 15% per year (as shown in Figure 7.3.1) the plant NPV will be 677MM. This scenario is possible, due to the rapid adoption of sustainable technologies, but not likely, as 15% is an aggressive growth rate. Table 24.4 shows a sensitivity analysis on a 15% inflation rate.

Table 24.4 Sensitivity analysis on 15% inflation of rPET prices

Product Price	Variable Costs										
	$69,052,040	$82,862,449	$96,672,857	$110,483,265	$124,293,673	***$138,104,081***	$151,914,489	$165,724,897	$179,535,305	$193,345,713	$207,156,121
$0.80	22.26%	20.64%	19.07%	17.56%	16.11%	14.71%	13.37%	12.07%	10.81%	9.60%	8.43%
$0.95	25.93%	24.34%	22.81%	21.32%	19.89%	18.51%	17.19%	15.91%	14.68%	13.50%	12.36%
$1.11	29.25%	27.69%	26.17%	24.70%	23.27%	21.90%	20.57%	19.30%	18.07%	16.89%	15.75%
$1.27	32.33%	30.78%	29.27%	27.80%	26.38%	25.00%	23.67%	22.38%	21.15%	19.96%	18.81%
$1.43	35.21%	33.68%	32.18%	30.72%	29.29%	27.91%	26.56%	25.27%	24.01%	22.81%	21.65%
$1.59	37.93%	36.42%	34.93%	33.47%	32.05%	30.66%	29.31%	27.99%	26.73%	25.50%	24.32%
$1.75	40.53%	39.03%	37.55%	36.10%	34.68%	33.28%	31.93%	30.60%	29.32%	28.08%	26.87%
$1.91	43.01%	41.53%	40.07%	38.62%	37.20%	35.81%	34.44%	33.11%	31.81%	30.55%	29.33%
$2.07	45.39%	43.93%	42.48%	41.05%	39.63%	38.24%	36.88%	35.54%	34.23%	32.95%	31.71%
$2.23	47.69%	46.25%	44.81%	43.39%	41.98%	40.60%	39.23%	37.89%	36.57%	35.29%	34.03%
$2.39	49.90%	48.48%	47.06%	45.65%	44.26%	42.88%	41.51%	40.17%	38.85%	37.56%	36.29%

25. Conclusions and Recommendations

At an NPV of -$198MM, with current technologies and material prices, this depolymerization process is uneconomical. One potential remedial factor for this plant will be increasing product prices to reflect a potential green premium on rDMT and rEG; however, this analysis was performed with a 16% premium already and it must be carefully considered whether consumers' willingness to pay will exceed this amount. Future improvements in consumer tastes and technology may aid in making such a process viable.

Additionally, this process uses a catalytically induced methanolysis process to depolymerize PET. The use of catalysts, while integral to reducing the required reaction temperatures and pressures required in supercritical methanol depolymerization, and PET hydrolysis, also added to complications in the separation process of our products. Separating methanol, DMT, and EG without impurities is a simple series of distillation steps. However, it was found that the catalyst chosen for this process, sodium carbonate, dissolves in the excess methanol required for methanolysis. Distilling the methanol from liquid DMT and EG is thus impossible without first removing the catalyst, since the catalyst would crystallize out of solution and clog up the distillation column. Thus, we included an evaporator, a compressor, a heat exchanger, and numerous pumps to evaporate as much of the liquid stream coming out of the reactor as possible to crystallize and separate the catalyst. This additional separation process adds $33MM in equipment costs, which is 31.4% of the total equipment cost, and $776 per hour of utilities, which is 24% of the total hourly utilities rate. Given the economic infeasibility of this process, it is recommended that PET recycling processes that do not use catalysts soluble in

excess methanol are explored to circumvent this problem and potentially lead to the design of a positive NPV PET depolymerization plant.

An important consideration is the production of DMT and EG as our products. Existing methanolysis plants, or ones that have existed in the past, from Teijin Fibers Limited and Eastman Chemical Company both depolymerize waste PET and re-polymerize the DMT and EG back into PET. While our plant separates our DMT and EG into high-purity products with the goal of selling them as individual products, it may be more economical to include a PET production facility alongside the recycling (i.e. depolymerization) operation. separations equipment found in our proposed process. Note that distillations to purify DMT and EG may still be required, as other unwanted materials may have been produced in the depolymerization process with boiling points between that of DMT and EG that could affect the quality of the PET produced using the resulting DMT and EG mixture. It is recommended that the design of a repolymerization process is completed to be compared alongside this process to determine what type of product would be most economical.

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28. Appendix

28.1 PUMPS

P-1 ~ P-6

Centrifugal Pumps Summary page

FBM = 3.3 CE = 800

Name	Q (gal/min)	H (ft)	S (gpm)(ft)^.5	CB $ (CE=567)	FT Table 22.20	FM Table 22.21	CP $ (CE=567)	CP $ (Given CE)	CBM $ (Given CE)	
P-1	279.53	586.168217	6768	6465	2.7	2	34910	49256	162545	
P-2	381.907	752.009097	10473	7744	2.7	2	41816	59000	194699	
P-3	18.8937	108.188884	197	5034	1	2	10068	14206	46879	Warning - extrapolation in cost estimate, refer to textbook for valid range
P-4	100.888	61.3555096	790	4293	1	2	8586	12114	39977	
P-5	86.0641	25.8995206	438	4409	1	2	8819	12443	41062	

Table 16.20 Typical Types of Radial Centrifugal Pumps and F_T Factors

No. of Stages	Shaft rpm	Case-Split Orientation	Flow Rate Range (gpm)	Pump Head Range(ft)	Maximum Motor Hp	Type Factor [F Eq. (16.15)
1	3,600	VSC	50–900	50–400	75	1.00
1	1,800	VSC	50–3,500	50–200	200	1.50
1	3,600	HSC	100–1,500	100–450	150	1.70
1	1,800	HSC	250–5,000	50–500	250	2.00
2	3,600	HSC	50–1,100	300–1,100	250	2.70
2+	3,600	HSC	100–1,500	650–3,200	1,450	8.90

Table 16.21 Materials of Construction Factors, F_M, for Centrifugal Pumps

Material of Construction	Material Factor [F_M, in Eq. (16.15)]
Cast iron	1.00
Ductile iron	1.15
Cast steel	1.35
Bronze	1.90
Stainless steel	2.00
Hastelloy C	2.95
Monel	3.30
Nickel	3.50
Titanium	9.70

Centrifugal Pumps Summary page

FBM = 3.3 CE = 800

Name	Q (gal/min)	H (ft)	S (gpm)(ft)^.5	CB $ (CE=567)	FT Table 22.20	FM Table 22.21	CP $ (CE=567)	CP $ (Given CE)	CBM $ (Given CE)	
P-6	34.5851	58.1509936	264	4734	2.7	2	25563	36068	119023	Warning - extrapolation in cost estimate, refer to textbook for valid range
			0	0	2.7	2	0	0	0	
			0	0	1	2	0	0	0	
			0	0	1	2	0	0	0	
			0	0	1	2	0	0	0	

Table 16.20 Typical Types of Radial Centrifugal Pumps and F_T Factors

No. of Stages	Shaft rpm	Case-Split Orientation	Flow Rate Range (gpm)	Pump Head Range(ft)	Maximum Motor Hp	Type Factor [F Eq. (16.15)
1	3,600	VSC	50–900	50–400	75	1.00
1	1,800	VSC	50–3,500	50–200	200	1.50
1	3,600	HSC	100–1,500	100–450	150	1.70
1	1,800	HSC	250–5,000	50–500	250	2.00
2	3,600	HSC	50–1,100	300–1,100	250	2.70
2+	3,600	HSC	100–1,500	650–3,200	1,450	8.90

Table 16.21 Materials of Construction Factors, F_M, for Centrifugal Pumps

Material of Construction	Material Factor [F_M, in Eq. (16.15)]
Cast iron	1.00
Ductile iron	1.15
Cast steel	1.35
Bronze	1.90
Stainless steel	2.00
Hastelloy C	2.95
Monel	3.30
Nickel	3.50
Titanium	9.70

DMT and EG Product/Rail Pumps

Centrifugal Pumps — Summary page

FBM = 3.3 CE = 800

Name	Q (gal/min)	H (ft)	S (gpm)(ft)^.5	CB $ (CE=567)	FT Table 22.20	FM Table 22.21	CP $ (CE=567)	CP $ (Given CE)	CBM $ (Given CE)	
DMT Product	50.8779392	28.29554	271	4712	1	2	9423	13296	43876	Warning - extrapolation in cost estimate, refer to textbook for valid range
EG Product	31.1376486	24.968	156	5342	1	2	10685	15076	49750	Warning - extrapolation in cost estimate, refer to textbook for valid range
DMT rail	698.02675	16.5	2835	4976	1	2	9953	14043	46342	
EG rail	726.334596	17.1	3004	5043	1	2	10086	14231	46962	
			0	0			0	0	0	

Table 16.20 Typical Types of Radial Centrifugal Pumps and F_T Factors

No. of Stages	Shaft rpm	Case-Split Orientation	Flow Rate Range (gpm)	Pump Head Range(ft)	Maximum Motor Hp	Type Factor [F Eq. (16.15)
1	3,600	VSC	50–900	50–400	75	1.00
1	1,800	VSC	50–3,500	50–200	200	1.50
1	3,600	HSC	100–1,500	100–450	150	1.70
1	1,800	HSC	250–5,000	50–500	250	2.00
2	3,600	HSC	50–1,100	300–1,100	250	2.70
2+	3,600	HSC	100–1,500	650–3,200	1,450	8.90

Table 16.21 Materials of Construction Factors, F_M, for Centrifugal Pumps

Material of Construction	Material Factor [F_M, in Eq. (16.15)]
Cast iron	1.00
Ductile iron	1.15
Cast steel	1.35
Bronze	1.90
Stainless steel	2.00
Hastelloy C	2.95
Monel	3.30
Nickel	3.50
Titanium	9.70

Purge Storage/Truck Pumps

Reciprocating Plunger Pumps — Summary page

FBM 3.3 CE = 800

Given Q, H, ρ

Name	Q (gal/min)	H (ft)	ρ (lb/gal)	ηp	PB (hp)	CB $ (CE=567)	FM See below	CP $ (CE=567)	CP $ (Given CE)	CBM $ (Given CE)	
Purge Waste	1.216	46.59	17.898616	0.9	0.03	2419	2.20	5321	7508	24775	Warning - extrapolation in cost estimate, refer to textbook for valid range
Purge Truck	166.67	15.8055732	17.898616	0.9	1.59	3214	2.20	7070	9976	32919	
				0.9	0.00	0		0	0	0	
				0.9	0.00	0		0	0	0	
				0.9	0.00	0		0	0	0	

Given PB

Name	PB (hp)
Purge Waste	
Purge Truck	

Ductile iron $F_M = 1.00$
Ni–Al–Bronze $F_M = 1.15$
Carbon steel $F_M = 1.50$
Stainless steel $F_M = 2.20$

28.2 ELECTRIC MOTORS

P-1 ~ P-6

Electric Motors											Summary page	
FBM	3.3		CE =	800								
Given Q, H, ρ												
Name	Q	H	ρ	ηp	PB	ηm	Pc	CB	FT	CP	CP	CBM
	(gal/min)	*(ft)*	*(lb/gal)*		*(hp)*		*(hp)*	*$ (CE=567)*	*Table 22.22*	*$ (CE=567)*	*$ (Given CE)*	*$ (Given CE)*
P-1	279.53	586.168217	8.2	0.66	62.03	0.90	68.88	3107	1.00	3107	4383	**14465**
P-2	381.907	752.009097	6.4	0.69	80.96	0.91	89.46	4214	1.00	4214	5946	**19623**
P-3	18.8937	108.188884	9.9355	0.29	2.15	0.82	2.61	425	1.00	425	599	**1977**
P-4	100.888	61.3555096	8.41841	0.54	2.94	0.83	3.53	445	1.00	445	628	**2071**
P-5	86.0641	25.8995206	8.64512	0.52	1.13	0.80	1.41	396	1.00	396	558	**1842**
Given PB												
Name	PB	ηm					PC					
	(hp)						*(hp)*					
P-1		0					0.00					
P-2		0					0.00					
P-3		0					0.00					
P-4		0					0.00					
P-5		0					0.00					

Table 16.22 F_T Factors in Eq. (16.20) and Ranges for Electric Motors

Type Motor Enclosure	3,600 rpm	1,800 rpm
Open, drip-proof enclosure, 1 to 700 Hp	1.0	0.90
Totally enclosed, fan-cooled, 1 to 250 Hp	1.4	1.3
Explosion-proof enclosure, 1 to 250 Hp	1.8	1.7

Electric Motors											Summary page	
FBM	3.3		CE =	800								
Given Q, H, ρ												
Name	Q	H	ρ	ηp	PB	ηm	Pc	CB	FT	CP	CP	CBM
	(gal/min)	*(ft)*	*(lb/gal)*		*(hp)*		*(hp)*	*$ (CE=567)*	*Table 22.22*	*$ (CE=567)*	*$ (Given CE)*	*$ (Given CE)*
P-6	34.5851	58.1509936	8.6	0.38	1.36	0.81	1.68	404	1.00	404	570	**1880**
				0.00	0.00	0.00	0.00	0	1.00	0	0	**0**
				0.00	0.00	0.00	0.00	0	1.00	0	0	**0**
				0.00	0.00	0.00	0.00	0	1.00	0	0	**0**
				0.00	0.00	0.00	0.00	0	1.00	0	0	**0**
Given PB												
Name	PB	ηm					PC					
	(hp)						*(hp)*					
P-6		0					0.00					
		0					0.00					
		0					0.00					

Table 16.22 F_T Factors in Eq. (16.20) and Ranges for Electric Motors

Type Motor Enclosure	3,600 rpm	1,800 rpm
Open, drip-proof enclosure, 1 to 700 Hp	1.0	0.90
Totally enclosed, fan-cooled, 1 to 250 Hp	1.4	1.3
Explosion-proof enclosure, 1 to 250 Hp	1.8	1.7

DMT, EG, and Purge Product/Rail Motors

Electric Motors — Summary page

FBM 3.3 CE = 800

Given Q, H, ρ

Name	Q (gal/min)	H (ft)	ρ (lb/gal)	ηp	PB (hp)	ηm	Pc (hp)	CB $ (CE=567)	FT Table 22.22	CP $ (CE=567)	CP $ (Given CE)	CBM $ (Given CE)	
DMT Product	50.8779392	28.29554	8.59445	0.44	0.85	0.79	1.07	381	1.80	686	968	3196	
EG Rail	726.334596	17.1	8.26122	0.75	4.17	0.84	4.95	479	1.80	862	1216	4013	
EG Product	31.1376486	24.968	8.26122	0.37	0.53	0.78	0.68	346	1.80	623	879	2902	Warning - extrapolation in cost estimate, refer to textbook for valid range
DMT Rail	698.02675	16.5	8.59445	0.74	4.04	0.84	4.80	475	1.80	855	1207	3982	
Purge Truck				0.00	0.00	0.00	0.00	410	1.80	738	1042	3438	

Given PB

Name	PB (hp)	ηm	PC (hp)
DMT Product		0	0.00
EG Rail		0	0.00
EG Product		0	0.00
DMT Rail		0	0.00
Purge Truck	1.59	0.81440173	1.95

Table 16.22 F_T Factors in Eq. (16.20) and Ranges for Electric Motors

Type Motor Enclosure	3,600 rpm	1,800 rpm
Open, drip-proof enclosure, 1 to 700 Hp	1.0	0.90
Totally enclosed, fan-cooled, 1 to 250 Hp	1.4	1.3
Explosion-proof enclosure, 1 to 250 Hp	1.8	1.7

Electric Motors — Summary page

FBM 3.3 CE = 800

Given Q, H, ρ

Name	Q (gal/min)	H (ft)	ρ (lb/gal)	ηp	PB (hp)	ηm	Pc (hp)	CB $ (CE=567)	FT Table 22.22	CP $ (CE=567)	CP $ (Given CE)	CBM $ (Given CE)	
Purge Waste				0.00	0.00	0.00	0.00	5	1.80	9	13	43	Warning - extrapolation in cost estimate, refer to textbook for valid range
				0.00	0.00	0.00	0.00	0	1.80	0	0	0	
				0.00	0.00	0.00	0.00	0	1.80	0	0	0	
				0.00	0.00	0.00	0.00	0	1.80	0	0	0	
				0.00	0.00	0.00	0.00	0	1.80	0	0	0	

Given PB

Name	PB (hp)	ηm	PC (hp)
Purge Waste	0.03	0.66576218	0.05
		0	0.00
		0	0.00
		0	0.00
		0	0.00

Table 16.22 F_T Factors in Eq. (16.20) and Ranges for Electric Motors

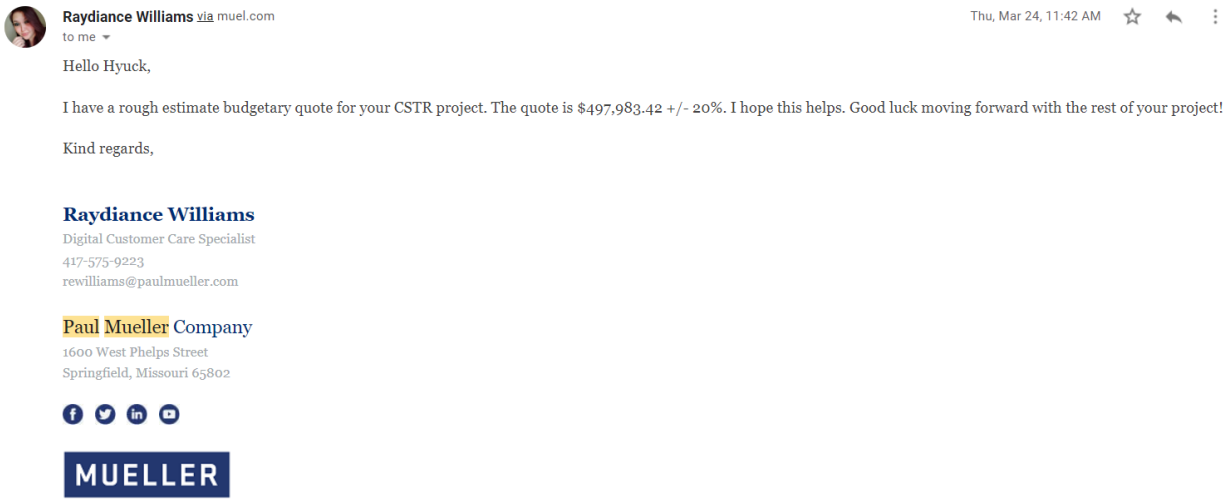
Type Motor Enclosure	3,600 rpm	1,800 rpm
Open, drip-proof enclosure, 1 to 700 Hp	1.0	0.90
Totally enclosed, fan-cooled, 1 to 250 Hp	1.4	1.3
Explosion-proof enclosure, 1 to 250 Hp	1.8	1.7

28.3 SLURRY MIXER (SLURMIX)

Storage Tanks					
FBM =	4		CE =	800	
Name	Type	V	Cp	CP	Cbm
		U.S. gal	*$(CE=567)*	*$ (Given CE)*	*$ (Given CE)*
Slurry mixer	Cone roof	23930	46735	65940	**263761**
			0	0	**0**
			0	0	**0**
			0	0	**0**
			0	0	**0**
Note: Carbon steel only					
Max pressure 3 psig					
See text for open roof, spheres					
Cone roof for low vapor pressure, requires vent system					
Floating roof to prevent evaporation					

28.4 REACTORS (R-1, R-2)

(quote for 4,000 gallons)



Raydiance Williams via muel.com
to me

Thu, Mar 24, 11:42 AM

Hello Hyuck,

I have a rough estimate budgetary quote for your CSTR project. The quote is $497,983.42 +/- 20%. I hope this helps. Good luck moving forward with the rest of your project!

Kind regards,

Raydiance Williams
Digital Customer Care Specialist
417-575-9223
rewilliams@paulmueller.com

Paul Mueller Company
1600 West Phelps Street
Springfield, Missouri 65802

MUELLER

Use of 6th-10th rule

$$(\$497{,}983) \times \left(\frac{25{,}886}{4{,}000}\right)^{0.6} = \$1{,}526{,}925 \text{ per tank}$$

28.5 Compressor (COMP)

Compressors								Summary page
FBM =	2.15		CE =	800				
Name	Compressor Type	Pc	Cb	FD	FM	Cp	Cp	CBM
	(screw, centrifugal, reciprocating)	*hp*	*$(CE=567)*	*see below*	*see below*	$ (CE=567)	*$ (Given CE)*	*$ (Given CE)*
COMP	Centrifugal Compressor	7811	2682264	1	2.5	6705659	9461247	**20341681**
			0			0	0	**0**
			0			0	0	**0**
			0			0	0	**0**
			0			0	0	**0**

Possible FD values		Possible FM values	
Electric	1	Cast iron	1
Steam	1.15	Carbon Steel	1
Gas	1.25	Stainless Steel	2.5
		Nickel Alloy	5

28.6 Distillation Column 1 (DC-1) and Plates

DC-1: Regular distillation				
Inner diameter (ft)		9.03		
Outer diameter (ft)				
Tray spacing (ft)		2.00		
No. trays		14		
Length (ft)		41.00		
Matl density (lb/in3), stainless steel 316		0.289		
EM (psi), stainless steel 316		28000000		
Operating pressure (psig)		29.008		
CE Plant Cost Index		800		
FM, stainless steel 316 (Table 16.26)		2.1		
Not adjusted for new CE Plant Cost Index				**Adjusted for CE Plant Cost Index**
Vertical Vessel				
Eq. 16.52	CP	184406.05		260184.91
Eq. 16.57	Cv	74974.20		105783.71
Eq. 16.58	CPL	26960.22	Di and L in feet	38039.12
Eq. 16.59	W	17845.88	Di, L, ts in inches	
	tS, rounded	0.31		
			tS in inches, additional 1/8in is	
	tS	0.28	corrosion allowance	
	tV	0.16		
Eq. 16.60	tP	0.13	Di in inches	
Eq. 16.61	Pd	40.81	Pd in psig	
			Maximum allowable stress, psig	
	S	20000.00	for stainless steel 316	
	E	0.85	fractional weld efficiency	
Eq. 16.62	tW	0.03	Do and L in inches	
Plates				
Eq. 16.66	CT	65460.19		92360.06
Eq. 16.67	CBT	1784.55	Di in ft	
Eq. 16.68	FNT	1.28	Equation used for NT < 20	
	FTT	1.00	Sieve tray	
	FTM	2.05	Stainless steel 316	

28.7 Distillation Column 2 (DC-2) and Packings

DC-2: Vacuum distillation				
Inner diameter (ft)	13.73			
Outer diameter (ft)				
Tray spacing (ft)	2.00			
No. trays	--			
Length (ft)	41.00			
Matl density (lb/in3), stainless steel 316	0.289			
EM (psi), stainless steel 316	28000000			
Operating pressure (psig)	10			
CE Plant Cost Index	800			
FM, stainless steel 316 (Table 16.26)	2.1			
Not adjusted for CE Plant Cost Index				**Adjusted for CE Plant Cost Index**
Vertical vessel				
Eq. 16.52	CP	585700.56		826385.26
Eq. 16.57	Cv	262165.43		369898.31
Eq. 16.58	CPL	35153.16	Di and L in feet	49598.82
Eq. 16.59	W	105723.10	Di, L, ts in inches	
	tS, rounded	1.13		
			tS in inches, additional 1/8in is	
	tS	1.11	corrosion allowance	
	tV	0.98		
Eq. 16.60	tP	0.06		
Eq. 16.61	Pd	15.24	Pd in psig	
			Maximum allowable stress, psig for	
	S	20000.00	stainless steel 316	
	E	1.00	fractional weld efficiency	
Eq. 16.63	tE	1.04	Do, L in inches; Pd, EM in psig	
			L and Di in inches, correction factor for	
Eq. 16.64	tEC	-0.05	tE	
Packings				
	Cpackings	1771370.19		2499287.744
	VP	6069.89		
	CPK	285.00		
			2 liquid distributors (1 at feed, 1 every	
	CDR	41452.88	20 ft)	

28.8 Distillation Column 3 (DC-3) and Packings

DC-3 Vacuum distillation				
Inner diameter (ft)	4.87			
Outer diameter (ft)				
Tray spacing (ft)	2.00			
No. trays	--			
Length (ft)	41.00			
Matl density (lb/in3), stainless steel 316	0.289			
EM (psi), stainless steel 316	28000000			
Operating pressure (psig)	10			
CE Plant Cost Index	800			
FM, stainless steel 316 (Table 16.26)	2.1			
Not adjusted for CE Plant Cost Index				**Adjusted for CE Plant Cost Index**
Vertical vessel				
Eq. 16.52	CP	176876.67		249561.44
Eq. 16.57	Cv	75540.62		106582.88
Eq. 16.58	CPL	18241.37	Di and L in feet	25737.39
Eq. 16.59	W	18068.61	Di, L, ts in inches	
	tS, rounded	0.63		
			tS in inches, additional 1/8in is	
	tS	0.53	corrosion allowance	
	tV	0.41		
Eq. 16.60	tP	0.03		
Eq. 16.61	Pd	15.24	Pd in psig	
			Maximum allowable stress, psig for	
	S	20000.00	stainless steel 316	
	E	0.85	fractional weld efficiency	
Eq. 16.63	tE	0.56	Do, L in inches; Pd, EM in psig	
			L and Di in inches, correction factor	
Eq. 16.64	tEC	-0.15	for tE	
Packings				
	Cpackings	223026.89		314676.3942
	VP	764.24		
	CPK	285.00		
			2 liquid distributors (1 at feed, 1	
	CDR	5219.18	every 20 ft)	

28.9 Distillation Column 4 (DC-4) and Packings

DC-4 Vacuum distillation				
Inner diameter (ft)	5.25			
Outer diameter (ft)				
Tray spacing (ft)	2.00			
No. trays	--			
Length (ft)	41.00			
Matl density (lb/in3), stainless steel 316	0.289			
EM (psi), stainless steel 316	28000000			
Operating pressure (psig)	10			
CE Plant Cost Index	800			
FM, stainless steel 316 (Table 16.26)	2.1			
Not adjusted for CE Plant Cost Index				**Adjusted for CE Plant Cost Index**
Vertical vessel				
Eq. 16.52	CP	185705.35		262018.13
Eq. 16.57	Cv	79327.77		111926.31
Eq. 16.58	CPL	19117.02	Di and L in feet	26972.87
Eq. 16.59	W	19572.48	Di, L, ts in inches	
	tS, rounded	0.63		
			tS in inches, additional 1/8in is	
	tS	0.56	corrosion allowance	
	tV	0.44		
Eq. 16.60	tP	0.03		
Eq. 16.61	Pd	15.24	Pd in psig	
			Maximum allowable stress, psig for	
	S	20000.00	stainless steel 316	
	E	0.85	fractional weld efficiency	
Eq. 16.63	tE	0.58	Do, L in inches; Pd, EM in psig	
			L and Di in inches, correction	
Eq. 16.64	tEC	-0.15	factor for tE	
Packings				
	Cpackings	258629.51		364909.3653
	VP	886.24		
	CPK	285.00		
			2 liquid distributors (1 at feed, 1	
	CDR	6052.34	every 20 ft)	

28.10 Reflux Drums

DC-1 Reflux Drum: Horizontal, cheaper				
Required volume (ft3)		492.70	492.70	10 minute holding time
Inner diameter		6.80		2:1 diameter:length ratio
Length		13.59		
Operating pressure (psig)		14.7		
Matl density (lb/in3), stainless steel 316		0.289		
FM, stainless steel 316 (Table 16.26)		2.1		**Adjusted for CE Plant Cost Index**
Eq. 16.52	CP		49922.25	70437.04
Eq. 16.53	CV		22154.31	
Eq. 16.59	W		5303.20	Di, L, ts in inches
Eq. 16.55	CPL		3398.21	Di in feet
Pg. 466	tS		0.31	Used instead of Eq. 16.60 for sufficient rigidity at low P
Eq. 16.60	tS		0.05	Di in inches
Eq. 16.61	Pd		21.76	psig
	S		20000.00	Maximum allowable stress, psig for stainless steel 316
	E		0.85	fractional weld efficiency

DC-2 Reflux Drum: Horizontal, cheaper				
Required volume (ft3)		1201.73	1201.73	10 minute holding time
Inner diameter		9.15		2:1 diameter:length ratio
Length		18.29		
Operating pressure (psig)		14.7		
Matl density (lb/in3), stainless steel 316		0.289		
FM, stainless steel 316 (Table 16.26)		2.1		**Adjusted for CE Plant Cost Index**
Eq. 16.52	CP		68602.44	96793.57
Eq. 16.53	CV		30945.73	
Eq. 16.59	W		9599.71	Di, L, ts in inches
Eq. 16.55	CPL		3616.41	Di in feet
Pg. 466	tS		0.31	Used instead of Eq. 16.60 for sufficient rigidity at low P
Eq. 16.60	tS		0.07	Di in inches
Eq. 16.61	Pd		21.76	psig
	S		20000.00	Maximum allowable stress, psig for stainless steel 316
	E		0.85	fractional weld efficiency

DC-3 Reflux Drum: Horizontal, cheaper				
Required volume (ft3)		33.11	33.11	10 minute holding time
Inner diameter (ft)		2.76		2:1 diameter:length ratio
Length (ft)		5.53		
Operating pressure (psig)		14.7		
Matl density (lb/in3), stainless steel 316		0.289		
FM, stainless steel 316 (Table 16.26)		2.1		**Adjusted for CE Plant Cost Index**
Eq. 16.52	CP		18198.31	25676.62582
Eq. 16.53	CV		7325.63	
Eq. 16.59	W		703.82	Di, L, ts in inches
Eq. 16.55	CPL		2814.49	Di in feet
Pg. 466	tS		0.25	Used instead of Eq. 16.60 for sufficient rigidity at low P
Eq. 16.60	tS		0.02	Di in inches
Eq. 16.61	Pd		21.76	psig
	S		20000.00	Maximum allowable stress, psig for stainless steel 316
	E		0.85	fractional weld efficiency

DC-4 Reflux Drum: Horizontal, cheaper				
Required volume (ft3)		108.80	108.80	10 minute holding time
Inner diameter (ft)		4.11		2:1 diameter:length ratio
Length (ft)		8.21		
Operating pressure (psig)		14.7		
Matl density (lb/in3), stainless steel 316		0.289		
FM, stainless steel 316 (Table 16.26)		2.1		**Adjusted for CE Plant Cost Index**
Eq. 16.52	CP		29730.46	41947.74482
Eq. 16.53	CV		12701.09	
Eq. 16.59	W		1942.28	Di, L, ts in inches
Eq. 16.55	CPL		3058.18	Di in feet
Pg. 466	tS		0.31	Used instead of Eq. 16.60 for sufficient rigidity at low P
Eq. 16.60	tS		0.03	Di in inches
Eq. 16.61	Pd		21.76	psig
	S		20000.00	Maximum allowable stress, psig for stainless steel 316
	E		0.85	fractional weld efficiency

28.11 Condensers

DC-1 Condenser: Floating head HX				
Heat duty (BTU/hr)	61130711.42			
operating P (psig)	29.008			
Thi (F)	181.427576			
Tho (F)	181.427576			
Tci (F)	90			
Tco (F)	120			
dT1	61.427576			
dT2	91.427576			
LMTD	75.43596616			
CW U (Btu/ft2-hr-F)	100	shell-side organic solvent; tube-side water (textbook range 50-150)		
A	8103.655926			**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	487450.1		687760.3115
Eq. 16.39	CB	97441.06		
Eq. 16.44	FM	4.06		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1.25	Tube length	
Eq. 16.45	FP	0.99		

DC-2 Condenser: Floating head HX				
Heat duty (BTU/hr)	59516835.42			
operating P (psig)	29.008			
Thi (F)	269.1812462			
Tho (F)	269.1812462			
Tci (F)	90			
Tco (F)	120			
dT1	149.1812462			
dT2	179.1812462			
LMTD	163.7234127			
CW U (Btu/ft2-hr-F)	100	shell-side organic solvent; tube-side water (textbook range 50-150)		
A	3635.206134			**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	277927.4		392137.3937
Eq. 16.39	CB	56592.15		
Eq. 16.44	FM	3.99		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1.25	Tube length	
Eq. 16.45	FP	0.99		

DC-3 Condenser: Floating head HX				
Heat duty (BTU/hr)	5890918.077			
operating P (psig)	29.008			
Thi (F)	209.09			
Tho (F)	209.09			
Tci (F)	90			
Tco (F)	120			
dT1	89.09			
dT2	119.09			
LMTD	103.37			
CW U (Btu/ft2-hr-F)	100	shell-side organic solvent; tube-side water (textbook range 50-150)		
A	569.91			**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	118426.5		167092.1198
Eq. 16.39	CB	25099.31		
Eq. 16.44	FM	3.83		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1.25	Tube length	
Eq. 16.45	FP	0.99		

DC-4 Condenser: Floating head HX				
Heat duty (BTU/hr)	5511216.718			
operating P (psig)	29.008			
Thi (F)	410.68			
Tho (F)	410.68			
Tci (F)	90			
Tco (F)	120			
dT1	290.68			
dT2	320.68			
LMTD	305.44			
CW U (Btu/ft2-hr-F)	100	shell-side organic solvent; tube-side water (textbook range 50-150)		
A	180.4365695			**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	95353.2		134537.1637
Eq. 16.39	CB	20681.00		
Eq. 16.44	FM	3.74		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1.25	Tube length	
Eq. 16.45	FP	0.99		

28.12 Reboilers

DC-1 Reboiler: Kettle vaporizer				
Heat duty (BTU/hr)	71189252.76			
operating P (psig)	29.008			
Thi (F)	479.774	steam at 550 psig		
Tho (F)	479.774			
Tci (F)	449.54			
Tco (F)	449.54			
dT1	30.23			
dT2	30.23			
LMTD	30.23			
CW U (Btu/ft2-hr-F)	100	shell-side organic solvent; tube-side water (textbook range 50-150)		
A	23548.34			**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	1664648.8		2348710.802
Eq. 16.39	CB	324338.33		
Eq. 16.44	FM	4.17		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1.25	Tube length	
Eq. 16.45	FP	0.99		

DC-2 Reboiler: Kettle vaporizer				
Heat duty (BTU/hr)	61697624.53			
operating P (psig)	29.008			
Thi (F)	479.77			
Tho (F)	479.77			
Tci (F)	433.36			
Tco (F)	433.36			
dT1	46.41			
dT2	46.41			
LMTD	46.41			
CW U (Btu/ft2-hr-F)	100	shell-side organic solvent; tube-side water (textbook range 50-150)		
A	13292.86			**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	986511.7		1391903.595
Eq. 16.39	CB	194901.56		
Eq. 16.44	FM	4.11		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1.25	Tube length	
Eq. 16.45	FP	0.99		

DC-3 Reboiler: Kettle reboiler				
Heat duty (BTU/hr)	8779042.572			
operating P (psig)	29.008			
Thi (F)	361.28			
Tho (F)	361.28			
Tci (F)	316.28			
Tco (F)	316.28			
dT1	45.00			
dT2	45.00			
LMTD	45.00			
CW U (Btu/ft2-hr-F)	100	shell-side organic solvent; tube-side water (textbook range 50-150)		
A	1950.77			**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	262808.1		370805.0686
Eq. 16.39	CB	54259.89		
Eq. 16.44	FM	3.93		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1.25	Tube length	
Eq. 16.45	FP	0.99		

DC-4 Reboiler: Kettle vaporizer				
Heat duty (BTU/hr)	5297963.117			
operating P (psig)	29.008			
Thi (F)	459.57			
Tho (F)	459.57			
Tci (F)	437.71			
Tco (F)	437.71			
dT1	21.86			
dT2	21.86			
LMTD	21.86			
CW U (Btu/ft2-hr-F)	100	shell-side organic solvent; tube-side water (textbook range 50-150)		
A	2423.71			**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	295179.9		416479.5999
Eq. 16.39	CB	60652.60		
Eq. 16.44	FM	3.95		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1.25	Tube length	
Eq. 16.45	FP	0.99		

28.13 Distillation Column Pumps and Motors

DC-1 Condenser pump (1 bar liquid recycle to 2.5 bar to go back)			
Flow rate (gpm)	368.81		
Pressure rise (bar) (1 --> 2.5 bar)	1.500		
Pressure rise (atm)	1.480		
Liquid density (g/mL)	0.721		
Liquid density (lb/ft^3)	44.92		
Liquid density (lb/gal)	6.0		
H (ft)	70.69		
S	3100.87		
CB	5082		
FT	1	Type of pump; single-stage centrifugal pump OK	
FM	2	Material pump; stainless steel	
CP	10163		**Adjusted for CE Plant Cost Index**
CP	10163		14339.56481
Pump Motor			
	Flow rate (gpm	368.81	
	H (ft)	70.69	
Eq. 16.17	np	0.68	
	PB	6.93	
Eq. 16.18	nM	0.85	
Eq. 16.16	PC	8.11	
Eq. 16.19	CB	564.27	
Table 16.22	FM	1.80	**Adjusted for CE Plant Cost Index**
Eq. 16.20	CP	1015.68	1433.054821

DC-2 Condenser pump (0.15 bar to 1 bar to enter reflux drum)			
Flow rate (gpm)	302.67		
Pressure rise (bar)	0.850		
Pressure rise (atm)	0.839		
Liquid density (g/mL)	1.004		
Liquid density (lb/ft^3)	62.52		
Liquid density (lb/gal)	8.4		
H (ft)	28.78		
S	1623.72		
CB	4507		
FT	1	Type of pump; single-stage centrifugal pump OK	
FM	2	Material pump; stainless steel	
CP	9014		**Adjusted for CE Plant Cost Index**
CP	9014		12718.47298
Pump Motor			
	Flow rate (gpm	302.67	
	H (ft)	28.78	
Eq. 16.17	np	0.66	
	PB	3.32	
Eq. 16.18	nM	0.84	
Eq. 16.16	PC	3.97	
Eq. 16.19	CB	454.98	
Table 16.22	FM	1.80	**Adjusted for CE Plant Cost Index**
Eq. 16.20	CP	818.97	1155.50713

DC-3 Condenser pump (0.15 bar to 1 bar for reflux drum)				
Flow rate (gpm)	27.10			
Pressure rise (bar) (1 --> 2.5 bar)	1.500			
Pressure rise (atm)	1.480			
Liquid density (g/mL)	1.010			
Liquid density (lb/ft^2)	62.95			
Liquid density (lb/gal)	8.4			
H (ft)	50.44			
S	192.46			
CB	5059			
FT	1	Type of pump; single-stage centrifugal pump OK		
FM	2	Material pump; stainless steel		
CP	10118			**Adjusted for CE Plant Cost Index**
CP	10118			14275.83878
Pump Motor				
	Flow rate (gpm	27.10		
	H (ft)	50.44		
Eq. 16.17	np	0.35		
	PB	1.01		
Eq. 16.18	nM	0.80		
Eq. 16.16	PC	1.26		
Eq. 16.19	CB	390.34		
Table 16.22	FM	1.80		**Adjusted for CE Plant Cost Index**
Eq. 16.20	CP	702.61		991.3416785

DC-4 Condenser pump (0.15 bar to 1 bar for reflux drum)				
Flow rate (gpm)	81.40			
Pressure rise (bar) (1 --> 2.5 bar)	1.500			
Pressure rise (atm)	1.480			
Liquid density (g/mL)	1.030			
Liquid density (lb/ft^3)	64.17			
Liquid density (lb/gal)	8.6			
H (ft)	49.48			
S	572.61			
CB	4324			
FT	1	Type of pump; single-stage centrifugal pump OK		
FM	2	Material pump; stainless steel		
CP	8648			**Adjusted for CE Plant Cost Index**
CP	8648			12201.43834
Pump Motor				
	Flow rate (gpm	81.40		
	H (ft)	49.48		
Eq. 16.17	np	0.51		
	PB	2.06		
Eq. 16.18	nM	0.82		
Eq. 16.16	PC	2.50		
Eq. 16.19	CB	422.29		
Table 16.22	FM	1.80		**Adjusted for CE Plant Cost Index**
Eq. 16.20	CP	760.12		1072.481296

28.14 Distillation Column Vacuum Systems

DC-2			
Temperature (C)	132		
Volume (ft3)	6073		
Operating pressure (torr)	112.5		
Gas (m3/kmol)	224.36		
Avg molecular weight of air (kg/kmol)	28.97		
Leakage rate (lb/hr)	56.15		
Leakage rate (kg/hr)	25.47		
Leakage rate (kmol/hr)	0.88		
Leakage rate (m3/hr)	197.25		
Leakage rate (ft3/min)	**116.05**		
(utilities) To (C)	426		
(utilities) Preal (kW)	4.814		
System type	**Size factor**	**Cp (w CE index)**	**Utilities cost ($/hr)**
Three-stage rotary lobe	116.05	80012	0.481

DC-3			
Temperature (C)	98		
Volume (ft3)	765		
Operating pressure (torr)	112.5		
Gas (m3/kmol)	205.86		
Avg molecular weight (kg/kmol)	28.97		
Leakage rate (lb/hr)	18.03		
Leakage rate (kg/hr)	8.18		
Leakage rate (kmol/hr)	0.28		
Leakage rate (m3/hr)	58.11		
Leakage rate (ft3/min)	**34.19**		
(utilities) To (C)	368		
(utilities) Preal (kW)	1.418		
System type	**Size factor**	**Cp (w CE index)**	**Utilities cost ($/hr)**
Three-stage rotary lobe	60	61051	0.142

DC-4			
Temperature (C)	210		
Volume (ft3)	887		
Operating pressure (torr)	112.5		
Gas (m3/kmol)	144.33		
Avg molecular weight (kg/kmol)	28.97		
Leakage rate (lb/hr)	19.37		
Leakage rate (kg/hr)	8.78		
Leakage rate (kmol/hr)	0.30		
Leakage rate (m3/hr)	43.76		
Leakage rate (ft3/hr)	**25.75**		
(utilities) To (C)	3219		
(utilities) Preal (kW)	17.001		
System type	**Size factor**	**Cp (w CE index)**	**Utilities cost ($/hr)**
Three-stage rotary lobe	60	61051	1.700

28.15 Decanter (DEC-1)

DEC-1 Vertical tank					
Inlet flow (L/min)		346.0988871			
Required volume (ft3)		366.67	30 minute holding time		
Inner diameter (ft)		6.16	2:1 diameter:length ratio		
Length (ft)		12.32			
Operating pressure (psig)		14.504			
Matl density (lb/in3), stainless steel 316		0.289			
FM, stainless steel 316 (Table 16.26)		2.1			
Eq. 16.52	CP	70557.00		Final cost:	99551.32266
Eq. 16.64	CV	29180.33			
Eq. 16.59	W	4354.61			
Eq. 16.56	CPL	9278.32	Di, L in feet		
Pg. 466	tS	0.31	Used instead of Eq. 16.60 for sufficient rigidity at low P		
Eq. 16.60	tS	0.05	Di in inches		
Eq. 16.61	Pd	21.49	psig		
	S	20000.00	Maximum allowable stress, psig for stainless steel 316		
	E	0.85	fractional weld efficiency		

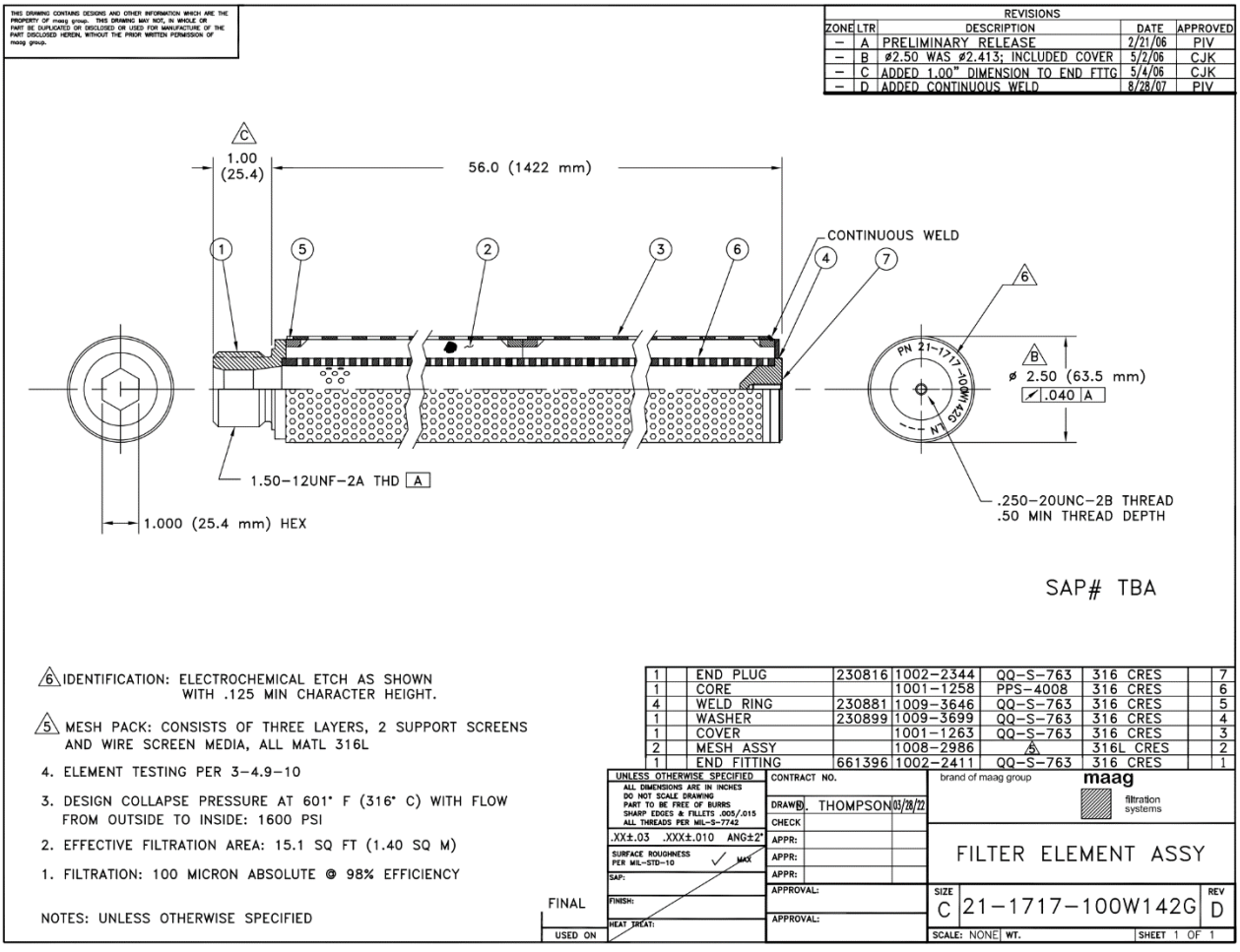
28.16 Evaporator and Vacuum System (EVAP)

EVAP Forced circulation evaporator (for viscous solutions)			
Heat duty (BTU/hr)	37515961.91		
operating P (psig)	2.18		
Thi (F)	311		
Tho (F)	311		
Tci (F)	284		
Tco (F)	284		
dT1	27		
dT2	27		
LMTD	27		
CW U (Btu/ft2-hr-F)	650		
A	2137.661647		
Table 16.32	CP, stainless steel	1316283.21	1857189.71 Assumed a FM of 2
Table 16.32	CP, carbon steel	658141.61	

EVAP Vacuum system		
Temperature (C)	140	
Volume (L)	52691710	Capacity to hold 10 minutes of vapor/liquid production
Volume (ft3)	1860793	
Operating pressure (torr)	112.5	
Gas (m3/kmol)	228.93	
Avg molecular weight of air (kg/kmol)	28.97	
Leakage rate (lb/hr)	2242.72	
Leakage rate (kg/hr)	1017.28	
Leakage rate (kmol/hr)	35.11	
Leakage rate (m3/hr)	8038.76	
Leakage rate (ft3/min)	**4729.47**	
(utilities) To (C)	440	
(utilities) Preal (kW)	196.192	

System type	**Size factor**	**Cp**	**Utilities cost ($/hr)**
Three-stage rotary lobe	4729.47	365866	13.733

28.17 Filter Candles (SLSEP)



MAAG Group
a DOVER company

PUMP & FILTRATION SYSTEMS › MAAG ETTLINGER
PELLETIZING SYSTEMS › GALA SCHEER AUTOMATIK
PULVERIZING SYSTEMS › REDUCTION
RECYCLING SYSTEMS › ETTLINGER

March 28, 2022

University of Pennsylvania
Philadelphia, PA 19104

Attention: Shannon Zhang
Office: 201-723-8701
shazha@seas.upenn.edu

Subject: Maag Reduction Proposal
Candle Filter Elements

Dear Shannon,

Thank you for your recent inquiry. We are pleased to offer our quotation for Maag filter elements. The Maag filter element will have an outside diameter of 2.50" and an outside guard.

Meanwhile, we look forward to serving you. If you have any questions or comments, please feel free to contact us any time.

Best Regards,

MAAG REDUCTION INC.

Drew Thompson
Sales Engineer
704-716-90512(office)

Attachments: *MAAG Drawing 21-1812-100W142G*
MAAG Conditions of Sale

Item# 1 Standard Filter Element Description:

SAP No.	**74******
Maag Drawing Number:	21-1717-100W142G
Element Material:	316L
Media Type:	Wire Screen
Rating:	***~100 micron absolute***
Overall Diameter:	2.5" [63.5 mm]
Overall Length:	57.0" [1447.8 mm]
Filtration Area:	15.1 SF [1.40 SM]
End Fitting:	1.50"-12 UNF Thread
End Plug:	.25"-20 UNC Thread
Collapse Pressure:	1,600 PSID
Guard:	Yes

**The equipment and services offered here represent our full and entire scope of supply. Any deviations, changes or additions must be addressed and confirmed as part of a written re-quote.*

Commercial Summary:

ITEM	QTY	ITEM DESCRIPTION	UNIT PRICE	EXTENDED PRICE
1	169	Filter Element, 100 micron Standard Length, **21-1717-100W1420**	$880	$148,720

Delivery:	10-12 Weeks ** ** Please contact Maag for delivery date at time of PO placement
Shipping Point:	FCA Eagle Rock, VA USA
Drawing:	Reference drawing attached for your review
Payment Terms:	Net 30 days

28.18 Heat Exchangers

28.18.1 HX-1

HX-1 Floating head HX			
Heat duty (BTU/hr)	80131705.89		
operating P (psig)	29.008		
Thi (F)	656.18		
Tho (F)	186.00		
Tci (F)	90.00		
Tco (F)	120.00		
dT1	536.18		
dT2	96.00		
LMTD	96.00		
CW U (Btu/ft2-hr-F)	83.51		
A	9995.27		**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	460495.15	649728.61
Eq. 16.39	CB	114498.49	
Eq. 16.44	FM	4.08	
Table 16.25	a	2.7	stainless steel for both shell/tube
Table 16.25	b	0.07	stainless steel for both shell/tube
Page 462	FL	1	Tube length > 20ft
Eq. 16.45	FP	0.99	

28.18.2 HX-2

HX-2 Floating head HX			
Heat duty (BTU/hr)	2681535.063		
operating P (psig)	29.008		
Thi (F)	181.33		
Tho (F)	141.05		
Tci (F)	90.00		
Tco (F)	120.00		
dT1	61.33		
dT2	51.05		
LMTD	51.05		
CW U (Btu/ft2-hr-F)	97.58		
A	538.30		**Adjusted for CE Plant Cost Index**
Eq. 16.43	CP	93200.22	131499.43
Eq. 16.39	CB	24720.13	
Eq. 16.44	FM	3.83	
Table 16.25	a	2.7	stainless steel for both shell/tube
Table 16.25	b	0.07	stainless steel for both shell/tube
Page 462	FL	1	Tube length > 20ft
Eq. 16.45	FP	0.99	

28.18.3 HX-3

HX-3 Floating head HX				
Heat duty (BTU/hr)	2179200.456			
operating P (psig)	29.008			
Thi (F)	437.96			
Tho (F)	93.66			
Tci (F)	90.00			
Tco (F)	120.00			
dT1	317.96			
dT2	3.66			
LMTD	3.66			
CW U (Btu/ft2-hr-F)	41.39			
A	14385.36			
Eq. 16.43	CP	626263.20		883616.51
Eq. 16.39	CB	154367.35		
Eq. 16.44	FM	4.12		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1	Tube length > 20ft	
Eq. 16.45	FP	0.99		

28.18.4 HX-4

HX-4 Floating head HX				
Heat duty (BTU/hr)	6623388.069			
operating P (psig)	29.008			
Thi (F)	279.32			
Tho (F)	50.00			
Tci (F)	10.00			
Tco (F)	50.00			
dT1	229.32			
dT2	40.00			
LMTD	40.00			
CW U (Btu/ft2-hr-F)	43.95	Btu/hr-sqft-F		
A	3767.57			
Eq. 16.43	CP	227420.35		320875.27
Eq. 16.39	CB	57837.98		
Eq. 16.44	FM	3.99		
Table 16.25	a	2.7	stainless steel for both shell/tube	
Table 16.25	b	0.07	stainless steel for both shell/tube	
Page 462	FL	1	Tube length > 20ft	
Eq. 16.45	FP	0.99		

28.19 Storage Tanks

28.19.1 DMT, EG, and Purge Storage Quote

Andy Diggs <adiggs@liquidhandlingequip.com> Tue,
to me

Chris,

Budgetary pricing would be as follows for the tanks. This would include on site heat tracing.

500,013 gallon tanks	$1.5 million
315,000 gallon tanks	$1.1 million
12,000 gallon tanks	$750,000

This is just pricing for your school project. None of the manufacturers we represent would be able to perform this.

Thanks,

Andy Diggs
Liquid Handling Equipment, Inc.
P.O. Box 668525
Charlotte, N.C. 28266-8525
704-399-8700 Office
704-785-0351 Cell
www.LiquidHandlingEquip.com



Andy Diggs
to me

Hi Chris,

I would estimate 460 volt and able to handle a 75 HP motor. I'm afraid we don't get involved with that.
Andy

Sent from my iPhone

28.19.2 Preprocessing Waste Storage Bin

Volume Needed Calculation

$$\frac{1403kg}{hr} \cdot \frac{2.205lb}{1kg} \cdot \frac{1ft^3}{15lb} \cdot \frac{24hr}{1day} \cdot \frac{7days}{1week} = 34648.88 \frac{ft^3}{week}$$

Purchase Cost Calculation using Seider et al.

$$646 \cdot (34648.88^{0.46}) \cdot \left(\frac{800}{567}\right) = 111{,}684.84$$

28.20 Crushers

28.20.1 Jaw Crusher

Purchase Cost Calculation using Seider et al.

$$2061 \cdot \left(\left(\frac{16000}{907.18}\right)^{0.89}\right) \cdot \left(\frac{800}{567}\right) = 47{,}366$$

28.20.2 Cone Crusher

Purchase Cost Calculation using Seider et al.

$$2041 \cdot \left(\left(\frac{16000}{907.18}\right)^{1.05}\right) \cdot \left(\frac{800}{567}\right) = 58{,}627.01$$

28.20.3 Ball Mill

Purchase Cost Calculation using Seider et al.

$$64640 \cdot \left(\left(\frac{16000}{907.18}\right)^{0.69}\right) \cdot \left(\frac{800}{567}\right) = 660{,}758.22$$

28.21 ASG Recycling Machinery Line Quote

Machine Description	Specifications	Qty (piece)	Price (USD)	Total (USD)
1. Debaler Machine (model#CBJ)	1) return cycloid motor: 5.5kw 2) reduction ratio: 1:35 3) main shaft rotating speed: 42rpm 4) turning diameter: φ390㎜ 5) main machine material: Q235 6) putting platform dimension: 1900×2500㎜ 7) feeding mouth dimension: 1800×2200㎜	1	$16,000	$16,000
2. Belt Conveyor 1 (model#PS - L - 1000)	1) belt width: 1000㎜ 2) belt material: PVC 3) motor power: 3.7KW 4) reduction ratio: 1: 30 5) drive roll diameter: φ273㎜ 6) belt linear velocity: 0.63m/s	1	$6,500	$6,500
3. Trommel (model#GX1500)	1) diameter: φ1500㎜ 2) length: 4500㎜ 3) material: carbon steel 4) degree of inclination: 5° 5) geared motor: 5.5KW 6) reduction ratio: 1:17	1	$16,000	$16,000
4. Belt Conveyor 2 (model#PS-L-1000)	1) belt width: 1000㎜ 2) belt material: PVC 3) motor power: 3.7KW 4) reduction ratio: 1: 30 5) drive roll diameter: φ273㎜ 6) belt linear velocity: 0.63m/s	1	$6,000	$6,000

5. Sorting Conveyor (model#FXPS)	A. Sorting conveyor (two sets) 1) belt width: 600㎜ 2) belt material: PVC 3) motor power: 1.5 KW 4) roller diameter: φ240㎜ 5) belt linear velocity: 0-1.25m/s 6) belt conveyor length: 11500㎜ B. Reverse conveyor 1) belt width: 600㎜ 2) belt material: PVC 3) motor power: 1.5 KW 4) roller diameter: φ240㎜ 5) belt linear velocity: 0-1.25m/s 6) belt conveyor length: 11600㎜	1	$20,000	$20,000
6. Belt Conveyor 3 (model#PS-L-1000)	1) belt width: 1000㎜ 2) belt material: PVC 3) motor power: 3KW 4) reduction ratio: 1: 30 5) drive roll diameter: φ273㎜ 6) belt linear velocity: 0.63m/s	2	$6,000	$12,000
7. Belt Conveyor 4 (model#PS-L-1000)	1) belt width: 1000㎜ 2) belt material: PVC 3) motor power: 3.7KW 4) reduction ratio: 1: 30 5) drive roll diameter: φ273㎜ 6) belt linear velocity: 0.63m/s 7) driven roller diameter: φ320㎜	4	$6,000	$24,000

8. Granulator (model#SWHB1200)	1) main motor: 45KW 2) cutter head rotary diameter: φ630 ㎜ 3) cutter head width: 1150㎜ 4) No.of rotating knife: 10 pcs 5) No.of stating knife: 4 pcs 6) cutter material: SKD11 7) cutter head rotating speed: 462rpm 8) cutter head material: 45 steel 9) screen mesh: φ95㎜ 10) hydraulic open feeding hopper/ hydraulic screen changer 11) hydraulic station power: 2.2KW 12) capacity: 800-1000kg/h 13) transmission power: 3KW 14) gear reducer model: NMRV130-30 15) screw conveyor rotating speed: 20-72.5rpm adjustable 16) screw vane diameter: φ250㎜ 17) screw space: 200㎜ 18) screw material: stainless steel	4	$24,000	$96,000
9. Screw Conveyor 1 (model#LX-390)	1) motor power: 3.7KW 2) screw conveyor rotating speed: 20-72.5 rpm 3) screw vane diameter: φ390㎜ 4) screw stroke: 300㎜ 5) screw material: stainless steel 6) frame material: carbon steel	2	$5,500	$11,000
10. Film and Flake Separator (model#PMFL)	1) material: stainless steel 2) frame material: carbon steel	2	$4,000	$8,000
11. Wind-Sending System (model#FS)	1) blower motor: 3KW 2) pipe diameter: φ159㎜ 3) pipe material: stainless steel	2	$1,500	$3,000
12. Storage For Labels (model#GLC-1)	1) storage material: stainless steel 2) volume: 1m3	2	$1,000	$2,000

13. Screw Conveyor 2 (model#LX-320)	1) motor power: 3.7KW 2) screw conveyor rotating speed: 20-72.5 rpm 3) screw vane diameter: φ390㎜ 4) screw stroke: 280㎜ 5) screw material: stainless steel 6) frame material: carbon steel	2	$5,500	$11,000
14. Washing Tank (model#QXC1500)	1. Width inside: 1500㎜ 2. Total length: 5000㎜ 3. Material: stainless steel 4. Frame material: carbon steel 5. Bottom screw motor: 5.5KW 6. Discharge material screw motor: 3.7KW 7. Lifting dirt screw motor power: 3KW 8. Main motor power: 3KW	6	$34,000	$204,000
15. Hot (Boiler) Washer (model#ZFL800)	1) motor power: 7.5KW 2) reducer model: BLD5-71-7.5 3) agitating shaft rotating speed: 20rpm 4) heating power: 60KW 5) boiler material: stainless steel 6) transmission power: 3.7KW 7) reducer model: NMRV110-20 8) screw rotating speed: 20-72.5rpm, adjustable 9) screw vane diameter: φ290㎜ 10) screw spacer: 200㎜ 7) screw material: stainless steel	4	$16,000	$64,000
16. High Speed Friction Washer (model#HXJ800)	1) rotor rotary diameter: φ524㎜ 2) rotor material: carbon steel 3) rotor rotating speed: 960rpm 4) No. of rotor vane: 24 pcs 5) washer body: stainless steel 6) effective washing length: 2800㎜ 7) motor power: 37KW 8) conveying angle: 15° 9) driving way: belt drive	2	$22,000	$44,000

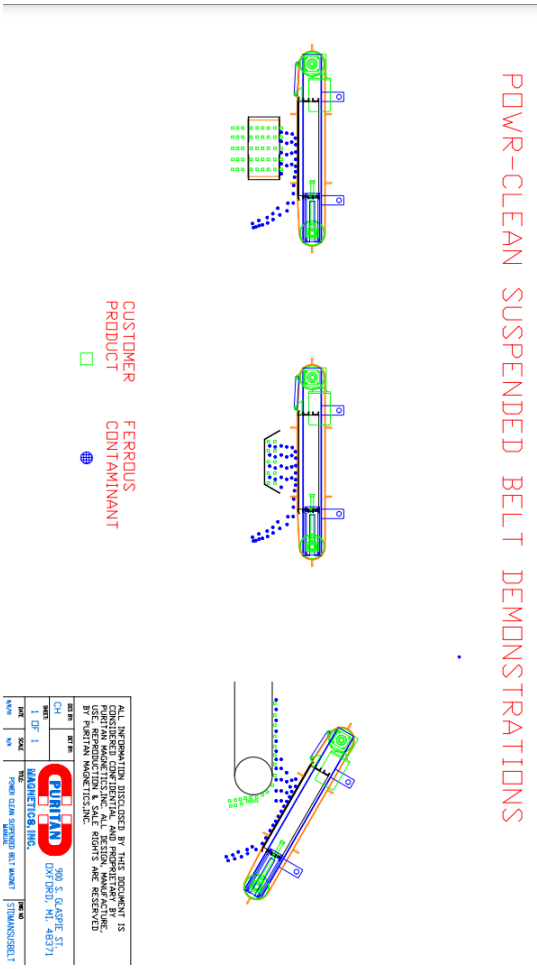
17. Screw Conveyor 3 (model#LX-320)	1) motor power: 3.7KW 2) screw conveyor rotating speed: 20-72.5rpm adjustable 3) screw vane diameter: φ320㎜ 4) screw stroke: 280㎜ 5) screw material: stainless steel 6) frame material: carbon steel	2	$5,500	$11,000
18. De-watering Machine (model#HTS800)	1) main motor power: 75KW 2) machine inside material: stainless steel 3) rotor rotary diameter: φ850㎜ 4) rotor material: carbon steel	2	$20,000	$40,000
19. Thermal Dryer (model#RSI800)	1) pipe diameter: φ159㎜ 2) blower power: 5.5KW 3) pipe material: stainless steel 4) blower model: 9-19 NO.4X5 5) heating power: 30KW	4	$2,000	$8,000
20. Cyclone Separator (model#FL1200)	1) separator diameter: φ1000㎜ 2) material: stainless steel	2	$3,500	$7,000
21. Finished Product Silo (model#GLC-2)	1) silo material: stainless steel 2) silo volume: 1m3	2	$3,500	$7,000
1. Belt Conveyor for Waste (model#PS - 800)	1) belt width: 800㎜ 2) belt material: PVC 3) motor power: 2.2KW 4) reduction ratio: 1: 30 5) drive roll diameter: φ273㎜ 6) belt linear velocity: 0.63m/s 7) driven roller diameter: φ323㎜	1	$6,000	$6,000
22. Electric Panel		2	$20,000	$40,000
Totals	**Installed Power: 730KW** **Capacity: 3,000 – 4,000 KG/h**			**$662,500**

28.22 Clean Management Quote

Phone call conversation: $1.32/gal of hazardous waste with $1,800 transportation fee per tanker and a tanker capacity of 5,000 gal. $59/ton of non-hazardous waste with $750 transportation fee per truck and a truck capacity of 10 tons.

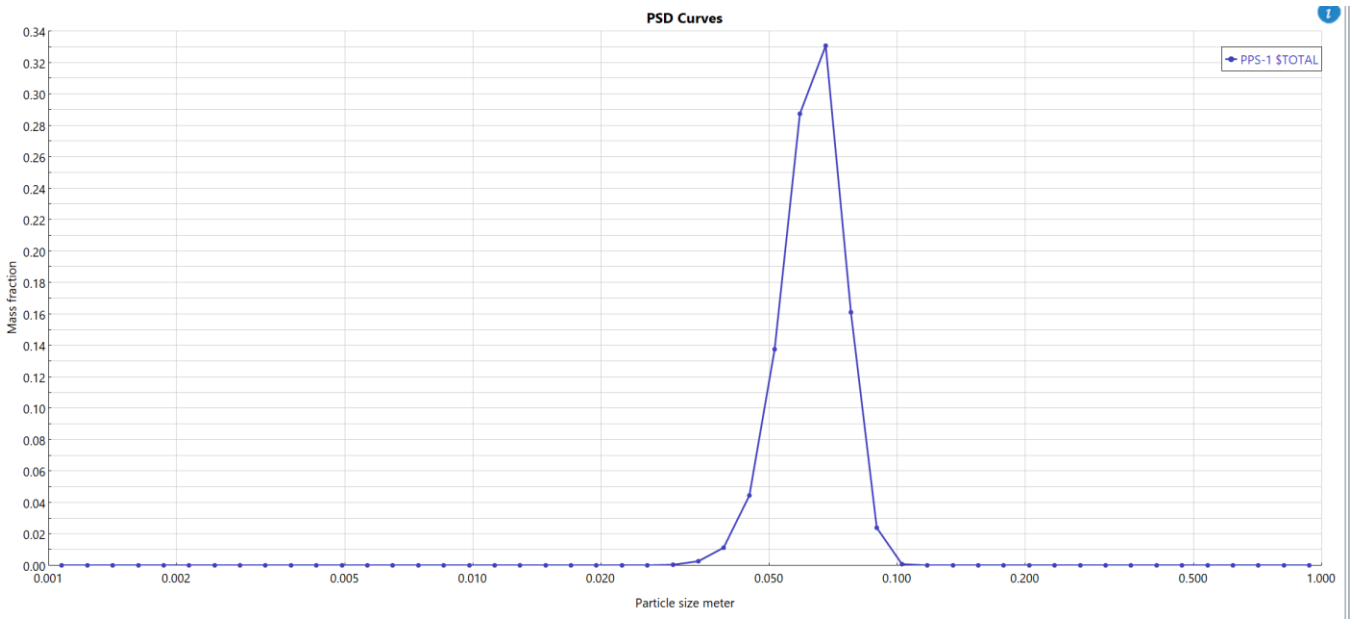
28.23 Puritan Magnetics Inc. Quote

Phone call conversation: 24 in x 30 in suspended belt PWR CLEAN magnet is $13,200 at 2-3 hp

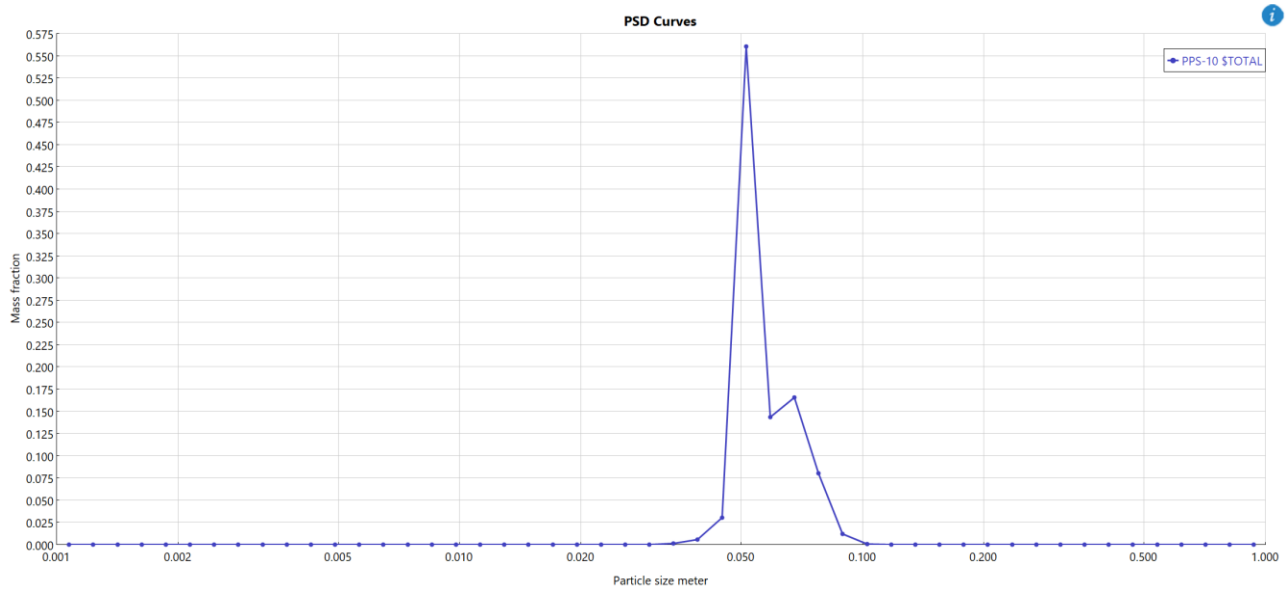


28.24 Particle Size Distribution Plots

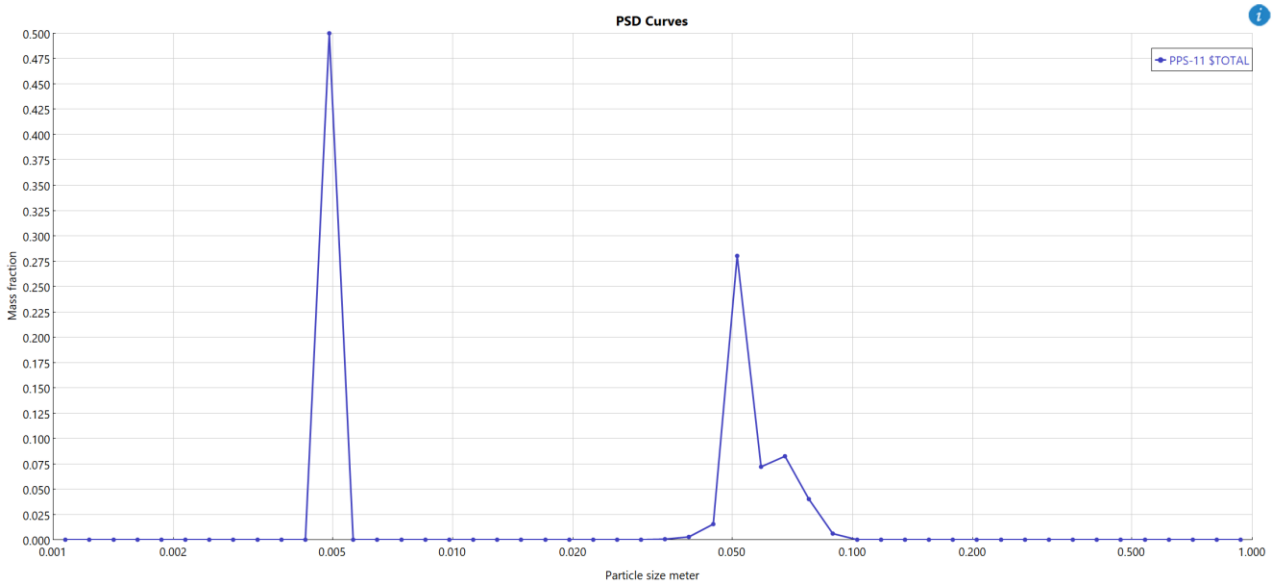
28.24.1 PSD of PET Feedstock



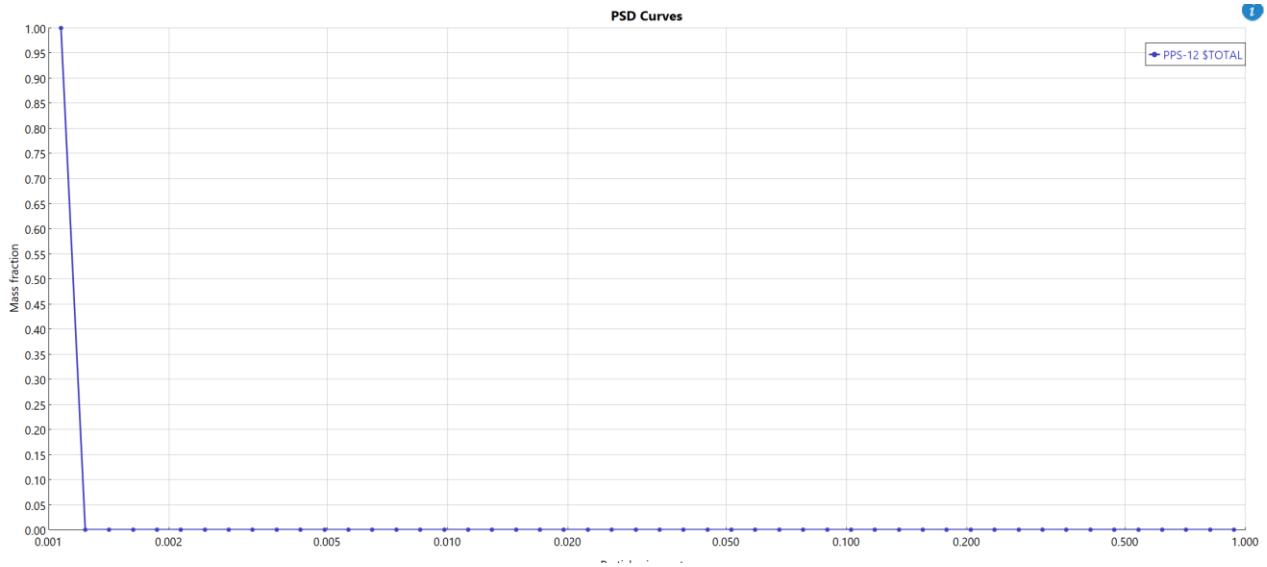
28.24.2 PSD of Jaw Crusher Output



28.24.3 PSD of Cone Crusher Output



28.24.4 PSD of Ball Mill Output



28.25 Supercritical Methanol Preliminary Calculations

Net Energy Input	Energy Input (Aspen)		(assuming WP3100 compressor) https://catalog.sauerusa.co		
	kJ/PET kg	$/PET kg	Compressor Power (hp) to m	compressor energy cost ($)	Profit
175439.3846			63.0875	24082.94301	
205404.4023			63.0875	24082.94301	
200883.4001			63.0875	24082.94301	
228543.7344			63.0875	24082.94301	
237308.589			63.0875	24082.94301	
233449.521			63.0875	24082.94301	
270629.8796			63.0875	24082.94301	
270500.8549			63.0875	24082.94301	
270435.3796			63.0875	24082.94301	
311383.8727			63.0875	24082.94301	
306116.4587	20243.38597	0.7996137458	63.0875	24082.94301	-24083.74263
294105.3673			63.0875	24082.94301	
342946.5838			63.0875	24082.94301	
338311.3209			63.0875	24082.94301	
384574.6788			63.0875	24082.94301	

Polyethylene Terephthalate

SAFETY DATA SHEET

Version 6.2
Revision Date 01/28/2020
Print Date 02/11/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name	:	POLYETHYLENE TEREPHTHALATE G, UNITED STATES PHARMACOPEIA (USP) REFERENCE STANDARD
Product Number	:	1546922
Brand	:	US Pharmacopeia
CAS-No.	:	25640-14-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich Inc. 3050 SPRUCE ST ST. LOUIS MO 63103 UNITED STATES
Telephone	:	+1 314 771-5765
Fax	:	+1 800 325-5052

1.4 Emergency telephone number

Emergency Phone #	:	800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

CAS-No.	:	25640-14-6

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first aid measures

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions
No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.230 g/cm3
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

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10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
No data available
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

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SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Poly(1,4-cyclohexanedimethylene terephthalate-co-ethylene terephthalate)	CAS-No. 25640-14-6	Revision Date

Poly(1,4-cyclohexanedimethylene terephthalate-co-ethylene terephthalate)	CAS-No. 25640-14-6	Revision Date

New Jersey Right To Know Components

Poly(1,4-cyclohexanedimethylene terephthalate-co-ethylene terephthalate)	CAS-No. 25640-14-6	Revision Date

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information

Further information
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Version: 6.2 Revision Date: 01/28/2020 Print Date: 02/11/2022

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Ethylene Glycol

ThermoFisher SCIENTIFIC

SAFETY DATA SHEET

Creation Date 02-Feb-2010 **Revision Date** 18-Jan-2018 **Revision Number** 4

1. Identification

Product Name **Ethylene glycol**

Cat No. : **E184-4; S800052**

CAS-No 107-21-1
Synonyms 1,2-Ethanediol; Monoethylene glycol; Antifreeze (Laboratory/Certified)

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 4
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver.	

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure



Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)

WARNING. Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Ethylene glycol	107-21-1	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

Inhalation Move to fresh air. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Get medical attention immediately if symptoms occur. If not breathing, give artificial respiration.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms and effects Breathing difficulties.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable Extinguishing Media No information available

Flash Point 111 °C / 231.8 °F

Method - DIN 51758

Autoignition Temperature 413 °C / 775.4 °F

Explosion Limits
Upper 15.30 vol %
Lower 3.20 vol %
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	1	1	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Ensure adequate ventilation. Do not breathe vapors or spray mist. Avoid contact with skin, eyes and clothing.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Ethylene glycol	TWA: 25 ppm STEL: 50 ppm STEL: 10 mg/m³	(Vacated) Ceiling: 50 ppm (Vacated) Ceiling: 125 mg/m³		Ceiling: 100 mg/m³

Legend

ACGIH - *American Conference of Governmental Industrial Hygienists*
OSHA - *Occupational Safety and Health Administration*

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory Protection	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Viscous liquid Liquid
Appearance	Colorless
Odor	Odorless
Odor Threshold	No information available
pH	5.5-7.5 50% aq. sol
Melting Point/Range	-13 °C / 8.6 °F
Boiling Point/Range	196 - 198 °C / 384.8 - 388.4 °F @ 760 mmHg
Flash Point	111 °C / 231.8 °F
Method -	DIN 51758
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	15.30 vol %
Lower	3.20 vol %
Vapor Pressure	0.12 mmHg @ 20 °C
Vapor Density	2.14 (Air = 1.0)
Specific Gravity	1.113
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	413 °C / 775.4 °F
Decomposition Temperature	> 500°C
Viscosity	21 cP (20°C)
Molecular Formula	C2 H6 O2
Molecular Weight	62.06

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Hygroscopic.
Conditions to Avoid	Incompatible products. Excess heat. Exposure to moist air or water.
Incompatible Materials	Strong oxidizing agents, Strong acids, Strong bases, Aldehydes
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO_2)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene glycol	7712 mg/kg (Rat)	9530 µL/kg (Rabbit) 10600 mg/kg (Rat)	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation May cause eye, skin, and respiratory tract irritation

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Ethylene glycol	107-21-1	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Kidney Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains. .

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Ethylene glycol	EC50: 6500 - 13000 mg/L, 96h (Pseudokirchneriella subcapitata)	LC50: = 16000 mg/L, 96h static (Poecilia reticulata) LC50: 40000 - 60000 mg/L, 96h static (Pimephales promelas) LC50: = 40761 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 41000 mg/L, 96h (Oncorhynchus mykiss) LC50: 14 - 18 mL/L, 96h static (Oncorhynchus mykiss) LC50: = 27540 mg/L, 96h static (Lepomis macrochirus)	Not listed	EC50: = 46300 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Ethylene glycol	-1.93

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Ethylene glycol	X	X	-	203-473-3	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Ethylene glycol	107-21-1	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Ethylene glycol	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Ethylene glycol	5000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Ethylene glycol	107-21-1	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Ethylene glycol	X	X	X	X	-

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Slight risk, Grade 1

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 02-Feb-2010
Revision Date 18-Jan-2018
Print Date 18-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Diethylene Glycol

Safety Data Sheet

THE DOW CHEMICAL COMPANY*

Product Name: Diethylene Glycol

Issue Date: 06/15/2015
Print Date: 15 Jun 2016

THE DOW CHEMICAL COMPANY* encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Identification

Product Name
Diethylene Glycol

Identified uses
For industrial use. It is recommended that you use this product in a manner consistent with the recommended use. If your intended use is not consistent with the recommended use, please contact our Customer Information Group (telephone number in Section 1 of this document).
Uses advised against
Production of tobacco products Generation of artificial smoke Electronic cigarettes (e-cigarettes) Applications with direct or indirect food or potable water contact Any application where the product is to be purposely used as a non-reactant component where the potential for sufficient human contact and/or ingestion exists Freezer gel packs and heating packs Glues and pastes Manufacturing of munitions Sprinkler systems Deicing of road or sidewalks Deicing of aircraft lavatories Consumer or hospital usage for deodorizing or air "purifying" purposes by spraying as an aerosol Fluid for pressure testing piping Pharmaceutical Use Treatment of wood rot and fungus in marine applications

COMPANY IDENTIFICATION
THE DOW CHEMICAL COMPANY*
Agent for Rohm and Haas Chemicals LLC
100 INDEPENDENCE MALL WEST
PHILADELPHIA PA 19106-2399
UNITED STATES

Customer Information Number: 215-592-3000
SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 1 800 424 9300
Local Emergency Contact: 800-424-9300

2. Hazards Identification

Classification of the substance or mixture This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

® ™ TRADEMARK OF THE DOW CHEMICAL COMPANY ("DOW") OR AN AFFILIATED COMPANY OF DOW

Hazard Class:

Acute toxicity (Oral)	Category 4
Specific target organ toxicity - repeated exposure (Oral)	Category 2

Label elements
Hazard Symbol:



Signal Word: Warning
Hazards of product:
Harmful if swallowed.
May cause damage to organs through prolonged or repeated exposure if swallowed.

Precautionary Statements:
Prevention: Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. Wash hands thoroughly after handling.
Response: IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth. Get medical advice/ attention if you feel unwell.
Storage: Store locked up.
Disposal: Dispose of contents and container to licensed, permitted incinerator, or other thermal destruction device.

Other Hazards: no data available

3. Composition Information

Synonym: Diethylene Glycol
This product is a substance.

Component	CAS #	Amount
Diethylene glycol	111-46-6	>= 99.0 - <= 100.0 %
Ethylene glycol	107-21-1	>= 0.0 - <= 0.2 %

4. First-aid measures

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Skin Contact: Immediately flush skin with water while removing contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Destroy contaminated leather items such as shoes, belts, and watchbands. Suitable emergency safety shower facility should be immediately available.
Eye Contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Ingestion: Seek medical attention immediately. Do not induce vomiting. If person is fully conscious give 1 cup or 8 ounces (240 ml) of water. If medical advice is delayed and if an adult has swallowed several ounces of chemical, then give 3-4 ounces (1/3-1/2 Cup) (90-120 ml) of hard liquor such as 80 proof whiskey. For children, give proportionally less liquor at a dose of 0.3 ounce (1 1/2 tsp.) (8 ml) liquor for each 10 pounds of body weight, or 2 ml per kg body weight [e.g., 1.2 ounce (2 1/3 tbsp.) for a 40 pound child or 36 ml for an 18 kg child].

Most important symptoms and effects, both acute and delayed

Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of immediate medical attention and special treatment needed

Due to structural analogy and clinical data, this material may have a mechanism of intoxication similar to ethylene glycol. On that basis, treatment similar to ethylene glycol intoxication may be of benefit. In cases where several ounces (60 - 100 ml) have been ingested, consider the use of ethanol and hemodialysis in the treatment. Consult standard literature for details of treatment. If ethanol is used, a therapeutically effective blood concentration in the range of 100 - 150 mg/dl may be achieved by a rapid loading dose followed by a continuous intravenous infusion. Consult standard literature for details of treatment. 4-Methyl pyrazole (Antizol®) is an effective blocker of alcohol dehydrogenase and should be used in the treatment of ethylene glycol (EG), di- or triethylene glycol (DEG, TEG), ethylene glycol butyl ether (EGBE), or methanol intoxication if available. Fomepizole protocol (Brent, J. et al., New England Journal of Medicine, Feb. 8, 2001, 344:6, p. 424-9): loading dose 15 mg/kg intravenously, follow by bolus dose of 10 mg/kg every 12 hours; after 48 hours, increase bolus dose to 15 mg/kg every 12 hours. Continue fomepizole until serum methanol, EG, DEG, TEG or EGBE are undetectable. The signs and symptoms of poisoning include anion gap metabolic acidosis, CNS depression, renal tubular injury, and possible late stage cranial nerve involvement. Respiratory symptoms, including pulmonary edema, may be delayed. Persons receiving significant exposure should be observed 24-48 hours for signs of respiratory distress. In severe poisoning, respiratory support with mechanical ventilation and positive end expiratory pressure may be required. Maintain adequate ventilation and oxygenation of the patient. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. If burn is present, treat as any thermal burn, after decontamination. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Suitable extinguishing media

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.
Extinguishing Media to Avoid: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.
Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound

from venting safety device or discoloration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to Section 7, Handling, for additional precautionary measures. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Collect in suitable and properly labeled containers. Small spills: Absorb with materials such as: Cat litter. Sand. Sawdust. Vermiculite. Zorb-all®. Hazorb®. Large spills: Dike area to contain spill. Pump into suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. Handling and Storage

Handling
General Handling: Avoid contact with eyes, skin, and clothing. Do not swallow. Wash thoroughly after handling. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Storage
Do not store near food, foodstuffs, drugs or potable water supplies. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact. Ask for a product brochure.

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Diethylene glycol	AIHA WEEL	TWA	10 mg/m3
Ethylene glycol	ACGIH	Ceiling Aerosol.	100 mg/m3

Personal Protection
Eye/Face Protection: Use safety glasses (with side shields).
Skin Protection: When prolonged or frequently repeated contact could occur, use protective clothing chemically resistant to this material. Selection of specific items such as faceshield, boots, apron, or

full-body suit will depend on the task. When handling hot material, protect skin from thermal burns as well as from skin absorption.

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Use gloves with insulation for thermal protection, when needed. If hands are cut or scratched, use gloves chemically resistant to this material even for brief exposures. Examples of preferred glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl alcohol ("PVA"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions, no respiratory protection should be needed; however, if material is heated or sprayed, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Appearance	
Physical State	Liquid.
Color	Colorless
Odor	odourless
Odor Threshold	No test data available
pH	No test data available
Melting Point	*No data available.*
Freezing Point	-6.5 °C (20.3 °F) *Literature*
Boiling Point (760 mmHg)	244.9 °C (472.8 °F) *Literature* .
Flash Point - Closed Cup	138 °C (280 °F) *Literature*
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not applicable to liquids
Flammable Limits In Air	**Lower**: 2.0 %(V) *Calculated* **Upper**: 12.3 %(V) *Estimated.*
Vapor Pressure	0.002 mmHg @ 20 °C *Literature*
Vapor Density (air = 1)	3.65 *Literature*
Specific Gravity (H2O = 1)	1.118 *Literature*
Solubility in water (by weight)	100 % @ 20 °C *Literature* Soluble
Partition coefficient, n-octanol/water (log Pow)	-1.98 *Estimated.*
Autoignition Temperature	229 °C (444 °F) *Literature*
Decomposition Temperature	No test data available
Dynamic Viscosity	35.7 mPa.s @ 20 °C *Literature*
Explosive properties	Not explosive
Oxidizing properties	The substance or mixture is not classified as oxidizing.
Liquid Density	1.18 g/cm3 @ 20 °C *Literature*

Molecular Weight	No test data available
Henry's Law Constant (H)	7.96E-10 atm*m3/mole; 25 °C Estimated.

10. Stability and Reactivity

Reactivity
No dangerous reaction known under conditions of normal use.

Chemical stability
Thermally stable at recommended temperatures and pressures.

Possibility of hazardous reactions
Polymerization will not occur.

Conditions to Avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous decomposition products
Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Alcohols. Ethers.

11. Toxicological Information

Acute Toxicity
Ingestion
Oral toxicity is expected to be moderate in humans due to diethylene glycol even though tests with animals show a lower degree of toxicity. May cause nausea and vomiting. May cause abdominal discomfort or diarrhea. Excessive exposure may cause central nervous system effects, cardiopulmonary effects (metabolic acidosis), and kidney failure.
Estimated. Lethal Dose, Human, adult 2 Ounces
LD50, rat, male 19,600 mg/kg
Aspiration hazard
Based on physical properties, not likely to be an aspiration hazard.
Dermal
Prolonged skin contact is unlikely to result in absorption of harmful amounts. Repeated skin exposure to large quantities may result in absorption of harmful amounts. Massive contact with damaged skin or of material sufficiently hot to burn skin may result in absorption of potentially lethal amounts.
LD50, rabbit 13,330 mg/kg
Inhalation
At room temperature, exposure to vapor is minimal due to low volatility. With good ventilation, single exposure is not expected to cause adverse effects. If material is heated or areas are poorly ventilated, vapor/mist may accumulate and cause respiratory irritation and symptoms such as headache and nausea.
The LC50 value is greater than the Maximum Attainable Concentration. LC50, 4 h, Aerosol, rat > 4.6 mg/l
No deaths occurred at this concentration.
Eye damage/eye irritation
May cause slight temporary eye irritation. Corneal injury is unlikely.
Skin corrosion/irritation
Prolonged contact is essentially nonirritating to skin.
Sensitization
Skin
Did not cause allergic skin reactions when tested in humans. Did not cause allergic skin reactions when tested in guinea pigs.

Respiratory
No relevant data found.

Repeated Dose Toxicity
In humans, effects have been reported on the following organs: Kidney. Gastrointestinal tract. In humans, symptoms may include: Headache. Nausea and/or vomiting. Abdominal discomfort. In animals, effects have been reported on the following organs: Liver.

Chronic Toxicity and Carcinogenicity
Diethylene glycol has been tested for carcinogenicity in animal studies and is not believed to pose a carcinogenic risk to man.

Developmental Toxicity
Diethylene glycol has caused toxicity to the fetus and some birth defects at maternally toxic, high doses in animals. Other animal studies have not reproduced birth defects even at much higher doses that caused severe maternal toxicity.

Reproductive Toxicity
Diethylene glycol did not interfere with reproduction in animal studies except at very high doses.

Genetic Toxicology
In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

12. Ecological Information

Toxicity

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, Pimephales promelas (fathead minnow), flow-through test, 96 h: 75,200 mg/l
Aquatic Invertebrate Acute Toxicity
EC50, Daphnia magna (Water flea), static test, 24 h, immobilization: > 10,000 mg/l
Toxicity to Micro-organisms
EC50, OECD 209 Test; activated sludge, Respiration inhibition, 3 h: > 1,000 mg/l

Persistence and Degradability

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Material is ultimately biodegradable (reaches > 70% biodegradation in OECD test(s) for inherent biodegradability).
OECD Biodegradation Tests: Based on analogy.

Biodegradation	Exposure Time	Method	10 Day Window
90 - 100 %	20 d	OECD 301A Test	pass
82 - 98 %	28 d	OECD 302C Test	Not applicable

Theoretical Oxygen Demand: 1.51 mg/mg

Bioaccumulative potential
Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient, n-octanol/water (log Pow): -1.98 Estimated.
Bioconcentration Factor (BCF): 100; Fish; Measured

Mobility in soil
Mobility in soil: Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process., Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient, soil organic carbon/water (Koc): < 1 Estimated.
Henry's Law Constant (H): 7.96E-10 atm*m3/mole; 25 °C Estimated.
Distribution in Environment: Mackay Level 1 Fugacity Model:

Air	Water.	Biota	Soil	Sediment
0.75 %	99.25 %	0 %	0 %	0 %

Results of PBT and vPvB assessment
This substance is not considered to be persistent, bioaccumulating and toxic (PBT). This substance is not considered to be very persistent and very bioaccumulating (vPvB).

Other adverse effects
This substance is not in Annex I of Regulation (EC) No 1005/2009 on substances that deplete the ozone layer.

13. Disposal Considerations

Disposal methods
DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Recycler. Reclaimer. Incinerator or other thermal destruction device.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
NOT REGULATED
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Product Name: DIETHYLENE GLYCOL

ICAO/IATA
NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
Diethylene glycol	111-46-6	> 99.0 %

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Component	CAS #	Amount
1,4-Dioxane	123-91-1	<= 0.5 PPM

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
WARNING: This product contains a chemical(s) known to the State of California to cause birth defects or other reproductive harm.

Component	CAS #	Amount
Ethylene glycol monomethyl ether	109-86-4	<= 0.05 PPM

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30
CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

16. Other Information

Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	1	0

Revision
Identification Number: 78287 / 1001 / Issue Date 06/15/2015 / Version: 11.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
Action Level	A value set by OSHA that is lower than the PEL which will trigger the need for activities such as exposure monitoring and medical surveillance if exceeded.

THE DOW CHEMICAL COMPANY* *urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.*

Dimethyl Terephthalate

Sigma-Aldrich. www.sigmaaldrich.com

SAFETY DATA SHEET

Version 6.3
Revision Date 08/24/2021
Print Date 02/05/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Dimethyl terephthalate

Product Number : 185124
Brand : Aldrich
CAS-No. : 120-61-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : $C_{10}H_{10}O_4$
Molecular weight : 194.18 g/mol
CAS-No. : 120-61-6

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EC-No. : 204-411-8

Component	Classification	Concentration
dimethyl terephthalate		
	Aquatic Acute 3; H402	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapors, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions
No special environmental precautions required.

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6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Advice on protection against fire and explosion
Provide appropriate exhaust ventilation at places where dust is formed.

Hygiene measures
General industrial hygiene practice.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place.

Storage class
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
dimethyl terephthalate	120-61-6	TWA	5 mg/m3	USA. Workplace Environmental Exposure Levels (WEEL)

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact

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with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 480 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, Size M)

Splash contact
Material: Nature latex/chloroprene
Minimum layer thickness: 0.6 mm
Break through time: 30 min
Material tested:Lapren® (KCL 706 / Aldrich Z677558, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Chunks Color: white
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 139 - 141 °C (282 - 286 °F)
f)	Initial boiling point and boiling range	288 °C 550 °F at 1,013 hPa
g)	Flash point	151 °C (304 °F) - closed cup
h)	Evaporation rate	No data available

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i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	0.00319 hPa at 20.00 °C (68.00 °F)
l)	Vapor density	No data available
m)	Density	1.36 g/cm3 at 20 °C (68 °F)
	Relative density	No data available
n)	Water solubility	0.0493 g/l at 20 °C (68 °F) - OECD Test Guideline 105 - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.21 at 23 °C (73 °F)
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong acids, Strong bases, Nitrates

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 3,200 mg/kg
Remarks: (IUCLID)
Inhalation: No data available
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
slight irritation

Respiratory or skin sensitization
Sensitisation test: - Guinea pig
Result: negative
Remarks: (IUCLID)

Germ cell mutagenicity
Test Type: Ames test
Test system: Salmonella typhimurium
Result: negative
Remarks: (Lit.)

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male - Inhalation

RTECS: WZ1225000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Hazardous properties cannot be excluded but are unlikely when the product is handled appropriately.

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Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	semi-static test LC50 - Danio rerio (zebra fish) - 13.0 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - > 26.5 mg/l - 24 h Remarks: (IUCLID)
Toxicity to algae	IC50 - Desmodesmus subspicatus (green algae) - 27.6 mg/l - 72 h Remarks: (IUCLID)
	static test NOEC - Desmodesmus subspicatus (green algae) - 29 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	NOEC - activated sludge - 500 mg/l (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability — Result: - Readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)

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Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

dimethyl terephthalate	CAS-No. 120-61-6	Revision Date

California Prop. 65 Components
This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

SECTION 16: Other information

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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SAFETY DATA SHEET

Version 6.3
Revision Date 06/07/2021
Print Date 02/05/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Bis(2-hydroxyethyl) terephthalate

Product Number : 465151
Brand : Aldrich
CAS-No. : 959-26-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula : $C_{12}H_{14}O_6$
Molecular weight : 254.24 g/mol
CAS-No. : 959-26-2

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EC-No. : 213-497-6

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first-aid measures

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid inhalation of dusts. Evacuate the danger area, observe emergency procedures, consult an expert.

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For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry.
Storage class (TRGS 510): 11: Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

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Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 106 - 109 °C (223 - 228 °F)
f)	Initial boiling point and boiling range	No data available
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available

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t) Oxidizing properties No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong oxidizing agents, Bases

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP:	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

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Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

No data available

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

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IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Bis(hydroxyethyl) terephthalate	CAS-No. 959-26-2	Revision Date

New Jersey Right To Know Components

Bis(hydroxyethyl) terephthalate	CAS-No. 959-26-2	Revision Date

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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MPT

SAFETY DATA SHEET

Version 6.2
Revision Date 01/14/2020
Print Date 02/05/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Methyl *p*-toluate

Product Number : 259667
Brand : Aldrich
CAS-No. : 99-75-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin irritation (Category 2), H315

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Warning

Hazard statement(s)
H315 Causes skin irritation.

Precautionary statement(s)
P264 Wash skin thoroughly after handling.

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P280	Wear protective gloves.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_9H_{10}O_2$
Molecular weight	:	150.17 g/mol
CAS-No.	:	99-75-2
EC-No.	:	202-784-1

Component	Classification	Concentration
Methyl p-toluate		
	Skin Irrit. 2; H315	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: crystalline Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 32 - 35 °C (90 - 95 °F) - lit.
f)	Initial boiling point and boiling range	103 - 104 °C 217 - 219 °F at 20 hPa - lit.
g)	Flash point	89 °C (192 °F) - closed cup
h)	Evaporation rate	No data available

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i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	1 hPa at 39 °C (102 °F)
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong bases

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 3,300 mg/kg
Inhalation: No data available
LD50 Dermal - Rabbit - > 5,000 mg/kg
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Moderate skin irritation - 24 h

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: XU2150000

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

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12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

SECTION 15: Regulatory information

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Methyl p-toluate	99-75-2	

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New Jersey Right To Know Components

Methyl p-toluate	CAS-No. 99-75-2	Revision Date

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SECTION 16: Other information

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.2 Revision Date: 01/14/2020 Print Date: 02/05/2022

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Sodium Carbonate

ThermoFisher SCIENTIFIC

SAFETY DATA SHEET

Creation Date 15-Oct-2009 **Revision Date** 23-Jan-2018 **Revision Number** 7

1. Identification

Product Name **Sodium carbonate**

Cat No. : **AC424280000; AC424280025; AC424285000**

CAS-No 497-19-8
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Serious Eye Damage/Eye Irritation	Category 2

Label Elements

Signal Word
Warning

Hazard Statements
Causes serious eye irritation



Precautionary Statements
Prevention

Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Keep only in original container

Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Spills
Absorb spillage to prevent material damage

Storage
Store in a dry place. Store in a closed container

Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Sodium carbonate	497-19-8	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.

Inhalation Move to fresh air. If symptoms arise, call a physician. If not breathing, give artificial respiration.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms and effects None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point Not applicable
Method - No information available

Autoignition Temperature

Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products
Sodium oxides

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	1	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.

Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Avoid ingestion and inhalation. Wash hands before breaks and immediately after handling the product.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	White
Odor	Odorless
Odor Threshold	No information available
pH	11.3 @ 20°C (10 g/l aq.sol)
Melting Point/Range	854 °C / 1569.2 °F
Boiling Point/Range	1600 °C / 2912 °F @ 760 mmHg
Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability (solid,gas)	Not flammable
Flammability or explosive limits	
Upper	No data available
Lower	No data available

Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	2.53
Bulk Density	500-800 kg/m^3
Solubility	Partly soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C Na2 O3
Molecular Weight	105.99

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Avoid dust formation. Incompatible products. Excess heat.

Incompatible Materials Strong oxidizing agents, Strong acids, Fluorine, Metals

Hazardous Decomposition Products Sodium oxides

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium carbonate	2800 mg/kg (Rat)	> 2000 mg/kg (rabbit)	2.3 mg/l 2h (Rat)

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Sodium carbonate	497-19-8	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. .

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Sodium carbonate	EC50: = 242 mg/L, 120h (Nitzschia)	Lepomis macrochirus: LC50: 300 mg/L/96h Gambusia affinis: LC50: 740 mg/L/96h	-	EC50: = 265 mg/L, 48h (Daphnia magna)

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Sodium carbonate	X	X	-	207-838-8	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313	Not applicable
SARA 311/312 Hazard Categories	See section 2 for more information
CWA (Clean Water Act)	Not applicable
Clean Air Act	Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA	Not applicable
California Proposition 65	This product does not contain any Proposition 65 chemicals
U.S. State Right-to-Know Regulations	Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade	No information available

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	15-Oct-2009
Revision Date	23-Jan-2018
Print Date	23-Jan-2018
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
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End of SDS

Methanol

ThermoFisher SCIENTIFIC

SAFETY DATA SHEET

Creation Date 27-Apr-2009 **Revision Date** 11-Apr-2018 **Revision Number** 7

1. Identification

Product Name **Methanol**

Cat No. : **A413-4; A413-20; A413-200; A413-500**

CAS-No 67-56-1
Synonyms Methyl alcohol

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Acute oral toxicity	Category 3
Acute dermal toxicity	Category 3
Acute Inhalation Toxicity - Vapors	Category 3
Specific target organ toxicity (single exposure) Target Organs - Optic nerve.	Category 1
Specific target organ toxicity - (repeated exposure) Target Organs - Kidney, Liver, spleen, Blood.	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
Toxic if swallowed
Toxic in contact with skin
Toxic if inhaled
Causes damage to organs
Causes damage to organs through prolonged or repeated exposure



Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Response
IF exposed: Call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
Skin
Call a POISON CENTER or doctor/physician if you feel unwell
Wash contaminated clothing before reuse
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)

Other hazards
Poison, may be fatal or cause blindness if swallowed. Vapor harmful. Cannot be made non-poisonous.
WARNING. Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Methyl alcohol	67-56-1	>95

4. First-aid measures

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.
Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms and effects	Breathing difficulties. May cause blindness: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.
Unsuitable Extinguishing Media	Water may be ineffective
Flash Point	12 °C / 53.6 °F
Method -	No information available
Autoignition Temperature	455 °C / 851 °F
Explosion Limits	
Upper	31.00 vol %
Lower	6.0 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

Hazardous Combustion Products
Carbon monoxide (CO) Formaldehyde
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
1	3	0	N/A

6. Accidental release measures

Personal Precautions	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional ecological information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling

Wear personal protective equipment. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not ingest. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

Storage

Keep container tightly closed in a dry and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Methyl alcohol	TWA: 200 ppm STEL: 250 ppm Skin	(Vacated) TWA: 200 ppm (Vacated) TWA: 260 mg/m³ (Vacated) STEL: 250 ppm (Vacated) STEL: 325 mg/m³ Skin TWA: 200 ppm TWA: 260 mg/m³	IDLH: 6000 ppm TWA: 200 ppm TWA: 260 mg/m³ STEL: 250 ppm STEL: 325 mg/m³	TWA: 200 ppm TWA: 260 mg/m³ STEL: 250 ppm STEL: 310 mg/m³

Legend

ACGIH - *American Conference of Governmental Industrial Hygienists*
OSHA - *Occupational Safety and Health Administration*
NIOSH IDLH: *The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health*

Engineering Measures

Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Alcohol-like
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	-98 °C / -144.4 °F
Boiling Point/Range	64.7 °C / 148.5 °F @ 760 mmHg
Flash Point	12 °C / 53.6 °F
Evaporation Rate	5.2 (ether = 1)
Flammability (solid,gas)	Not applicable

Flammability or explosive limits	
Upper	31.00 vol %
Lower	6.0 vol %
Vapor Pressure	128 hPa @ 20 °C
Vapor Density	1.11
Specific Gravity	0.791
Solubility	Miscible with water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	455 °C / 851 °F
Decomposition Temperature	No information available
Viscosity	0.55 cP at 20 °C
Molecular Formula	C H4 O
Molecular Weight	32.04
VOC Content(%)	100
Surface tension	0.02255 N/m @ 20°C

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Heat, flames and sparks. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents, Strong acids, Acid anhydrides, Acid chlorides, Strong bases, Metals, Peroxides

Hazardous Decomposition Products Carbon monoxide (CO), Formaldehyde

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methyl alcohol	**Calc. ATE 60 mg/kg** LD50 > 1187 – 2769 mg/kg (Rat)	**Calc. ATE 60 mg/kg** LD50 = 17100 mg/kg (Rabbit)	**Calc. ATE 0.6 mg/L (vapours) or 0.5 mg/L (mists)** LC50 = 128.2 mg/L (Rat) 4 h

Toxicologically Synergistic Products Carbon tetrachloride

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation May cause skin and eye irritation

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Methyl alcohol	67-56-1	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects Component substance is listed on California Proposition 65 as a developmental hazard.

Teratogenicity No information available.

STOT - single exposure Optic nerve
STOT - repeated exposure Kidney Liver spleen Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed May cause blindness: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Methyl alcohol	Not listed	Pimephales promelas: LC50 > 10000 mg/L 96h	EC50 = 39000 mg/L 25 min EC50 = 40000 mg/L 15 min EC50 = 43000 mg/L 5 min	EC50 > 10000 mg/L 24h

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Methyl alcohol	-0.74

13. Disposal considerations

Waste Disposal Methods Should not be released into the environment.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Methyl alcohol - 67-56-1	U154	-

14. Transport information

DOT
- **UN-No** UN1230
- **Proper Shipping Name** METHANOL
- **Hazard Class** 3
- **Packing Group** II

TDG
- **UN-No** UN1230
- **Proper Shipping Name** METHANOL
- **Hazard Class** 3
- **Subsidiary Hazard Class** 6.1
- **Packing Group** II

IATA
- **UN-No** UN1230
- **Proper Shipping Name** METHANOL
- **Hazard Class** 3
- **Subsidiary Hazard Class** 6.1
- **Packing Group** II

IMDG/IMO
- **UN-No** UN1230
- **Proper Shipping Name** METHANOL

Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Methyl alcohol	X	X	-	200-659-6	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Methyl alcohol	67-56-1	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Methyl alcohol	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Methyl alcohol	5000 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Methyl alcohol	67-56-1	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Methyl alcohol	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	Y
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date	27-Apr-2009
Revision Date	11-Apr-2018
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End of SDS

28.27 Aspen Plus Input File

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;Input Summary created by Aspen Plus Rel. 39.0 at 03:39:24 Mon Apr 18,
2022
;Directory C:\Users\chrisk1\Downloads  Filename
C:\Users\chrisk1\AppData\Local\Temp\~ap3c36.txt
;



DYNAMICS
    DYNAMICS RESULTS=ON


IN-UNITS MET SHORT-LENGTH=mm


DEF-STREAMS MIXCIPSD ALL


MODEL-OPTION


DESCRIPTION "
    Chemical Simulation with English Units :
    F, psi, lb/hr, lbmol/hr, Btu/hr, cuft/hr.


    Property Method: NRTL


    Flow basis for input: Mole


    Stream report composition: Mole flow
    "


DATABANKS 'APV121 PURE39' / 'APV121 AQUEOUS' / 'APV121 SOLIDS' &
         / 'APV121 INORGANIC' / 'APESV121 AP-EOS' /  &
```

```
        'NISTV121 NIST-TRC' / 'APV121 POLYMER' / NOASPENPCD

PROP-SOURCES 'APV121 PURE39' / 'APV121 AQUEOUS' /  &
        'APV121 SOLIDS' / 'APV121 INORGANIC' / 'APESV121 AP-EOS' &
         / 'NISTV121 NIST-TRC' / 'APV121 POLYMER'

COMPONENTS
    METHANOL CH4O /
    EG C2H6O2 /
    DMT C10H10O4-D2 /
    PET PET /
    NA2CO3 NA2CO3 /
    HDPE HDPE /
    ALUM AL /
    WATER H2O /
    DEG C4H10O3 /
    BIS-2-01 C12H14O6 /
    MPT C9H10O2-D3 /
    IRON FE /
    "POLY(-01" PP /
    AIR AIR

CISOLID-COMPS PET NA2CO3 HDPE ALUM IRON "POLY(-01"

MOIST-COMPS WATER

SOLVE
    RUN-MODE MODE=SIM

FLOWSHEET
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BLOCK BALLMILL IN=PPS-11 OUT=PPS-12
BLOCK FILMFLAK IN=PPS-14 OUT=PPS-16 PPS-15
BLOCK SINK IN=PPS-16 PPS-18 OUT=PPS-19 PPS-20
BLOCK R-1 IN=S-8 OUT=S-9
BLOCK M-1 IN=S-1 S-20-2 OUT=S-2
BLOCK SLURMIX IN=S-2 S-47 PPS-33-2 OUT=S-3
BLOCK P-1 IN=S-3 OUT=S-4
BLOCK SLSEP IN=S-23 OUT=S-24 S-25
BLOCK R-2 IN=S-9 OUT=S-10
BLOCK P-4 IN=S-27 OUT=S-28
BLOCK DEC-2 IN=S-35 OUT=S-36 S-37
BLOCK DEC-1 IN=S-31 OUT=S-32 S-35
BLOCK DC-3 IN=S-32 OUT=S-33 S-34
BLOCK DC-4 IN=S-39 OUT=S-40 S-41
BLOCK M-3 IN=S-45 OUT=S-47 S-46
BLOCK M-2 IN=S-7 S-6 OUT=S-8
BLOCK SEP-1 IN=S-4 OUT=S-5 S-6
BLOCK DC-2 IN=S-25 S-26 S-37 S-21 OUT=S-27 S-38
BLOCK EVAP IN=S-11 OUT=S-12 S-22
BLOCK DC-1 IN=S-16 OUT=S-17 S-21
BLOCK HX-1 IN=S-13 S-14 OUT=S-16 S-15
BLOCK COMP IN=S-12 OUT=S-13
BLOCK HX-2 IN=S-17 S-18 OUT=S-20 S-19
BLOCK P-3 IN=S-22 OUT=S-23
BLOCK P-5 IN=S-38 OUT=S-39
BLOCK P-6 IN=S-41 OUT=S-42
BLOCK P-2 IN=S-10 OUT=S-11
BLOCK HX-3 IN=S-42 S-43 OUT=S-45 S-44
BLOCK HX-4 IN=S-28 S-29 OUT=S-31 S-30
```

```
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    BLOCK METALDET IN=PPS-3 OUT=PPS-4 PPS-5
    BLOCK JAWCRUSH IN=PPS-9 OUT=PPS-10
    BLOCK TROMMEL IN=PPS-5 OUT=PPS-6 PPS-7
    BLOCK HOTWASH IN=PPS-20 PPS-21 OUT=PPS-23 PPS-22
    BLOCK FRICWASH IN=PPS-23 PPS-24 OUT=PPS-26 PPS-25
    BLOCK DEWATER IN=PPS-26 OUT=PPS-27 PPS-28
    BLOCK THERMDRY IN=PPS-28 PPS-29 OUT=PPS-31 PPS-30
    BLOCK CYC IN=PPS-32 OUT=PPS-34 PPS-33
    BLOCK B1 IN=PPS-31 PPS-30-2 OUT=PPS-32
    BLOCK B4 IN=PPS-7 PPS-8 OUT=PPS-9
    BLOCK B6 IN=PPS-12 OUT=PPS-14 PPS-13
    BLOCK B7 IN=PPS-17 PPS-27 OUT=PPS-18

PROPERTIES NRTL

PROP-DATA
    PROP-LIST ATOMNO / NOATOM
    PVAL PET 6 1 8 / 10. 8. 4.

ESTIMATE ALL
    NRTL DMT DEG UNIFAC
    NRTL DMT EG UNIFAC
    NRTL DEG MPT UNIFAC
    NRTL EG MPT UNIFAC

PROP-DATA PCES-1
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    PVAL PET .2918596200 / 298.9063450
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    PVAL HDPE .2918596200 / 298.9063450
    PVAL "POLY(-01" .2918596200 / 298.9063450
    PROP-LIST VLSTD
    PVAL AIR 32.91470000

PROP-DATA PURE-1
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    PVAL PET -270.518

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    IN-UNITS MET SHORT-LENGTH=mm
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    PVAL HDPE 80.38019758 -12127.32210 -10.25255770 1400.000000  &
        1980.000000
    PVAL "POLY(-01" 80.58293008 -12127.32210 -10.25255770  &
        1400.000000 1980.000000

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    0.0 0.0 0.0 76.98200000 212.0000000
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    0.0 0.0 0.0 76.98200000 212.0000000
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        77.00000000 77.00000000
    BPVAL MPT DEG 0.0 927.2824272 .3000000000 0.0 0.0 0.0  &
        77.00000000 77.00000000

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```

```
        83.1763771102 <mm> / 95.4992586021 <mm> /  &
        109.647819614 <mm> / 125.892541179 <mm> /  &
        144.543977074 <mm> / 165.958690743 <mm> /  &
        190.546071796 <mm> / 218.776162394 <mm> /  &
        251.188643150 <mm> / 288.403150312 <mm> /  &
        331.131121482 <mm> / 380.189396320 <mm> /  &
        436.515832240 <mm> / 501.187233627 <mm> /  &
        575.439937337 <mm> / 660.693448007 <mm> /  &
        758.577575029 <mm> / 870.963589956 <mm> /  &
        1000.00000000 <mm>

DEF-SUBS MIXED MIXED

DEF-SUBS-CLA MIXED
    DEF TYPE=MIXED ATTR=PSD

DEF-STREAMS MIXCIPSD S-9

STREAM PPS-1
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=12626.00000
    MASS-FLOW PET 12626.00000
    SUBS-ATTR PSD ( 2.26567E-10 2.59604E-11 3.33954E-11  &
        4.36725E-11 5.81943E-11 7.92209E-11 1.10501E-10  &
        1.58455E-10 2.34459E-10 3.59461E-10 5.73664E-10  &
        9.57819E-10 1.6824E-09 3.12743E-09 6.19177E-09  &
        1.31428E-08 3.0111E-08 7.4948E-08 2.03879E-07  &
        6.08999E-07 2.00288E-06 7.24831E-06 2.87062E-05  &
        0.000122851 0.000555302 0.00255481 0.0113085 0.0443638  &
        0.137445 0.287488 0.330559 0.16101 0.0238674  &
```

```
        0.000685409 1.96939E-06 2.20754E-10 2.22045E-16 * * *  &
        * * * * * * * * * * )
    SUBSTREAM CIPSD TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=14029.00000
    MASS-FLOW PET 12626.00000 / HDPE 561.1599998 / ALUM  &
        140.2900000 / IRON 280.6800000 / "POLY(-01"  &
        420.8700000
    SUBS-ATTR PSD ( 2.26567E-10 2.59604E-11 3.33954E-11  &
        4.36725E-11 5.81943E-11 7.92209E-11 1.10501E-10  &
        1.58455E-10 2.34459E-10 3.59461E-10 5.73664E-10  &
        9.57819E-10 1.6824E-09 3.12743E-09 6.19177E-09  &
        1.31428E-08 3.0111E-08 7.4948E-08 2.03879E-07  &
        6.08999E-07 2.00288E-06 7.24831E-06 2.87062E-05  &
        0.000122851 0.000555302 0.00255481 0.0113085 0.0443638  &
        0.137445 0.287488 0.330559 0.16101 0.0238674  &
        0.000685409 1.96939E-06 2.20754E-10 2.22045E-16 * * *  &
        * * * * * * * * * * )

STREAM PPS-2
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000

STREAM PPS-3
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=13818.50000
    MASS-FLOW PET 12626.00000 / HDPE 561.1599998 / ALUM  &
        140.2900000 / IRON 70.17000000 / "POLY(-01"  &
        420.8700000
    SUBS-ATTR PSD ( 2.26567E-10 2.59604E-11 3.33954E-11  &
        4.36725E-11 5.81943E-11 7.92209E-11 1.10501E-10  &
        1.58455E-10 2.34459E-10 3.59461E-10 5.73664E-10  &
```

```
        9.57819E-10 1.6824E-09 3.12743E-09 6.19177E-09  &
        1.31428E-08 3.0111E-08 7.4948E-08 2.03879E-07  &
        6.08999E-07 2.00288E-06 7.24831E-06 2.87062E-05  &
        0.000122851 0.000555302 0.00255481 0.0113085 0.0443638  &
        0.137445 0.287488 0.330559 0.16101 0.0238674  &
        0.000685409 1.96939E-06 2.20754E-10 2.22045E-16 * * *  &
        * * * * * * * * * * )

STREAM PPS-8
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=4410.000000
    MASS-FLOW WATER 4410.000000
    SUBS-ATTR PSD

STREAM PPS-17
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=9057.972998
    MASS-FLOW WATER 9057.972998
    SUBS-ATTR PSD

STREAM PPS-21
    SUBSTREAM MIXED TEMP=373.1500000 PRES=1.000000000  &
        MASS-FLOW=7257.477920
    MASS-FLOW WATER 7257.477920
    SUBS-ATTR PSD

STREAM PPS-24
    SUBSTREAM MIXED TEMP=373.1500000 PRES=1.000000000  &
        MASS-FLOW=7257.477920
    MASS-FLOW WATER 7257.477920
```

```
    SUBS-ATTR PSD

STREAM PPS-29
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=4851.000000
    MASS-FLOW AIR 4851.000000
    SUBS-ATTR PSD

STREAM PPS-30-2
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=4851.000000
    MASS-FLOW AIR 4851.000000
    SUBS-ATTR PSD

STREAM PPS-33-2
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=12753.50000
    MASS-FLOW PET 12626.00000 / WATER 127.5350000
    SUBS-ATTR PSD ( 1. * * * * * * * * * * * * * * *  &
        * * * * * * * * * * * * * * * * * * * * * * *  &
        * * * * * * * * * * * * * * * * * * * )

STREAM S-1
    SUBSTREAM MIXED TEMP=298.1500000 PRES=1.000000000  &
        MASS-FLOW=4304.000000
    MASS-FLOW METHANOL 4134.000000 / NA2CO3 170.0000000
    SUBS-ATTR PSD ( 1 * * * * * * * * * * * * * * *  &
        * * * * * * * * * * * * * * * * * * * * * * *  &
        * * * * * * * * * * * * * * * * * * * )
```

```
STREAM S-7
    SUBSTREAM MIXED TEMP=433.1500000 PRES=18.00000000  &
        MOLE-FLOW=64.50599998
    MASS-FRAC BIS-2-01 1.
    SUBS-ATTR PSD

STREAM S-14
    SUBSTREAM MIXED TEMP=305.3722222 PRES=1.000000000  &
        VOLUME-FLOW=63090.19661
    MASS-FRAC WATER 1.
    SUBS-ATTR PSD

STREAM S-18
    SUBSTREAM MIXED TEMP=305.3722222 PRES=2.000000000  &
        MASS-FLOW=37173.07406
    MASS-FRAC WATER 1.
    SUBS-ATTR PSD

STREAM S-20-2
    SUBSTREAM MIXED TEMP=333.1500000 PRES=1.973846534
    MASS-FLOW METHANOL 37533.00000 / EG 130.0000000
    SUBS-ATTR PSD

STREAM S-26
    IN-UNITS MET VOLUME-FLOW='cum/hr' ENTHALPY-FLO='Gcal/hr'  &
        HEAT-TRANS-C='kcal/hr-sqm-K' PRESSURE=bar TEMPERATURE=C  &
        VOLUME=cum DELTA-T=C HEAD=meter MOLE-DENSITY='kmol/cum'  &
        MASS-DENSITY='kg/cum' MOLE-ENTHALP='kcal/mol'  &
        MASS-ENTHALP='kcal/kg' HEAT=Gcal MOLE-CONC='mol/l'  &
        PDROP=bar SHORT-LENGTH=mm
```

```
    SUBSTREAM MIXED TEMP=25. PRES=1. <atm>
    MASS-FLOW MPT 1500.
    SUBS-ATTR PSD

STREAM S-29
    SUBSTREAM MIXED TEMP=277.5944444 PRES=1.000000000  &
        MASS-FLOW=88182.12154
    MASS-FRAC WATER 1.
    SUBS-ATTR PSD

STREAM S-43
    SUBSTREAM MIXED TEMP=305.3722222 PRES=1.000000000  &
        VOLUME-FLOW=31545.09820
    MASS-FRAC WATER 1.
    SUBS-ATTR PSD

STREAM S-47
    SUBSTREAM MIXED TEMP=298.1500000 VFRAC=0.
    MASS-FLOW METHANOL 1720.400000 / EG 132.7000000 / DMT  &
        2871.910000 / PET 317.0000000 / NA2CO3 7.600000000
    SUBS-ATTR PSD ( 1 * * * * * * * * * * * * * *  &
        * * * * * * * * * * * * * * * * * * * * *  &
        * * * * * * * * * * * * * * * * * )

BLOCK B1 MIXER
    PARAM

BLOCK B4 MIXER
    PARAM
```

```
BLOCK B7 MIXER
    PARAM

BLOCK M-1 MIXER
    PARAM

BLOCK M-2 MIXER
    PARAM

BLOCK SLURMIX MIXER
    PARAM PRES=1.000000000 NPHASE=1 PHASE=L
    BLOCK-OPTION FREE-WATER=NO

BLOCK M-3 FSPLIT
    FRAC S-46 0.05

BLOCK B6 SEP
    PARAM
    FRAC STREAM=PPS-13 SUBSTREAM=MIXED COMPS=PET HDPE WATER  &
        "POLY(-01" FRACS=1. 0. 0. 0.
    FRAC STREAM=PPS-13 SUBSTREAM=CIPSD COMPS=PET HDPE  &
        "POLY(-01" FRACS=0. 0. 0.

BLOCK DEBALER SEP
    PARAM
    FRAC STREAM=PPS-3 SUBSTREAM=CIPSD COMPS=PET HDPE ALUM  &
        IRON "POLY(-01" FRACS=1. 1. 1. 0.25 1.
    FRAC STREAM=PPS-2 SUBSTREAM=MIXED COMPS=PET HDPE ALUM  &
        IRON "POLY(-01" FRACS=0. 0. 0. 0.75 0.
```

```
BLOCK DEC-1 SEP
    IN-UNITS MET VOLUME-FLOW='cum/hr' ENTHALPY-FLO='Gcal/hr'  &
        HEAT-TRANS-C='kcal/hr-sqm-K' PRESSURE=bar TEMPERATURE=C  &
        VOLUME=cum DELTA-T=C HEAD=meter MOLE-DENSITY='kmol/cum'  &
        MASS-DENSITY='kg/cum' MOLE-ENTHALP='kcal/mol'  &
        MASS-ENTHALP='kcal/kg' HEAT=Gcal MOLE-CONC='mol/l'  &
        PDROP=bar SHORT-LENGTH=mm
    PARAM
    FRAC STREAM=S-32 SUBSTREAM=MIXED COMPS=METHANOL EG DMT  &
        WATER DEG BIS-2-01 MPT FRACS=0.485509 0.376311  &
        0.165086 0.270730269 0.457188 0. 0.108322505

BLOCK DEC-2 SEP
    IN-UNITS MET VOLUME-FLOW='cum/hr' ENTHALPY-FLO='Gcal/hr'  &
        HEAT-TRANS-C='kcal/hr-sqm-K' PRESSURE=bar TEMPERATURE=C  &
        VOLUME=cum DELTA-T=C HEAD=meter MOLE-DENSITY='kmol/cum'  &
        MASS-DENSITY='kg/cum' MOLE-ENTHALP='kcal/mol'  &
        MASS-ENTHALP='kcal/kg' HEAT=Gcal MOLE-CONC='mol/l'  &
        PDROP=bar SHORT-LENGTH=mm
    PARAM MAXIT=50
    FRAC STREAM=S-36 SUBSTREAM=MIXED COMPS=MPT FRACS=1.

BLOCK FILMFLAK SEP
    PARAM
    FRAC STREAM=PPS-16 SUBSTREAM=MIXED COMPS=PET HDPE FRACS= &
        1. 1.
    FRAC STREAM=PPS-16 SUBSTREAM=CIPSD COMPS=PET HDPE FRACS= &
        1. 1.

BLOCK METALDET SEP
```

```
    PARAM
    FRAC STREAM=PPS-4 SUBSTREAM=MIXED COMPS=METHANOL EG DMT  &
        PET NA2CO3 HDPE ALUM WATER DEG BIS-2-01 MPT IRON  &
        "POLY(-01" FRACS=0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.  &
        1. 0.
    FRAC STREAM=PPS-5 SUBSTREAM=CIPSD COMPS=PET HDPE IRON  &
        "POLY(-01" FRACS=1. 1. 0. 1.

BLOCK SEP-1 SEP
    PARAM
    FRAC STREAM=S-5 SUBSTREAM=MIXED COMPS=PET FRACS=0.9818
    FRAC STREAM=S-5 SUBSTREAM=CIPSD COMPS=PET FRACS=0.9818

BLOCK SINK SEP
    PARAM
    FRAC STREAM=PPS-19 SUBSTREAM=MIXED COMPS=HDPE FRACS=1.
    FRAC STREAM=PPS-19 SUBSTREAM=CIPSD COMPS=PET HDPE FRACS= &
        0. 1.

BLOCK SLSEP SEP
    PARAM
    FRAC STREAM=S-24 SUBSTREAM=MIXED COMPS=METHANOL EG DMT  &
        PET NA2CO3 WATER DEG FRACS=0.05 0.05 0.05 1. 1.  &
        0.05 0.05
    FRAC STREAM=S-24 SUBSTREAM=CIPSD COMPS=PET FRACS=1.

BLOCK TROMMEL SEP
    PARAM
    FRAC STREAM=PPS-6 SUBSTREAM=MIXED COMPS=PET HDPE ALUM  &
        "POLY(-01" FRACS=0. 0. 1. 0.
```

```
    FRAC STREAM=PPS-6 SUBSTREAM=CIPSD COMPS=PET HDPE ALUM  &
        "POLY(-01" FRACS=0. 0. 1. 0.

BLOCK EVAP FLASH2
    PARAM TEMP=413.1500000 PRES=.1480384900

BLOCK HX-1 HEATX
    PARAM CALC-TYPE=SIMULATION CALC-METHOD=TASCPLUS-RIG
    HETRAN-PARAM INPUT-FILE= &
    'B7.edr'
    FEEDS HOT=S-13 COLD=S-14
    OUTLETS-HOT S-16
    OUTLETS-COLD S-15
    HOT-SIDE SHELL-TUBE=SHELL DPPARMOPT=NO
    COLD-SIDE DPPARMOPT=NO
    TQ-PARAM CURVE=YES

BLOCK HX-2 HEATX
    PARAM CALC-TYPE=SIMULATION CALC-METHOD=TASCPLUS-RIG
    HETRAN-PARAM INPUT-FILE= &
    'MEOHHX_1.edr'
    FEEDS HOT=S-17 COLD=S-18
    OUTLETS-HOT S-20
    OUTLETS-COLD S-19
    HOT-SIDE SHELL-TUBE=SHELL DPPARMOPT=NO
    COLD-SIDE DPPARMOPT=NO
    TQ-PARAM CURVE=YES

BLOCK HX-3 HEATX
    PARAM CALC-TYPE=SIMULATION CALC-METHOD=TASCPLUS-RIG
```

```
    HETRAN-PARAM INPUT-FILE= &
    'B15.edr'
    FEEDS HOT=S-42 COLD=S-43
    OUTLETS-HOT S-45
    OUTLETS-COLD S-44
    HOT-SIDE SHELL-TUBE=SHELL DPPARMOPT=NO
    COLD-SIDE DPPARMOPT=NO
    TQ-PARAM CURVE=YES

BLOCK HX-4 HEATX
    PARAM CALC-TYPE=SIMULATION CALC-METHOD=TASCPLUS-RIG
    HETRAN-PARAM INPUT-FILE= &
    'HX-4_1.edr'
    FEEDS HOT=S-28 COLD=S-29
    OUTLETS-HOT S-31
    OUTLETS-COLD S-30
    HOT-SIDE SHELL-TUBE=SHELL DPPARMOPT=NO
    COLD-SIDE DPPARMOPT=NO
    TQ-PARAM CURVE=YES

BLOCK DC-1 RADFRAC
    SUBOBJECTS INTERNALS = CS-1
    PARAM NSTAGE=7 ALGORITHM=STANDARD HYDRAULIC=NO MAXOL=25  &
        DAMPING=NONE
    PARAM2 STATIC-DP=YES
    COL-CONFIG CONDENSER=TOTAL CA-CONFIG=INT-1
    FEEDS S-16 3
    PRODUCTS S-21 7 L / S-17 1 L
    P-SPEC 1 1.973846534
    COL-SPECS DP-STAGE=9.52643495E-3 MASS-D=37723.00000  &
```

```
        MOLE-RR=0.6
    REPORT NOHYDRAULIC
    INTERNALS CS-1 STAGE1=2 STAGE2=6 P-UPDATE=NO TRAYTYPE=SIEVE  &
        NPASS=1 TRAY-SPACE=.6096000000 SYSFAC=1.000000000  &
        OVER-DESIGN=1.000000000 WEIR-HT=50.80000000 <mm>  &
        DC-CLEAR=38.10000000 <mm> DC-WTOP-SIDE=430.7407123 <mm>  &
        DC-WBOT-SIDE=430.7407123 <mm> HOLE-DIAM=12.70000000 <mm>  &
        HOLE-AREA=.1000000000 FLOOD-METH=GLITSCH6  &
        DECK-THICK=0.134 <IN> PCT-FLOOD-FA=80.00000000  &
        AER-PARAM-M=1.000000000 MAX-DC-LOAD=GLITSCH  &
        MAX-ACC-DP=.0246730816 MAX-PCT-DCB=100.0000000  &
        MAX-PCT-ENT=10.00000000 MIN-WEIR-LD=4.470981863  &
        MAX-WEIR-LD=117.3721131 MIN-PCT-DCA=.1000000000
    TRAY-SIZE 1 2 6 SIEVE

BLOCK DC-2 RADFRAC
    SUBOBJECTS INTERNALS = CS-1
    PARAM NSTAGE=7 ALGORITHM=STANDARD HYDRAULIC=NO MAXOL=25  &
        DAMPING=NONE
    PARAM2 STATIC-DP=YES OLD-SULZER=NO
    COL-CONFIG CONDENSER=TOTAL CA-CONFIG=INT-1
    FEEDS S-25 3 / S-26 3 / S-37 3 / S-21 3
    PRODUCTS S-27 1 L / S-38 7 L
    P-SPEC 1 .1480384900
    COL-SPECS DP-STAGE=9.52643495E-3 MASS-B=20000.00000  &
        MOLE-RR=2.
    REPORT NOHYDRAULIC
    INTERNALS CS-1 STAGE1=2 STAGE2=6 INTERNAL=PACKING  &
        P-UPDATE=NO PACKTYPE=FLEXIGRID VENDOR=KOCH PACK-MAT=METAL  &
        PACK-SIZE="STYLE-2" PACK-HT=.6096000000 DPMETH=WALLIS
```

```
    PACK-SIZE 1 2 6 FLEXIGRID

BLOCK DC-3 RADFRAC
    IN-UNITS MET VOLUME-FLOW='cum/hr' ENTHALPY-FLO='Gcal/hr'  &
        HEAT-TRANS-C='kcal/hr-sqm-K' PRESSURE=bar TEMPERATURE=C  &
        VOLUME=cum DELTA-T=C HEAD=meter MOLE-DENSITY='kmol/cum'  &
        MASS-DENSITY='kg/cum' MOLE-ENTHALP='kcal/mol'  &
        MASS-ENTHALP='kcal/kg' HEAT=Gcal MOLE-CONC='mol/l'  &
        PDROP=bar SHORT-LENGTH=mm
    SUBOBJECTS INTERNALS = CS-1
    PARAM NSTAGE=14 ALGORITHM=STANDARD HYDRAULIC=NO MAXOL=25  &
        DAMPING=NONE
    PARAM2 STATIC-DP=YES OLD-SULZER=NO
    COL-CONFIG CONDENSER=TOTAL CA-CONFIG=INT-1
    FEEDS S-32 3
    PRODUCTS S-34 14 L / S-33 1 L
    P-SPEC 1 0.15
    COL-SPECS DP-STAGE=0.14 <psia> MASS-B=7000. MOLE-RR=4.
    REPORT NOHYDRAULIC
    INTERNALS CS-1 STAGE1=2 STAGE2=13 INTERNAL=PACKING  &
        P-UPDATE=NO VENDOR=GENERIC PACK-MAT=METAL  &
        PACK-SIZE="1.5-IN" PACK-HT=41. <ft> DPMETH=WALLIS
    PACK-SIZE 1 2 13 PALL

BLOCK DC-4 RADFRAC
    IN-UNITS MET VOLUME-FLOW='cum/hr' ENTHALPY-FLO='Gcal/hr'  &
        HEAT-TRANS-C='kcal/hr-sqm-K' PRESSURE=bar TEMPERATURE=C  &
        VOLUME=cum DELTA-T=C HEAD=meter MOLE-DENSITY='kmol/cum'  &
        MASS-DENSITY='kg/cum' MOLE-ENTHALP='kcal/mol'  &
        MASS-ENTHALP='kcal/kg' HEAT=Gcal MOLE-CONC='mol/l'  &
```

```
        PDROP=bar SHORT-LENGTH=mm
    SUBOBJECTS INTERNALS = CS-1
    PARAM NSTAGE=7 ALGORITHM=STANDARD HYDRAULIC=NO MAXOL=25  &
        DAMPING=NONE
    PARAM2 STATIC-DP=YES OLD-SULZER=NO
    COL-CONFIG CONDENSER=TOTAL CA-CONFIG=INT-1
    FEEDS S-39 3
    PRODUCTS S-40 1 L / S-41 7 L
    P-SPEC 1 0.15
    COL-SPECS DP-STAGE=0.14 <psia> MASS-D=11900. MOLE-RR=0.6
    REPORT NOHYDRAULIC
    INTERNALS CS-1 STAGE1=2 STAGE2=6 INTERNAL=PACKING  &
        P-UPDATE=NO VENDOR=GENERIC PACK-MAT=METAL  &
        PACK-SIZE="1.5-IN" PACK-HT=41. <ft> DPMETH=WALLIS
    PACK-SIZE 1 2 6 PALL

BLOCK R-1 RSTOIC
    PARAM TEMP=433.1500000 PRES=18.00000000
    STOIC 1 MIXED METHANOL -2. / BIS-2-01 -1. / CIPSD PET  &
        0. / MIXED EG 2. / DMT 1.
    STOIC 2 MIXED EG -2. / DEG 1. / WATER 1.
    CONV 1 MIXED BIS-2-01 0.777
    CONV 2 MIXED EG 0.05

BLOCK R-2 RSTOIC
    PARAM TEMP=433.1500000 PRES=18.00000000
    STOIC 2 MIXED EG -2. / DEG 1. / WATER 1.
    STOIC 1 MIXED METHANOL -2. / BIS-2-01 -1. / CIPSD PET  &
        0. / MIXED EG 2. / DMT 1.
    CONV 2 MIXED EG 0.05
```

```
    CONV 1 MIXED BIS-2-01 0.777

BLOCK P-1 PUMP
    PARAM PRES=18.00000000

BLOCK P-2 PUMP
    PARAM PRES=.9869232665 PUMP-TYPE=TURBINE

BLOCK P-3 PUMP
    PARAM PRES=3.947693067 EFF=0.7

BLOCK P-4 PUMP
    IN-UNITS MET VOLUME-FLOW='cum/hr' ENTHALPY-FLO='Gcal/hr'  &
        HEAT-TRANS-C='kcal/hr-sqm-K' PRESSURE=bar TEMPERATURE=C  &
        VOLUME=cum DELTA-T=C HEAD=meter MOLE-DENSITY='kmol/cum'  &
        MASS-DENSITY='kg/cum' MOLE-ENTHALP='kcal/mol'  &
        MASS-ENTHALP='kcal/kg' HEAT=Gcal MOLE-CONC='mol/l'  &
        PDROP=bar SHORT-LENGTH=mm
    PARAM PRES=2.

BLOCK P-5 PUMP
    PARAM PRES=.9869232665 EFF=0.7

BLOCK P-6 PUMP
    PARAM PRES=1.973846534 EFF=0.7

BLOCK COMP COMPR
    PARAM TYPE=ISENTROPIC PRES=2.467308167 SEFF=0.7 SB-MAXIT=30  &
        SB-TOL=0.0001
```

```
BLOCK FRICWASH SWASH
    PARAM LS-RATIO=0.5748

BLOCK HOTWASH SWASH
    PARAM LS-RATIO=0.5748

BLOCK BALLMILL CRUSHER
    PARAM POWER-SPEC=48.47049165 PSD-CALC-MET=POWER MECHEFF=0.9  &
        NPHASE=1 PHASE=S
    BWI-HGI MIXED BWI=2.320000000
    BWI-HGI CIPSD BWI=2.320000000

BLOCK CONCRUSH CRUSHER
    PARAM PSD-CALC-MET=USER-SPEC OPEN-CIRCUIT=NO MECHEFF=0.9  &
        BYPASS=0.5 NPHASE=1 PHASE=S
    BWI-HGI MIXED BWI=2.320000000
    BWI-HGI CIPSD BWI=2.320000000
    OVALL-DISTFN 1 DISTR-FUN=NORMAL STDDEV=1.00000000E-9  &
        D50=5.00000000E-3

BLOCK JAWCRUSH CRUSHER
    PARAM PSD-CALC-MET=USER-SPEC COMM-LAW=KICK MECHEFF=0.9  &
        BYPASS=0.5 INTERPOLATE=LOG-SPLINE NPHASE=1 PHASE=S
    BWI-HGI MIXED BWI=2.320000000
    BWI-HGI CIPSD BWI=2.320000000
    OVALL-DISTFN 1 DISTR-FUN=NORMAL STDDEV=1.00000000E-3  &
        D50=.0500000000

BLOCK CYC CYCLONE
    PARAM MODEL=SOLIDS-SEP TEMP=298.1500000 PRES=1.000000000
```

```
    SOLIDS-SEP SOLID-SPLIT=1. FLUID-SPLIT=1.

BLOCK THERMDRY DRYER
    EXITMOIST WATER CIPSD 0.01
    OPERATION PRES=1.000000000 HEATIN=7165.376899  &
        DRYER-TYPE=SHORTCUT
    PARAM MOIST-BASIS=WET

BLOCK DEWATER CFUGE
    PARAM TYPE=SOLIDS-SEP PRES=1.000000000 DUTY=1.43307538E+5  &
        TINIT=298.1500000
    SOLIDS-SEP SOLID-SPLIT=1. FLUID-SPLIT=0.8

EO-CONV-OPTI

STREAM-REPOR MOLEFLOW MASSFLOW

PROPERTY-REP PCES

PROP-TABLE BINRY-1 FLASHCURVE
    IN-UNITS MET SHORT-LENGTH=mm
    PROPERTIES NRTL FREE-WATER=STEAM-TA SOLU-WATER=3  &
        TRUE-COMPS=YES
    MOLE-FLOW DMT 1 /  EG  1
    STATE VFRAC=0.0
    ANALYSIS ANAL-TYPE=TXY
    VARY PRES
    RANGE LIST=1.000000000
    VARY MOLEFRAC COMP=DMT
    RANGE VARVALUE=RANGE LOWER=0.0 UPPER=1.0 NPOINT=50
```

```
    PARAM NPHASE=3

PROP-TABLE BINRY-2 FLASHCURVE
    IN-UNITS MET SHORT-LENGTH=mm
    PROPERTIES NRTL FREE-WATER=STEAM-TA SOLU-WATER=3  &
        TRUE-COMPS=YES
    MOLE-FLOW DEG 1 /  EG  1
    STATE VFRAC=0.0
    ANALYSIS ANAL-TYPE=TXY
    VARY PRES
    RANGE LIST=1.000000000
    VARY MOLEFRAC COMP=DEG
    RANGE VARVALUE=RANGE LOWER=0.0 UPPER=1.0 NPOINT=50
    PARAM NPHASE=3

PROP-TABLE BINRY-3 FLASHCURVE
    IN-UNITS MET SHORT-LENGTH=mm
    PROPERTIES NRTL FREE-WATER=STEAM-TA SOLU-WATER=3  &
        TRUE-COMPS=YES
    MOLE-FLOW DMT 1 /  BIS-2-01  1
    STATE VFRAC=0.0
    ANALYSIS ANAL-TYPE=TXY
    VARY PRES
    RANGE LIST=1.000000000
    VARY MOLEFRAC COMP=DMT
    RANGE VARVALUE=RANGE LOWER=0.0 UPPER=1.0 NPOINT=50
    PARAM NPHASE=3
;
;
;
```

;

;

28.29 Aspen Plus Report File

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 ASPEN TECHNOLOGY, INC.                 U.S.A. 888/996-7100

 781/221-6400                           EUROPE (44) 1189-226555


 PLATFORM: WIN-X64                                       APRIL 18,
2022

 VERSION: 39.0   Build 116                               MONDAY

 INSTALLATION:                                           3:37:56 A.M.
```

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RUN CONTROL SECTION

RUN CONTROL INFORMATION

THIS COPY OF ASPEN PLUS LICENSED TO UNIVERSITY OF PENNSYLVAN

TYPE OF RUN: NEW

INPUT FILE NAME: _0832sma.inm

OUTPUT PROBLEM DATA FILE NAME: _0832sma
LOCATED IN:

PDF SIZE USED FOR INPUT TRANSLATION:
  NUMBER OF FILE RECORDS (PSIZE) = 0
  NUMBER OF IN-CORE RECORDS = 256
PSIZE NEEDED FOR SIMULATION = 256

CALLING PROGRAM NAME: apmain
LOCATED IN: C:\Program Files\AspenTech\Aspen Plus V12.1\Engine\\xeq

SIMULATION REQUESTED FOR ENTIRE FLOWSHEET

DESCRIPTION

Chemical Simulation with English Units : F, psi, lb/hr, lbmol/hr,

Btu/hr, cuft/hr. Property Method: NRTL Flow basis for input: Mole

Stream report composition: Mole flow

FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY STREAMS

STREAM	SOURCE	DEST	STREAM	SOURCE	DEST
S-20-2	----	M-1	S-1	----	M-1
PPS-33-2	----	SLURMIX	S-7	----	M-2
S-26	----	DC-2	S-14	----	HX-1
S-18	----	HX-2	S-43	----	HX-3
S-29	----	HX-4	PPS-1	----	DEBALER
PPS-21	----	HOTWASH	PPS-24	----	FRICWASH
PPS-29	----	THERMDRY	PPS-30-2	----	B1
PPS-8	----	B4	PPS-17	----	B7
PPS-11	CONCRUSH	BALLMILL	PPS-12	BALLMILL	B6
PPS-16	FILMFLAK	SINK	PPS-15	FILMFLAK	----
PPS-19	SINK	----	PPS-20	SINK	HOTWASH
S-9	R-1	R-2	S-2	M-1	SLURMIX
S-3	SLURMIX	P-1	S-4	P-1	SEP-1
S-24	SLSEP	----	S-25	SLSEP	DC-2
S-10	R-2	P-2	S-28	P-4	HX-4
S-36	DEC-2	----	S-37	DEC-2	DC-2
S-32	DEC-1	DC-3	S-35	DEC-1	DEC-2
S-33	DC-3	----	S-34	DC-3	----
S-40	DC-4	----	S-41	DC-4	P-6
S-47	M-3	SLURMIX	S-46	M-3	----
S-8	M-2	R-1	S-5	SEP-1	----
S-6	SEP-1	M-2	S-27	DC-2	P-4

S-38	DC-2	P-5	S-12	EVAP	COMP
S-22	EVAP	P-3	S-17	DC-1	HX-2
S-21	DC-1	DC-2	S-16	HX-1	DC-1
S-15	HX-1	----	S-13	COMP	HX-1
S-20	HX-2	----	S-19	HX-2	----
S-23	P-3	SLSEP	S-39	P-5	DC-4
S-42	P-6	HX-3	S-11	P-2	EVAP
S-45	HX-3	M-3	S-44	HX-3	----
S-31	HX-4	DEC-1	S-30	HX-4	----
PPS-3	DEBALER	METALDET	PPS-2	DEBALER	----
PPS-4	METALDET	----	PPS-5	METALDET	TROMMEL
PPS-10	JAWCRUSH	CONCRUSH	PPS-6	TROMMEL	----
PPS-7	TROMMEL	B4	PPS-23	HOTWASH	FRICWASH
PPS-22	HOTWASH	----	PPS-26	FRICWASH	DEWATER
PPS-25	FRICWASH	----	PPS-27	DEWATER	B7
PPS-28	DEWATER	THERMDRY	PPS-31	THERMDRY	B1
PPS-30	THERMDRY	----	PPS-34	CYC	----
PPS-33	CYC	----	PPS-32	B1	CYC
PPS-9	B4	JAWCRUSH	PPS-14	B6	FILMFLAK
PPS-13	B6	----	PPS-18	B7	SINK

FLOWSHEET CONNECTIVITY BY BLOCKS

BLOCK	INLETS	OUTLETS
CONCRUSH	PPS-10	PPS-11
BALLMILL	PPS-11	PPS-12
FILMFLAK	PPS-14	PPS-16 PPS-15
SINK	PPS-16 PPS-18	PPS-19 PPS-20
R-1	S-8	S-9

FLOWSHEET SECTION

FLOWSHEET CONNECTIVITY BY BLOCKS (CONTINUED)

M-1	S-1 S-20-2	S-2
SLURMIX	S-2 S-47 PPS-33-2	S-3
P-1	S-3	S-4
SLSEP	S-23	S-24 S-25
R-2	S-9	S-10
P-4	S-27	S-28
DEC-2	S-35	S-36 S-37
DEC-1	S-31	S-32 S-35
DC-3	S-32	S-33 S-34
DC-4	S-39	S-40 S-41
M-3	S-45	S-47 S-46
M-2	S-7 S-6	S-8
SEP-1	S-4	S-5 S-6
DC-2	S-25 S-26 S-37 S-21	S-27 S-38
EVAP	S-11	S-12 S-22
DC-1	S-16	S-17 S-21
HX-1	S-13 S-14	S-16 S-15
COMP	S-12	S-13
HX-2	S-17 S-18	S-20 S-19
P-3	S-22	S-23
P-5	S-38	S-39
P-6	S-41	S-42
P-2	S-10	S-11
HX-3	S-42 S-43	S-45 S-44
HX-4	S-28 S-29	S-31 S-30

DEBALER	PPS-1	PPS-3 PPS-2
METALDET	PPS-3	PPS-4 PPS-5
JAWCRUSH	PPS-9	PPS-10
TROMMEL	PPS-5	PPS-6 PPS-7
HOTWASH	PPS-20 PPS-21	PPS-23 PPS-22
FRICWASH	PPS-23 PPS-24	PPS-26 PPS-25
DEWATER	PPS-26	PPS-27 PPS-28
THERMDRY	PPS-28 PPS-29	PPS-31 PPS-30
CYC	PPS-32	PPS-34 PPS-33
B1	PPS-31 PPS-30-2	PPS-32
B4	PPS-7 PPS-8	PPS-9
B6	PPS-12	PPS-14 PPS-13
B7	PPS-17 PPS-27	PPS-18

CONVERGENCE STATUS SUMMARY

TEAR STREAM SUMMARY

==========

STREAM ID	VARIABLE ID	MAXIMUM ERR/TOL	MAX. ERR. RELATIVE	ABSOLUTE ERROR	CONV STAT	BLOCK
S-47	METHANOLMOLEFLOW	0.78650	0.78650E-04	0.79788E-32	#	$OLVER01
S-27	DMT MOLEFLOW	0.41363	0.41363E-04	0.21638E-07	#	$OLVER01

```
   PPS-18   MASS ENTHALPY     0.66276E-02 -0.66276E-06  0.10364E-06  #
$OLVER02


   #  = CONVERGED

   *  = NOT CONVERGED
```

FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER01

Tear Stream : S-47 S-27

Tolerance used: 0.100D-03 0.100D-03

Trace molefrac: 0.100D-05 0.100D-05

Trace substr-2: 0.100D-05 0.100D-05

MAXIT= 30 WAIT 1 ITERATIONS BEFORE ACCELERATING

QMAX = 0.0 QMIN = -5.0

METHOD: WEGSTEIN STATUS: CONVERGED

TOTAL NUMBER OF ITERATIONS: 14

*** FINAL VALUES ***

VAR#	TEAR STREAM VAR	STREAM	SUBSTREA	COMPONEN	ATTRIBUT	ELEMENT	UNIT	VALUE	PREV VALUE	ERR/TOL
1	TOTAL MOLEFLOW	S-47	MIXED				KMOL/HR	38.6376	38.6376	-2.8702-05
2	SUBS-ATTR-VA	S-47	MIXED		PSD	FRAC1		MISSING	MISSING	0.0
3	SUBS-ATTR-VA	S-47	MIXED		PSD	FRAC2		MISSING	MISSING	0.0
4	SUBS-ATTR-VA	S-47	MIXED		PSD	FRAC3		MISSING	MISSING	0.0

```
        5  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC4                    MISSING      MISSING       0.0

        6  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC5                    MISSING      MISSING       0.0

        7  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC6                    MISSING      MISSING       0.0

        8  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC7                    MISSING      MISSING       0.0

        9  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC8                    MISSING      MISSING       0.0

       10  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC9                    MISSING      MISSING       0.0

       11  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC10                   MISSING      MISSING       0.0

       12  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC11                   MISSING      MISSING       0.0

       13  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC12                   MISSING      MISSING       0.0

       14  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC13                   MISSING      MISSING       0.0

       15  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC14                   MISSING      MISSING       0.0

       16  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC15                   MISSING      MISSING       0.0

       17  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC16                   MISSING      MISSING       0.0

       18  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC17                   MISSING      MISSING       0.0

       19  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC18                   MISSING      MISSING       0.0

       20  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC19                   MISSING      MISSING       0.0

       21  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC20                   MISSING      MISSING       0.0

       22  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC21                   MISSING      MISSING       0.0
```

```
       23  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC22                    MISSING      MISSING       0.0

       24  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC23                    MISSING      MISSING       0.0

       25  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC24                    MISSING      MISSING       0.0

       26  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC25                    MISSING      MISSING       0.0

       27  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC26                    MISSING      MISSING       0.0

       28  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC27                    MISSING      MISSING       0.0

       29  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC28                    MISSING      MISSING       0.0

       30  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC29                    MISSING      MISSING       0.0

       31  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC30                    MISSING      MISSING       0.0

       32  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC31                    MISSING      MISSING       0.0

       33  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC32                    MISSING      MISSING       0.0

       34  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC33                    MISSING      MISSING       0.0

       35  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC34                    MISSING      MISSING       0.0

       36  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC35                    MISSING      MISSING       0.0

       37  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC36                    MISSING      MISSING       0.0

       38  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC37                    MISSING      MISSING       0.0

       39  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC38                    MISSING      MISSING       0.0

       40  SUBS-ATTR-VA      S-47      MIXED             PSD
FRAC39                    MISSING      MISSING       0.0
```

FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER01 (CONTINUED)

41	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC40		MISSING	MISSING	0.0	
42	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC41		MISSING	MISSING	0.0	
43	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC42		MISSING	MISSING	0.0	
44	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC43		MISSING	MISSING	0.0	
45	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC44		MISSING	MISSING	0.0	
46	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC45		MISSING	MISSING	0.0	
47	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC46		MISSING	MISSING	0.0	
48	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC47		MISSING	MISSING	0.0	
49	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC48		MISSING	MISSING	0.0	
50	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC49		MISSING	MISSING	0.0	
51	SUBS-ATTR-VA	S-47	MIXED		PSD
FRAC50		MISSING	MISSING	0.0	
52	TOTAL MOLEFLOW	S-47	CIPSD		
KMOL/HR	0.0	0.0	0.0		
53	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC1		MISSING	MISSING	0.0	
54	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC2		MISSING	MISSING	0.0	
55	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC3		MISSING	MISSING	0.0	

```
       56  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC4                    MISSING      MISSING       0.0

       57  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC5                    MISSING      MISSING       0.0

       58  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC6                    MISSING      MISSING       0.0

       59  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC7                    MISSING      MISSING       0.0

       60  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC8                    MISSING      MISSING       0.0

       61  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC9                    MISSING      MISSING       0.0

       62  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC10                   MISSING      MISSING       0.0

       63  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC11                   MISSING      MISSING       0.0

       64  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC12                   MISSING      MISSING       0.0

       65  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC13                   MISSING      MISSING       0.0

       66  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC14                   MISSING      MISSING       0.0

       67  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC15                   MISSING      MISSING       0.0

       68  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC16                   MISSING      MISSING       0.0

       69  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC17                   MISSING      MISSING       0.0

       70  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC18                   MISSING      MISSING       0.0

       71  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC19                   MISSING      MISSING       0.0

       72  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC20                   MISSING      MISSING       0.0

       73  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC21                   MISSING      MISSING       0.0
```

	74	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC22			MISSING	MISSING	0.0	
	75	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC23			MISSING	MISSING	0.0	
	76	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC24			MISSING	MISSING	0.0	
	77	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC25			MISSING	MISSING	0.0	
	78	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC26			MISSING	MISSING	0.0	
	79	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC27			MISSING	MISSING	0.0	
	80	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC28			MISSING	MISSING	0.0	
	81	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC29			MISSING	MISSING	0.0	
	82	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC30			MISSING	MISSING	0.0	
	83	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC31			MISSING	MISSING	0.0	
	84	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC32			MISSING	MISSING	0.0	
	85	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC33			MISSING	MISSING	0.0	
	86	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC34			MISSING	MISSING	0.0	
	87	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC35			MISSING	MISSING	0.0	
	88	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC36			MISSING	MISSING	0.0	
	89	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC37			MISSING	MISSING	0.0	
	90	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC38			MISSING	MISSING	0.0	
	91	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC39			MISSING	MISSING	0.0	

```
       92  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC40                   MISSING      MISSING       0.0

       93  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC41                   MISSING      MISSING       0.0

       94  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC42                   MISSING      MISSING       0.0

       95  SUBS-ATTR-VA      S-47      CIPSD             PSD
FRAC43                   MISSING      MISSING       0.0
```

FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER01 (CONTINUED)

96	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC44		MISSING	MISSING	0.0	
97	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC45		MISSING	MISSING	0.0	
98	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC46		MISSING	MISSING	0.0	
99	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC47		MISSING	MISSING	0.0	
100	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC48		MISSING	MISSING	0.0	
101	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC49		MISSING	MISSING	0.0	
102	SUBS-ATTR-VA	S-47	CIPSD		PSD
FRAC50		MISSING	MISSING	0.0	
103	TOTAL MOLEFLOW	S-27	MIXED		
KMOL/HR	353.0757	353.0758	-8.0766-04		
104	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC1		MISSING	MISSING	0.0	
105	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC2		MISSING	MISSING	0.0	
106	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC3		MISSING	MISSING	0.0	
107	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC4		MISSING	MISSING	0.0	
108	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC5		MISSING	MISSING	0.0	
109	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC6		MISSING	MISSING	0.0	
110	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC7		MISSING	MISSING	0.0	

111	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC8		MISSING	MISSING	0.0	
112	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC9		MISSING	MISSING	0.0	
113	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC10		MISSING	MISSING	0.0	
114	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC11		MISSING	MISSING	0.0	
115	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC12		MISSING	MISSING	0.0	
116	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC13		MISSING	MISSING	0.0	
117	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC14		MISSING	MISSING	0.0	
118	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC15		MISSING	MISSING	0.0	
119	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC16		MISSING	MISSING	0.0	
120	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC17		MISSING	MISSING	0.0	
121	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC18		MISSING	MISSING	0.0	
122	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC19		MISSING	MISSING	0.0	
123	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC20		MISSING	MISSING	0.0	
124	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC21		MISSING	MISSING	0.0	
125	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC22		MISSING	MISSING	0.0	
126	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC23		MISSING	MISSING	0.0	
127	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC24		MISSING	MISSING	0.0	
128	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC25		MISSING	MISSING	0.0	

129	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC26		MISSING	MISSING	0.0	
130	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC27		MISSING	MISSING	0.0	
131	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC28		MISSING	MISSING	0.0	
132	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC29		MISSING	MISSING	0.0	
133	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC30		MISSING	MISSING	0.0	
134	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC31		MISSING	MISSING	0.0	
135	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC32		MISSING	MISSING	0.0	
136	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC33		MISSING	MISSING	0.0	
137	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC34		MISSING	MISSING	0.0	
138	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC35		MISSING	MISSING	0.0	
139	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC36		MISSING	MISSING	0.0	
140	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC37		MISSING	MISSING	0.0	
141	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC38		MISSING	MISSING	0.0	
142	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC39		MISSING	MISSING	0.0	
143	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC40		MISSING	MISSING	0.0	
144	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC41		MISSING	MISSING	0.0	
145	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC42		MISSING	MISSING	0.0	
146	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC43		MISSING	MISSING	0.0	

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      147  SUBS-ATTR-VA      S-27      MIXED             PSD
FRAC44                  MISSING      MISSING       0.0

      148  SUBS-ATTR-VA      S-27      MIXED             PSD
FRAC45                  MISSING      MISSING       0.0

      149  SUBS-ATTR-VA      S-27      MIXED             PSD
FRAC46                  MISSING      MISSING       0.0

      150  SUBS-ATTR-VA      S-27      MIXED             PSD
FRAC47                  MISSING      MISSING       0.0
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FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER01 (CONTINUED)

151	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC48		MISSING	MISSING	0.0	
152	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC49		MISSING	MISSING	0.0	
153	SUBS-ATTR-VA	S-27	MIXED		PSD
FRAC50		MISSING	MISSING	0.0	
154	TOTAL MOLEFLOW	S-27	CIPSD		
KMOL/HR	0.0	0.0	0.0		
155	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC1		MISSING	MISSING	0.0	
156	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC2		MISSING	MISSING	0.0	
157	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC3		MISSING	MISSING	0.0	
158	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC4		MISSING	MISSING	0.0	
159	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC5		MISSING	MISSING	0.0	
160	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC6		MISSING	MISSING	0.0	
161	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC7		MISSING	MISSING	0.0	
162	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC8		MISSING	MISSING	0.0	
163	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC9		MISSING	MISSING	0.0	
164	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC10		MISSING	MISSING	0.0	
165	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC11		MISSING	MISSING	0.0	

166 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC12 MISSING MISSING 0.0

167 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC13 MISSING MISSING 0.0

168 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC14 MISSING MISSING 0.0

169 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC15 MISSING MISSING 0.0

170 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC16 MISSING MISSING 0.0

171 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC17 MISSING MISSING 0.0

172 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC18 MISSING MISSING 0.0

173 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC19 MISSING MISSING 0.0

174 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC20 MISSING MISSING 0.0

175 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC21 MISSING MISSING 0.0

176 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC22 MISSING MISSING 0.0

177 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC23 MISSING MISSING 0.0

178 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC24 MISSING MISSING 0.0

179 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC25 MISSING MISSING 0.0

180 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC26 MISSING MISSING 0.0

181 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC27 MISSING MISSING 0.0

182 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC28 MISSING MISSING 0.0

183 SUBS-ATTR-VA S-27 CIPSD PSD
FRAC29 MISSING MISSING 0.0

184	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC30		MISSING	MISSING	0.0	
185	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC31		MISSING	MISSING	0.0	
186	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC32		MISSING	MISSING	0.0	
187	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC33		MISSING	MISSING	0.0	
188	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC34		MISSING	MISSING	0.0	
189	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC35		MISSING	MISSING	0.0	
190	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC36		MISSING	MISSING	0.0	
191	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC37		MISSING	MISSING	0.0	
192	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC38		MISSING	MISSING	0.0	
193	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC39		MISSING	MISSING	0.0	
194	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC40		MISSING	MISSING	0.0	
195	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC41		MISSING	MISSING	0.0	
196	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC42		MISSING	MISSING	0.0	
197	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC43		MISSING	MISSING	0.0	
198	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC44		MISSING	MISSING	0.0	
199	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC45		MISSING	MISSING	0.0	
200	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC46		MISSING	MISSING	0.0	
201	SUBS-ATTR-VA	S-27	CIPSD		PSD
FRAC47		MISSING	MISSING	0.0	

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      202  SUBS-ATTR-VA      S-27      CIPSD             PSD
FRAC48                  MISSING      MISSING       0.0

      203  SUBS-ATTR-VA      S-27      CIPSD             PSD
FRAC49                  MISSING      MISSING       0.0

      204  SUBS-ATTR-VA      S-27      CIPSD             PSD
FRAC50                  MISSING      MISSING       0.0

      205  MOLE-FLOW         S-47      MIXED    METHANOL
KMOL/HR       3.6524-25    3.6521-25       0.7865
```

FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER01 (CONTINUED)

206	MOLE-FLOW	S-47	MIXED	EG	
KMOL/HR	1.0849-07	1.0848-07	0.4260		
207	MOLE-FLOW	S-47	MIXED	DMT	
KMOL/HR	35.4391	35.4391	8.4438-04		
208	MOLE-FLOW	S-47	MIXED	PET	
KMOL/HR	0.0	0.0	0.0		
209	MOLE-FLOW	S-47	MIXED	NA2CO3	
KMOL/HR	0.0	0.0	0.0		
210	MOLE-FLOW	S-47	MIXED	HDPE	
KMOL/HR	0.0	0.0	0.0		
211	MOLE-FLOW	S-47	MIXED	ALUM	
KMOL/HR	0.0	0.0	0.0		
212	MOLE-FLOW	S-47	MIXED	WATER	
KMOL/HR	1.8414-20	1.8411-20	1.7743	T	
213	MOLE-FLOW	S-47	MIXED	DEG	
KMOL/HR	2.6048-06	2.6040-06	2.9215	T	
214	MOLE-FLOW	S-47	MIXED	BIS-2-01	
KMOL/HR	3.1985	3.1985	-9.7034-03		
215	MOLE-FLOW	S-47	MIXED	MPT	
KMOL/HR	1.1806-06	1.1810-06	-3.5014	T	
216	MOLE-FLOW	S-47	MIXED	IRON	
KMOL/HR	0.0	0.0	0.0		
217	MOLE-FLOW	S-47	MIXED	POLY(-01	
KMOL/HR	0.0	0.0	0.0		
218	MOLE-FLOW	S-47	MIXED	AIR	
KMOL/HR	0.0	0.0	0.0		
219	PRESSURE	S-47	MIXED		
ATM	1.9629	1.9629	2.6892-06		
220	MASS ENTHALPY	S-47	MIXED		
CAL/GM	-879.6550	-879.6550	2.9381-04		

221	MOLE-FLOW	S-47	CIPSD	METHANOL	
KMOL/HR	0.0	0.0	0.0		
222	MOLE-FLOW	S-47	CIPSD	EG	
KMOL/HR	0.0	0.0	0.0		
223	MOLE-FLOW	S-47	CIPSD	DMT	
KMOL/HR	0.0	0.0	0.0		
224	MOLE-FLOW	S-47	CIPSD	PET	
KMOL/HR	0.0	0.0	0.0		
225	MOLE-FLOW	S-47	CIPSD	NA2CO3	
KMOL/HR	0.0	0.0	0.0		
226	MOLE-FLOW	S-47	CIPSD	HDPE	
KMOL/HR	0.0	0.0	0.0		
227	MOLE-FLOW	S-47	CIPSD	ALUM	
KMOL/HR	0.0	0.0	0.0		
228	MOLE-FLOW	S-47	CIPSD	WATER	
KMOL/HR	0.0	0.0	0.0		
229	MOLE-FLOW	S-47	CIPSD	DEG	
KMOL/HR	0.0	0.0	0.0		
230	MOLE-FLOW	S-47	CIPSD	BIS-2-01	
KMOL/HR	0.0	0.0	0.0		
231	MOLE-FLOW	S-47	CIPSD	MPT	
KMOL/HR	0.0	0.0	0.0		
232	MOLE-FLOW	S-47	CIPSD	IRON	
KMOL/HR	0.0	0.0	0.0		
233	MOLE-FLOW	S-47	CIPSD	POLY(-01	
KMOL/HR	0.0	0.0	0.0		
234	MOLE-FLOW	S-47	CIPSD	AIR	
KMOL/HR	0.0	0.0	0.0		
235	PRESSURE	S-47	CIPSD		
ATM	1.9629	1.9629	2.6892-06		
236	MASS ENTHALPY	S-47	CIPSD		
CAL/GM	0.0	0.0	0.0		
237	MOLE-FLOW	S-27	MIXED	METHANOL	
KMOL/HR	1.2887	1.2887	-1.2617-03		
238	MOLE-FLOW	S-27	MIXED	EG	
KMOL/HR	330.8998	330.8998	-1.1336-03		

239	MOLE-FLOW	S-27	MIXED	DMT	
KMOL/HR	1.8833	1.8833	0.4136		
240	MOLE-FLOW	S-27	MIXED	PET	
KMOL/HR	0.0	0.0	0.0		
241	MOLE-FLOW	S-27	MIXED	NA2CO3	
KMOL/HR	0.0	0.0	0.0		
242	MOLE-FLOW	S-27	MIXED	HDPE	
KMOL/HR	0.0	0.0	0.0		
243	MOLE-FLOW	S-27	MIXED	ALUM	
KMOL/HR	0.0	0.0	0.0		
244	MOLE-FLOW	S-27	MIXED	WATER	
KMOL/HR	3.2605	3.2605	-4.6622-04		
245	MOLE-FLOW	S-27	MIXED	DEG	
KMOL/HR	5.7607	5.7608	-0.1224		
246	MOLE-FLOW	S-27	MIXED	BIS-2-01	
KMOL/HR	6.4911-11	6.4902-11	1.3889	T	
247	MOLE-FLOW	S-27	MIXED	MPT	
KMOL/HR	9.9827	9.9827	1.9086-03		
248	MOLE-FLOW	S-27	MIXED	IRON	
KMOL/HR	0.0	0.0	0.0		
249	MOLE-FLOW	S-27	MIXED	POLY(-01	
KMOL/HR	0.0	0.0	0.0		
250	MOLE-FLOW	S-27	MIXED	AIR	
KMOL/HR	0.0	0.0	0.0		
251	PRESSURE	S-27	MIXED		
ATM	0.1480	0.1480	0.0		
252	MASS ENTHALPY	S-27	MIXED		
CAL/GM	-1607.3315	-1607.3344	1.7631-02		
253	MOLE-FLOW	S-27	CIPSD	METHANOL	
KMOL/HR	0.0	0.0	0.0		
254	MOLE-FLOW	S-27	CIPSD	EG	
KMOL/HR	0.0	0.0	0.0		
255	MOLE-FLOW	S-27	CIPSD	DMT	
KMOL/HR	0.0	0.0	0.0		
256	MOLE-FLOW	S-27	CIPSD	PET	
KMOL/HR	0.0	0.0	0.0		

257	MOLE-FLOW	S-27	CIPSD	NA2CO3	
KMOL/HR	0.0	0.0	0.0		
258	MOLE-FLOW	S-27	CIPSD	HDPE	
KMOL/HR	0.0	0.0	0.0		
259	MOLE-FLOW	S-27	CIPSD	ALUM	
KMOL/HR	0.0	0.0	0.0		
260	MOLE-FLOW	S-27	CIPSD	WATER	
KMOL/HR	0.0	0.0	0.0		

FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER01 (CONTINUED)

261	MOLE-FLOW	S-27	CIPSD	DEG		
KMOL/HR	0.0	0.0	0.0			
262	MOLE-FLOW	S-27	CIPSD	BIS-2-01		
KMOL/HR	0.0	0.0	0.0			
263	MOLE-FLOW	S-27	CIPSD	MPT		
KMOL/HR	0.0	0.0	0.0			
264	MOLE-FLOW	S-27	CIPSD	IRON		
KMOL/HR	0.0	0.0	0.0			
265	MOLE-FLOW	S-27	CIPSD	POLY(-01		
KMOL/HR	0.0	0.0	0.0			
266	MOLE-FLOW	S-27	CIPSD	AIR		
KMOL/HR	0.0	0.0	0.0			
267	PRESSURE	S-27	CIPSD			
ATM	0.0	0.0	0.0			
268	MASS ENTHALPY	S-27	CIPSD			
CAL/GM	0.0	0.0	0.0			

T - SIGNIFIES COMPONENT IS A TRACE COMPONENT

*** ITERATION HISTORY ***

TEAR STREAMS AND TEAR VARIABLES:

ITERATION	MAX-ERR/TOL	VAR#	STREAM ID	VAR DESCRIPTION	SUBSTREA	COMPONEN	ATTRIBUT	ELEMENT
1	0.1000E+07	251	S-27	PRESSURE	MIXED			

```
          2      0.9239E+05  245 S-27      MOLE-FLO         MIXED
DEG
          3      0.2253E+06  239 S-27      MOLE-FLO         MIXED
DMT
          4      -2407.      245 S-27      MOLE-FLO         MIXED
DEG
          5      -1525.      239 S-27      MOLE-FLO         MIXED
DMT
          6       1028.      239 S-27      MOLE-FLO         MIXED
DMT
          7      -636.1      239 S-27      MOLE-FLO         MIXED
DMT
          8      -282.1      239 S-27      MOLE-FLO         MIXED
DMT
          9       202.9      239 S-27      MOLE-FLO         MIXED
DMT
         10      -38.45      239 S-27      MOLE-FLO         MIXED
DMT
         11      -4.894      245 S-27      MOLE-FLO         MIXED
DEG
         12      -3.522      245 S-27      MOLE-FLO         MIXED
DEG
         13       2.053      245 S-27      MOLE-FLO         MIXED
DEG
         14      0.7865      205 S-47      MOLE-FLO         MIXED
METHANOL

 CONVERGENCE BLOCK:  $OLVER02
 ----------------------------
     Tear Stream  :  PPS-18
     Tolerance used:  0.100D-03
     Trace molefrac:  0.100D-05
     Trace substr-2:  0.100D-05

     MAXIT=   30 WAIT   1 ITERATIONS BEFORE ACCELERATING
```

QMAX = 0.0 QMIN = -5.0

METHOD: WEGSTEIN STATUS: CONVERGED

TOTAL NUMBER OF ITERATIONS: 4

*** FINAL VALUES ***

VAR#	TEAR STREAM VAR	STREAM	SUBSTREA	COMPONEN	ATTRIBUT	ELEMENT	UNIT	VALUE	PREV VALUE	ERR/TOL
1	TOTAL MOLEFLOW	PPS-18	MIXED				KMOL/HR	825.0726	825.0726	0.0
2	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC1		MISSING	MISSING	0.0
3	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC2		MISSING	MISSING	0.0
4	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC3		MISSING	MISSING	0.0

FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER02 (CONTINUED)

5	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC4
		MISSING	MISSING	0.0		
6	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC5
		MISSING	MISSING	0.0		
7	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC6
		MISSING	MISSING	0.0		
8	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC7
		MISSING	MISSING	0.0		
9	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC8
		MISSING	MISSING	0.0		
10	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC9
		MISSING	MISSING	0.0		
11	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC10
		MISSING	MISSING	0.0		
12	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC11
		MISSING	MISSING	0.0		
13	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC12
		MISSING	MISSING	0.0		
14	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC13
		MISSING	MISSING	0.0		
15	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC14
		MISSING	MISSING	0.0		
16	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC15
		MISSING	MISSING	0.0		
17	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC16
		MISSING	MISSING	0.0		
18	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC17
		MISSING	MISSING	0.0		
19	SUBS-ATTR-VA	PPS-18	MIXED		PSD	FRAC18
		MISSING	MISSING	0.0		

```
       20  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC19                    MISSING      MISSING       0.0

       21  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC20                    MISSING      MISSING       0.0

       22  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC21                    MISSING      MISSING       0.0

       23  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC22                    MISSING      MISSING       0.0

       24  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC23                    MISSING      MISSING       0.0

       25  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC24                    MISSING      MISSING       0.0

       26  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC25                    MISSING      MISSING       0.0

       27  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC26                    MISSING      MISSING       0.0

       28  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC27                    MISSING      MISSING       0.0

       29  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC28                    MISSING      MISSING       0.0

       30  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC29                    MISSING      MISSING       0.0

       31  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC30                    MISSING      MISSING       0.0

       32  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC31                    MISSING      MISSING       0.0

       33  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC32                    MISSING      MISSING       0.0

       34  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC33                    MISSING      MISSING       0.0

       35  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC34                    MISSING      MISSING       0.0

       36  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC35                    MISSING      MISSING       0.0

       37  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC36                    MISSING      MISSING       0.0
```

```
       38  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC37                   MISSING      MISSING       0.0

       39  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC38                   MISSING      MISSING       0.0

       40  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC39                   MISSING      MISSING       0.0

       41  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC40                   MISSING      MISSING       0.0

       42  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC41                   MISSING      MISSING       0.0

       43  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC42                   MISSING      MISSING       0.0

       44  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC43                   MISSING      MISSING       0.0

       45  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC44                   MISSING      MISSING       0.0

       46  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC45                   MISSING      MISSING       0.0

       47  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC46                   MISSING      MISSING       0.0

       48  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC47                   MISSING      MISSING       0.0

       49  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC48                   MISSING      MISSING       0.0

       50  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC49                   MISSING      MISSING       0.0

       51  SUBS-ATTR-VA      PPS-18    MIXED             PSD
FRAC50                   MISSING      MISSING       0.0

       52  TOTAL MOLEFLOW    PPS-18    CIPSD
KMOL/HR          0.0          0.0          0.0

       53  SUBS-ATTR-VA      PPS-18    CIPSD             PSD
FRAC1                    MISSING      MISSING       0.0

       54  SUBS-ATTR-VA      PPS-18    CIPSD             PSD
FRAC2                    MISSING      MISSING       0.0

       55  SUBS-ATTR-VA      PPS-18    CIPSD             PSD
FRAC3                    MISSING      MISSING       0.0
```

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       56  SUBS-ATTR-VA      PPS-18    CIPSD             PSD
FRAC4                    MISSING      MISSING       0.0

       57  SUBS-ATTR-VA      PPS-18    CIPSD             PSD
FRAC5                    MISSING      MISSING       0.0

       58  SUBS-ATTR-VA      PPS-18    CIPSD             PSD
FRAC6                    MISSING      MISSING       0.0

       59  SUBS-ATTR-VA      PPS-18    CIPSD             PSD
FRAC7                    MISSING      MISSING       0.0
```

FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER02 (CONTINUED)

60	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC8		MISSING	MISSING	0.0	
61	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC9		MISSING	MISSING	0.0	
62	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC10		MISSING	MISSING	0.0	
63	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC11		MISSING	MISSING	0.0	
64	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC12		MISSING	MISSING	0.0	
65	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC13		MISSING	MISSING	0.0	
66	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC14		MISSING	MISSING	0.0	
67	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC15		MISSING	MISSING	0.0	
68	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC16		MISSING	MISSING	0.0	
69	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC17		MISSING	MISSING	0.0	
70	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC18		MISSING	MISSING	0.0	
71	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC19		MISSING	MISSING	0.0	
72	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC20		MISSING	MISSING	0.0	
73	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC21		MISSING	MISSING	0.0	
74	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC22		MISSING	MISSING	0.0	

	75	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC23			MISSING	MISSING	0.0	
	76	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC24			MISSING	MISSING	0.0	
	77	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC25			MISSING	MISSING	0.0	
	78	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC26			MISSING	MISSING	0.0	
	79	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC27			MISSING	MISSING	0.0	
	80	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC28			MISSING	MISSING	0.0	
	81	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC29			MISSING	MISSING	0.0	
	82	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC30			MISSING	MISSING	0.0	
	83	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC31			MISSING	MISSING	0.0	
	84	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC32			MISSING	MISSING	0.0	
	85	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC33			MISSING	MISSING	0.0	
	86	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC34			MISSING	MISSING	0.0	
	87	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC35			MISSING	MISSING	0.0	
	88	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC36			MISSING	MISSING	0.0	
	89	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC37			MISSING	MISSING	0.0	
	90	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC38			MISSING	MISSING	0.0	
	91	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC39			MISSING	MISSING	0.0	
	92	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC40			MISSING	MISSING	0.0	

93	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC41		MISSING	MISSING	0.0	
94	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC42		MISSING	MISSING	0.0	
95	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC43		MISSING	MISSING	0.0	
96	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC44		MISSING	MISSING	0.0	
97	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC45		MISSING	MISSING	0.0	
98	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC46		MISSING	MISSING	0.0	
99	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC47		MISSING	MISSING	0.0	
100	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC48		MISSING	MISSING	0.0	
101	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC49		MISSING	MISSING	0.0	
102	SUBS-ATTR-VA	PPS-18	CIPSD		PSD
FRAC50		MISSING	MISSING	0.0	
103	MOLE-FLOW	PPS-18	MIXED	METHANOL	
KMOL/HR	0.0	0.0	0.0		
104	MOLE-FLOW	PPS-18	MIXED	EG	
KMOL/HR	0.0	0.0	0.0		
105	MOLE-FLOW	PPS-18	MIXED	DMT	
KMOL/HR	0.0	0.0	0.0		
106	MOLE-FLOW	PPS-18	MIXED	PET	
KMOL/HR	0.0	0.0	0.0		
107	MOLE-FLOW	PPS-18	MIXED	NA2CO3	
KMOL/HR	0.0	0.0	0.0		
108	MOLE-FLOW	PPS-18	MIXED	HDPE	
KMOL/HR	0.0	0.0	0.0		
109	MOLE-FLOW	PPS-18	MIXED	ALUM	
KMOL/HR	0.0	0.0	0.0		
110	MOLE-FLOW	PPS-18	MIXED	WATER	
KMOL/HR	825.0726	825.0726	0.0		

111	MOLE-FLOW		PPS-18	MIXED	DEG
KMOL/HR		0.0	0.0	0.0	
112	MOLE-FLOW		PPS-18	MIXED	BIS-2-01
KMOL/HR		0.0	0.0	0.0	
113	MOLE-FLOW		PPS-18	MIXED	MPT
KMOL/HR		0.0	0.0	0.0	
114	MOLE-FLOW		PPS-18	MIXED	IRON
KMOL/HR		0.0	0.0	0.0	

FLOWSHEET SECTION

CONVERGENCE BLOCK: $OLVER02 (CONTINUED)

115	MOLE-FLOW	PPS-18	MIXED	POLY(-01	
KMOL/HR	0.0	0.0	0.0		
116	MOLE-FLOW	PPS-18	MIXED	AIR	
KMOL/HR	0.0	0.0	0.0		
117	PRESSURE	PPS-18	MIXED		
ATM	1.0000	1.0000	0.0		
118	MASS ENTHALPY	PPS-18	MIXED		
CAL/GM	-3734.9864	-3734.9839	-6.6276-03		
119	MOLE-FLOW	PPS-18	CIPSD	METHANOL	
KMOL/HR	0.0	0.0	0.0		
120	MOLE-FLOW	PPS-18	CIPSD	EG	
KMOL/HR	0.0	0.0	0.0		
121	MOLE-FLOW	PPS-18	CIPSD	DMT	
KMOL/HR	0.0	0.0	0.0		
122	MOLE-FLOW	PPS-18	CIPSD	PET	
KMOL/HR	0.0	0.0	0.0		
123	MOLE-FLOW	PPS-18	CIPSD	NA2CO3	
KMOL/HR	0.0	0.0	0.0		
124	MOLE-FLOW	PPS-18	CIPSD	HDPE	
KMOL/HR	0.0	0.0	0.0		
125	MOLE-FLOW	PPS-18	CIPSD	ALUM	
KMOL/HR	0.0	0.0	0.0		
126	MOLE-FLOW	PPS-18	CIPSD	WATER	
KMOL/HR	0.0	0.0	0.0		
127	MOLE-FLOW	PPS-18	CIPSD	DEG	
KMOL/HR	0.0	0.0	0.0		
128	MOLE-FLOW	PPS-18	CIPSD	BIS-2-01	
KMOL/HR	0.0	0.0	0.0		
129	MOLE-FLOW	PPS-18	CIPSD	MPT	
KMOL/HR	0.0	0.0	0.0		

```
      130  MOLE-FLOW         PPS-18    CIPSD    IRON
KMOL/HR          0.0          0.0          0.0

      131  MOLE-FLOW         PPS-18    CIPSD    POLY(-01
KMOL/HR          0.0          0.0          0.0

      132  MOLE-FLOW         PPS-18    CIPSD    AIR
KMOL/HR          0.0          0.0          0.0

      133  PRESSURE          PPS-18    CIPSD
ATM              1.0000       1.0000       0.0

      134  MASS ENTHALPY     PPS-18    CIPSD
CAL/GM           0.0          0.0          0.0
```

*** ITERATION HISTORY ***

TEAR STREAMS AND TEAR VARIABLES:

ITERATION	MAX-ERR/TOL	VAR#	STREAM ID	VAR DESCRIPTION	SUBSTREA	COMPONEN	ATTRIBUT	ELEMENT
1	0.1000E+07	117	PPS-18	PRESSURE	MIXED			
2	6410.	1	PPS-18	TOTAL MO	MIXED			
3	-4108.	1	PPS-18	TOTAL MO	MIXED			
4	-0.6628E-02	118	PPS-18	MASS ENT	MIXED			

COMPUTATIONAL SEQUENCE

SEQUENCE USED WAS:

DEBALER METALDET TROMMEL B4 M-1

$OLVER01 SLURMIX P-1 SEP-1 M-2 R-1 R-2 P-2 EVAP COMP *HX-1 DC-1 P-3

| SLSEP P-4 HX-4 DEC-1 DEC-2 DC-2 P-5 DC-4 P-6 HX-3 M-3

(RETURN $OLVER01)

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   HX-2 DC-3 JAWCRUSH CONCRUSH *BALLMILL B6 FILMFLAK
   $OLVER02 SINK HOTWASH FRICWASH DEWATER B7
   (RETURN $OLVER02)
   *THERMDRY B1 CYC

OVERALL FLOWSHEET BALANCE
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FLOWSHEET SECTION

OVERALL FLOWSHEET BALANCE (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
CONVENTIONAL COMPONENTS (KMOL/HR)			
METHANOL	1300.38	1171.71	0.989520E-01
EG	2.09446	125.305	-0.983285
DMT	0.00000	64.3376	-1.00000
PET	197.105	197.105	-0.157324E-06
NA2CO3	1.60394	1.60394	0.00000
HDPE	20.0030	20.0030	-0.235986E-06
ALUM	5.19948	5.19948	0.00000
WATER	319593.	319596.	-0.854909E-05
DEG	0.00000	2.73250	-1.00000
BIS-2-01	64.5060	0.168364	0.997390
MPT	9.98820	9.98820	0.178812E-06
IRON	5.02587	5.02587	0.00000

POLY(-01	10.0015	10.0015	-0.235986E-06
AIR	335.119	335.119	0.00000
TOTAL BALANCE			
MOLE(KMOL/HR)	321544.	321544.	0.331478E-09
MASS(KG/HR)	0.586641E+07	0.586641E+07	0.413265E-09
ENTHALPY(CAL/SEC)	-0.607814E+10	-0.607039E+10	-0.127484E-02

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

PHYSICAL PROPERTIES SECTION

COMPONENTS

ID	TYPE	ALIAS	NAME
METHANOL	C	CH4O	METHANOL
EG	C	C2H6O2	ETHYLENE-GLYCOL
DMT	C	C10H10O4-D2	DIMETHYL-TEREPHTHALATE
PET	C	PET	POLY(ETHYLENE-TEREPHTHALATE)
NA2CO3	C	NA2CO3	SODIUM-CARBONATE
HDPE	C	HDPE	HIGH-DENSITY-POLY(ETHYLENE)
ALUM	C	AL	ALUMINIUM
WATER	C	H2O	WATER
DEG	C	C4H10O3	DIETHYLENE-GLYCOL
BIS-2-01	C	C12H14O6	BIS-2-HYDROXYETHYL-TEREPHTHALATE
MPT	C	C9H10O2-D3	METHYL-PARA-TOLUATE
IRON	C	FE	IRON
POLY(-01	C	PP	POLY(PROPYLENE)
AIR	C	AIR	AIR

PROPERTY CONSTANT ESTIMATION SECTION

BINARY PARAMETERS

FOR COMPONENT PAIRS CONTAINING EG

DESCRIPTION		PARAMETER NAME	ESTIMATED VALUE	METHOD OF ESTIMATION
NRTL PARAMETERS				UNIFAC
EG	DMT	NRTL /2	835.5	
DMT	EG	NRTL /2	-313.3	
EG	DMT	NRTL /3	0.3000	
DMT	EG	NRTL /3	0.3000	
EG	MPT	NRTL /2	957.5	
MPT	EG	NRTL /2	-14.80	
EG	MPT	NRTL /3	0.3000	
MPT	EG	NRTL /3	0.3000	

PROPERTY CONSTANT ESTIMATION SECTION

BINARY PARAMETERS (CONTINUED)

FOR COMPONENT PAIRS CONTAINING DMT

DESCRIPTION		PARAMETER NAME		ESTIMATED VALUE	METHOD OF ESTIMATION
NRTL PARAMETERS					UNIFAC
DMT	DEG	NRTL	/2	260.4	
DEG	DMT	NRTL	/2	435.2	
DMT	DEG	NRTL	/3	0.3000	
DEG	DMT	NRTL	/3	0.3000	

PROPERTY CONSTANT ESTIMATION SECTION

BINARY PARAMETERS (CONTINUED)

FOR COMPONENT PAIRS CONTAINING DEG

DESCRIPTION		PARAMETER NAME	ESTIMATED VALUE	METHOD OF ESTIMATION
NRTL PARAMETERS				UNIFAC
DEG	MPT	NRTL /2	328.7	
MPT	DEG	NRTL /2	515.2	
DEG	MPT	NRTL /3	0.3000	
MPT	DEG	NRTL /3	0.3000	

U-O-S BLOCK SECTION

BLOCK: B1 MODEL: MIXER

INLET STREAMS: PPS-31 PPS-30-2

OUTLET STREAM: PPS-32

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	240.341	240.341	0.00000
MASS(KG/HR)	17604.5	17604.5	0.00000
ENTHALPY(CAL/SEC)	-0.130800E+07	-0.130800E+07	0.113211E-12

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

OUTLET PRESSURE: MINIMUM OF INLET STREAM PRESSURES

BLOCK: B4 MODEL: MIXER

INLET STREAMS: PPS-7 PPS-8

OUTLET STREAM: PPS-9

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	406.200	406.200	0.00000
MASS(KG/HR)	30644.0	30644.0	0.00000
ENTHALPY(CAL/SEC)	-0.700009E+07	-0.700009E+07	-0.272310E-09

U-O-S BLOCK SECTION

BLOCK: B4 MODEL: MIXER (CONTINUED)

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

OUTLET PRESSURE: MINIMUM OF INLET STREAM PRESSURES

BLOCK: B6 MODEL: SEP

INLET STREAM: PPS-12

OUTLET STREAMS: PPS-14 PPS-13

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			

MOLE(KMOL/HR)	406.201	406.200	0.568857E-06
MASS(KG/HR)	30644.0	30644.0	0.413725E-06
ENTHALPY(CAL/SEC)	-0.699894E+07	-0.619026E+07	-0.115544

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR STREAM PPS-14

TWO PHASE TP FLASH		
PRESSURE DROP	ATM	0.0
MAXIMUM NO. ITERATIONS		30
CONVERGENCE TOLERANCE		0.000100000

U-O-S BLOCK SECTION

BLOCK: B6 MODEL: SEP (CONTINUED)

FLASH SPECS FOR STREAM PPS-13

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= PPS-13	CPT=	PET	FRACTION=	1.00000
		HDPE		0.0
		WATER		0.0
		POLY(-01		0.0

SUBSTREAM= CIPSD

STREAM= PPS-13	CPT=	PET	FRACTION=	0.0
		HDPE		0.0
		POLY(-01		0.0

*** RESULTS ***

HEAT DUTY CAL/SEC
0.80869E+06

```
 COMPONENT = PET
   STREAM     SUBSTREAM    SPLIT FRACTION
   PPS-14     CIPSD                1.00000
   PPS-13     MIXED                1.00000

 COMPONENT = HDPE
   STREAM     SUBSTREAM    SPLIT FRACTION
   PPS-14     CIPSD                1.00000

 COMPONENT = WATER
   STREAM     SUBSTREAM    SPLIT FRACTION
   PPS-14     MIXED                1.00000

 COMPONENT = POLY(-01
   STREAM     SUBSTREAM    SPLIT FRACTION
   PPS-14     CIPSD                1.00000

BLOCK:  B7       MODEL: MIXER
------------------------------
  INLET STREAMS:         PPS-17      PPS-27
  OUTLET STREAM:         PPS-18
  PROPERTY OPTION SET:   NRTL      RENON (NRTL) / IDEAL GAS
```

U-O-S BLOCK SECTION

BLOCK: B7 MODEL: MIXER (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	825.073	825.073	0.00000
MASS(KG/HR)	14863.9	14863.9	-0.244752E-15
ENTHALPY(CAL/SEC)	-0.154213E+08	-0.154212E+08	-0.643776E-06

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE 0.000100000

OUTLET PRESSURE: MINIMUM OF INLET STREAM PRESSURES

BLOCK: BALLMILL MODEL: CRUSHER

INLET STREAM: PPS-11

OUTLET STREAM: PPS-12

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

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     *     CALCULATION WARNING
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*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	406.200	406.201	-0.235986E-06
MASS(KG/HR)	30644.0	30644.0	-0.305456E-06
ENTHALPY(CAL/SEC)	-0.700009E+07	-0.699894E+07	-0.164421E-03

U-O-S BLOCK SECTION

BLOCK: BALLMILL MODEL: CRUSHER (CONTINUED)

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

PSD CALCULATION METHOD:	DISTRIBUTION FUNCTION WITH POWER SPEC
COMMINUTION LAW:	BOND'S LAW
SPECIFIED POWER KW	48.4705
BOND WORK INDEX FOR SUBSTREAM MIXED ,KWHR/TON	2.32000
BOND WORK INDEX FOR SUBSTREAM CIPSD ,KWHR/TON	2.32000
MAXIMUM NO. OF FLASH ITERATIONS	30
FLASH TOLERANCE	0.000100000

*** RESULTS ***

PARTICLE DIAMETER WHICH IS	
LARGER THAN 80% OF INLET MASS METER	0.055056
PARTICLE DIAMETER WHICH IS	
LARGER THAN 80% OF OUTLET MASS METER	0.0011185
D80 REDUCTION RATIO	49.2224
PARTICLE DIAMETER WHICH IS	

LARGER THAN 50% OF INLET MASS METER 0.0052481

PARTICLE DIAMETER WHICH IS

LARGER THAN 50% OF OUTLET MASS METER 0.0010741

D50 REDUCTION RATIO 4.88613

SAUTER DIAMETER AT INLET METER 0.0090289

SAUTER DIAMETER AT OUTLET METER 0.0010741

BLOCK: COMP MODEL: COMPR

INLET STREAM: S-12

OUTLET STREAM: S-13

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1387.90	1387.90	0.00000
MASS(KG/HR)	61310.5	61310.5	-0.474696E-15
ENTHALPY(CAL/SEC)	-0.217988E+08	-0.202999E+08	-0.687634E-01

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

U-O-S BLOCK SECTION

BLOCK: COMP MODEL: COMPR (CONTINUED)

*** INPUT DATA ***

ISENTROPIC CENTRIFUGAL COMPRESSOR

OUTLET PRESSURE ATM	2.46731
ISENTROPIC EFFICIENCY	0.70000
MECHANICAL EFFICIENCY	1.00000

*** RESULTS ***

INDICATED HORSEPOWER REQUIREMENT	KW	6,275.85
BRAKE HORSEPOWER REQUIREMENT	KW	6,275.85
NET WORK REQUIRED	KW	6,275.85
POWER LOSSES	KW	0.0
ISENTROPIC HORSEPOWER REQUIREMENT	KW	4,393.09
CALCULATED OUTLET TEMP K		620.394
ISENTROPIC TEMPERATURE K		563.594
EFFICIENCY (POLYTR/ISENTR) USED		0.70000
OUTLET VAPOR FRACTION		1.00000
HEAD DEVELOPED, M-KGF/KG		26,303.7
MECHANICAL EFFICIENCY USED		1.00000
INLET HEAT CAPACITY RATIO		1.14069
INLET VOLUMETRIC FLOW RATE , L/MIN		5,297,270.
OUTLET VOLUMETRIC FLOW RATE, L/MIN		477,269.
INLET COMPRESSIBILITY FACTOR		1.00000

OUTLET COMPRESSIBILITY FACTOR	1.00000
AV. ISENT. VOL. EXPONENT	1.12407
AV. ISENT. TEMP EXPONENT	1.12407
AV. ACTUAL VOL. EXPONENT	1.16891
AV. ACTUAL TEMP EXPONENT	1.16891

BLOCK: CONCRUSH MODEL: CRUSHER

INLET STREAM:	PPS-10	
OUTLET STREAM:	PPS-11	
PROPERTY OPTION SET:	NRTL	RENON (NRTL) / IDEAL GAS

U-O-S BLOCK SECTION

BLOCK: CONCRUSH MODEL: CRUSHER (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	406.200	406.200	0.00000
MASS(KG/HR)	30644.0	30644.0	-0.694704E-07
ENTHALPY(CAL/SEC)	-0.700009E+07	-0.700009E+07	0.443828E-07

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

PSD CALCULATION METHOD:	DISTRIBUTION FUNCTION
COMMINUTION LAW:	BOND'S LAW
BOND WORK INDEX FOR SUBSTREAM MIXED ,KWHR/TON	2.32000
BOND WORK INDEX FOR SUBSTREAM CIPSD ,KWHR/TON	2.32000
MAXIMUM NO. OF FLASH ITERATIONS	30

FLASH TOLERANCE 0.000100000

*** RESULTS ***

POWER REQUIREMENT KW 0.19978

PARTICLE DIAMETER WHICH IS

LARGER THAN 80% OF INLET MASS METER 0.066380

PARTICLE DIAMETER WHICH IS

LARGER THAN 80% OF OUTLET MASS METER 0.055056

D80 REDUCTION RATIO 1.20567

PARTICLE DIAMETER WHICH IS

LARGER THAN 50% OF INLET MASS METER 0.053712

PARTICLE DIAMETER WHICH IS

LARGER THAN 50% OF OUTLET MASS METER 0.0052481

D50 REDUCTION RATIO 10.2346

SAUTER DIAMETER AT INLET METER 0.056108

SAUTER DIAMETER AT OUTLET METER 0.0090289

BLOCK: CYC MODEL: CYCLONE

INLET STREAM: PPS-32

OUTLET STREAMS: PPS-34 PPS-33

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	240.341	240.341	0.00000

```
       MASS(KG/HR    )             17604.5          17604.5
0.00000

       ENTHALPY(CAL/SEC )       -0.130800E+07    -0.131344E+07
0.414278E-02
```

U-O-S BLOCK SECTION

BLOCK: CYC MODEL: CYCLONE (CONTINUED)

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

CALCULATION METHOD	SOLIDS SEPARATOR
CLASSIFICATION CHARACTERISTIC	SETTLING VELOCITY
VAPOR RECOVERY TO VAPOR OUTLET	1.00000
SOLIDS RECOVERY TO SOLIDS OUTLET	1.00000
SEPARATION SHARPNESS	0.0
FINES OFFSET	0.0

TWO PHASE PQ FLASH

SPECIFIED PRESSURE	ATM	1.00000
SPECIFIED HEAT DUTY	CAL/SEC	0.0
MAXIMUM NO. ITERATIONS		30
CONVERGENCE TOLERANCE		0.000100000

*** RESULTS ***

VAPOR FRACTION TO VAPOR OUTLET	1.00000
SOLIDS FRACTION TO SOLID OUTLET	1.00000
SOLIDS LOAD OF VAPOR	0.0
VAPOR LOAD OF SOLIDS	0.0

SEPARATION EFFICIENCY FOR SUBSTREAM CIPSD

PARTICLE SIZE METER	EFFICIENCY
0.10741E-02	1.0000
0.12332E-02	0.10000E+36
0.14159E-02	0.10000E+36
0.16257E-02	0.10000E+36
0.18665E-02	0.10000E+36
0.21431E-02	0.10000E+36
0.24606E-02	0.10000E+36
0.28251E-02	0.10000E+36
0.32437E-02	0.10000E+36
0.37242E-02	0.10000E+36
0.42760E-02	0.10000E+36
0.49095E-02	0.10000E+36
0.56368E-02	0.10000E+36
0.64720E-02	0.10000E+36
0.74308E-02	0.10000E+36
0.85317E-02	0.10000E+36
0.97957E-02	0.10000E+36
0.11247E-01	0.10000E+36
0.12913E-01	0.10000E+36
0.14826E-01	0.10000E+36
0.17023E-01	0.10000E+36

0.19545E-01	0.10000E+36
0.22441E-01	0.10000E+36
0.25765E-01	0.10000E+36
0.29583E-01	0.10000E+36
0.33965E-01	0.10000E+36
0.38997E-01	0.10000E+36
0.44775E-01	0.10000E+36
0.51409E-01	0.10000E+36
0.59025E-01	0.10000E+36
0.67770E-01	0.10000E+36
0.77810E-01	0.10000E+36
0.89338E-01	0.10000E+36
0.10257	0.10000E+36
0.11777	0.10000E+36
0.13522	0.10000E+36
0.15525	0.10000E+36
0.17825	0.10000E+36
0.20466	0.10000E+36
0.23498	0.10000E+36
0.26980	0.10000E+36
0.30977	0.10000E+36
0.35566	0.10000E+36
0.40835	0.10000E+36
0.46885	0.10000E+36
0.53831	0.10000E+36
0.61807	0.10000E+36
0.70964	0.10000E+36
0.81477	0.10000E+36
0.93548	0.10000E+36

BLOCK: DC-1 MODEL: RADFRAC

INLETS - S-16 STAGE 3

OUTLETS - S-17 STAGE 1

S-21 STAGE 7

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1387.90	1387.90	-0.327650E-15
MASS(KG/HR)	61310.5	61310.5	0.139537E-09
ENTHALPY(CAL/SEC)	-0.259090E+08	-0.252049E+08	-0.271754E-01

U-O-S BLOCK SECTION

BLOCK: DC-1 MODEL: RADFRAC (CONTINUED)

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

****
**** INPUT DATA ****
****

**** INPUT PARAMETERS ****

NUMBER OF STAGES	7
ALGORITHM OPTION	STANDARD
ABSORBER OPTION	NO
INITIALIZATION OPTION	STANDARD
HYDRAULIC PARAMETER CALCULATIONS	NO
INSIDE LOOP CONVERGENCE METHOD	BROYDEN
DESIGN SPECIFICATION METHOD	NESTED
MAXIMUM NO. OF OUTSIDE LOOP ITERATIONS	25
MAXIMUM NO. OF INSIDE LOOP ITERATIONS	10

MAXIMUM NUMBER OF FLASH ITERATIONS 30

FLASH TOLERANCE
0.000100000

OUTSIDE LOOP CONVERGENCE TOLERANCE
0.000100000

**** COL-SPECS ****

MOLAR VAPOR DIST / TOTAL DIST 0.0

MOLAR REFLUX RATIO 0.60000

MASS DISTILLATE RATE KG/HR 37,723.0

**** PROFILES ****

P-SPEC STAGE 1 PRES, ATM 1.97385

U-O-S BLOCK SECTION

BLOCK: DC-1 MODEL: RADFRAC (CONTINUED)

****
**** RESULTS ****
****

*** COMPONENT SPLIT FRACTIONS ***

	OUTLET STREAMS	
	S-17	S-21
COMPONENT:		
METHANOL	.99972	.27659E-03
EG	.50558E-02	.99494
DMT	.64884E-07	1.0000
WATER	.91070	.89300E-01
DEG	.43150E-08	1.0000
BIS-2-01	0.0000	1.0000
MPT	.11990E-04	.99999

*** SUMMARY OF KEY RESULTS ***

TOP STAGE TEMPERATURE	K	356.165
BOTTOM STAGE TEMPERATURE	K	505.118

TOP STAGE LIQUID FLOW	KMOL/HR	708.370
BOTTOM STAGE LIQUID FLOW	KMOL/HR	207.288
TOP STAGE VAPOR FLOW	KMOL/HR	0.0
BOILUP VAPOR FLOW	KMOL/HR	1,319.10
MOLAR REFLUX RATIO		0.60000
MOLAR BOILUP RATIO		6.36360
CONDENSER DUTY (W/O SUBCOOL)	CAL/SEC	-4,279,080.
REBOILER DUTY	CAL/SEC	4,983,160.

**** MAXIMUM FINAL RELATIVE ERRORS ****

DEW POINT	0.53314E-07	STAGE= 5	
BUBBLE POINT	0.16368E-07	STAGE= 6	
COMPONENT MASS BALANCE	0.81340E-07	STAGE= 5	COMP=DMT
ENERGY BALANCE	0.42123E-07	STAGE= 5	

U-O-S BLOCK SECTION

BLOCK: DC-1 MODEL: RADFRAC (CONTINUED)

**** PROFILES ****

NOTE REPORTED VALUES FOR STAGE LIQUID AND VAPOR RATES ARE THE FLOWS
FROM THE STAGE INCLUDING ANY SIDE PRODUCT.

STAGE	TEMPERATURE	PRESSURE	ENTHALPY CAL/MOL		HEAT DUTY
	K	ATM	LIQUID	VAPOR	CAL/SEC
1	356.17	1.9738	-55606.	-47396.	-.42791+07
2	356.49	1.9834	-55856.	-47451.	
3	357.63	1.9929	-63328.	-47509.	
4	359.40	2.0024	-64581.	-47772.	
5	380.07	2.0120	-86112.	-48727.	
6	469.73	2.0215	-0.10557E+06	-67397.	
7	505.12	2.0310	-0.12103E+06	-89535.	.49832+07

STAGE	FLOW RATE KMOL/HR		FEED RATE KMOL/HR			PRODUCT RATE KMOL/HR	
	LIQUID	VAPOR	LIQUID	VAPOR	MIXED	LIQUID	VAPOR
1	1889.	0.000				1180.6163	

2	700.4	1889.						
3	2129.	1881.	1387.9045					
4	2077.	1922.						
5	1553.	1870.						
6	1526.	1345.						
7	207.3	1319.					207.2881	

**** MASS FLOW PROFILES ****

STAGE	FLOW RATE		FEED RATE			PRODUCT RATE	
	KG/HR		KG/HR			KG/HR	
	LIQUID	VAPOR	LIQUID	VAPOR	MIXED	LIQUID	VAPOR
1	0.6036E+05	0.000				.37723+05	
2	0.2232E+05	0.6036E+05					
3	0.8412E+05	0.6005E+05	.61310+05				
4	0.8034E+05	0.6053E+05					
5	0.8071E+05	0.5675E+05					
6	0.1126E+06	0.5712E+05					
7	0.2359E+05	0.8900E+05				.23587+05	

U-O-S BLOCK SECTION

BLOCK: DC-1 MODEL: RADFRAC (CONTINUED)

**** MOLE-X-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.99191	0.52864E-03	0.44316E-08	0.75626E-02	0.96048E-11
2	0.97998	0.25444E-02	0.15391E-04	0.17462E-01	0.11624E-06
3	0.86468	0.58526E-01	0.37875E-01	0.37681E-01	0.12341E-02
4	0.77298	0.65011E-01	0.38875E-01	0.12187	0.12670E-02
5	0.29693	0.43494	0.58944E-01	0.20628	0.28979E-02
6	0.26550E-01	0.82203	0.10507	0.38998E-01	0.73537E-02
7	0.15630E-02	0.59252	0.38901	0.42236E-02	0.12678E-01

**** MOLE-X-PROFILE ****

STAGE	BIS-2-01	MPT
1	0.53446E-24	0.11689E-13
2	0.79369E-15	0.35104E-11
3	0.58472E-06	0.54235E-09
4	0.59951E-06	0.67814E-09
5	0.80199E-06	0.72251E-08
6	0.81778E-06	0.69170E-08

7	0.60067E-05	0.55526E-08			

**** MOLE-Y-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.99647	0.13953E-03	0.13475E-11	0.33905E-02	0.85805E-15
2	0.99191	0.52864E-03	0.44316E-08	0.75626E-02	0.96048E-11
3	0.98747	0.12792E-02	0.57335E-05	0.11248E-01	0.43285E-07
4	0.95776	0.93910E-03	0.77451E-05	0.41289E-01	0.69127E-07
5	0.85850	0.65250E-02	0.54221E-04	0.13491	0.18316E-05
6	0.34244	0.41066	0.80869E-02	0.23742	0.13910E-02
7	0.30476E-01	0.85810	0.60445E-01	0.44462E-01	0.65171E-02

**** MOLE-Y-PROFILE ****

STAGE	BIS-2-01	MPT
1	0.36285E-33	0.40223E-16
2	0.53446E-24	0.11689E-13
3	0.29552E-15	0.13144E-11
4	0.42721E-15	0.20348E-11
5	0.96253E-14	0.13769E-09
6	0.37964E-10	0.74828E-08
7	0.23692E-08	0.71314E-08

**** K-VALUES ****

STAGE	METHANOL	EG	DMT	WATER	DEG

1	1.0046	0.26395	0.30407E-03	0.44832	0.89336E-04
2	1.0122	0.20777	0.28793E-03	0.43310	0.82632E-04
3	1.1420	0.21857E-01	0.15138E-03	0.29852	0.35072E-04
4	1.2391	0.14445E-01	0.19923E-03	0.33879	0.54562E-04
5	2.8912	0.15002E-01	0.91987E-03	0.65403	0.63205E-03
6	12.898	0.49957	0.76971E-01	6.0879	0.18916
7	19.498	1.4482	0.15538	10.527	0.51406

U-O-S BLOCK SECTION

BLOCK: DC-1 MODEL: RADFRAC (CONTINUED)

**** K-VALUES ****

STAGE	BIS-2-01	MPT
1	0.67891E-09	0.34410E-02
2	0.67339E-09	0.33300E-02
3	0.50540E-09	0.24235E-02
4	0.71260E-09	0.30005E-02
5	0.12002E-07	0.19057E-01
6	0.46423E-04	1.0818
7	0.39442E-03	1.2843

**** MASS-X-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.99471	0.10269E-02	0.26933E-07	0.42640E-02	0.31900E-10
2	0.98508	0.49544E-02	0.93762E-04	0.98688E-02	0.38697E-06
3	0.70136	0.91956E-01	0.18618	0.17184E-01	0.33154E-02
4	0.64029	0.10432	0.19515	0.56758E-01	0.34758E-02
5	0.18304	0.51935	0.22020	0.71493E-01	0.59162E-02
6	0.11534E-01	0.69175	0.27661	0.95250E-02	0.10580E-01

```
      7    0.44013E-03   0.32320       0.66386       0.66868E-03
0.11823E-01


                          ****   MASS-X-PROFILE     ****

   STAGE     BIS-2-01      MPT

      1    0.42527E-23   0.54941E-13

      2    0.63304E-14   0.16538E-10

      3    0.37631E-05   0.20618E-08

      4    0.39403E-05   0.26328E-08

      5    0.39226E-05   0.20874E-07

      6    0.28188E-05   0.14084E-07

      7    0.13421E-04   0.73282E-08


                          ****   MASS-Y-PROFILE     ****

   STAGE     METHANOL      EG            DMT           WATER
DEG

      1    0.99782       0.27065E-03   0.81776E-11   0.19088E-02
0.28457E-14

      2    0.99471       0.10269E-02   0.26933E-07   0.42640E-02
0.31900E-10

      3    0.99113       0.24871E-02   0.34876E-04   0.63478E-02
0.14389E-06

      4    0.97448       0.18509E-02   0.47757E-04   0.23619E-01
0.23294E-06

      5    0.90623       0.13342E-01   0.34687E-03   0.80071E-01
0.64034E-05

      6    0.25844       0.60036       0.36988E-01   0.10074
0.34769E-02

      7    0.14474E-01   0.78943       0.17397       0.11872E-01
0.10251E-01


                          ****   MASS-Y-PROFILE     ****

   STAGE     BIS-2-01      MPT
```

1	0.28829E-32	0.18878E-15
2	0.42527E-23	0.54941E-13
3	0.23535E-14	0.61831E-11
4	0.34489E-14	0.97031E-11
5	0.80619E-13	0.68121E-09
6	0.22733E-09	0.26468E-07
7	0.89277E-08	0.15874E-07

U-O-S BLOCK SECTION

BLOCK: DC-1 MODEL: RADFRAC (CONTINUED)

****
***** HYDRAULIC PARAMETERS *****
****

*** DEFINITIONS ***

MARANGONI INDEX = SIGMA - SIGMATO

FLOW PARAM = (ML/MV)*SQRT(RHOV/RHOL)

QR = QV*SQRT(RHOV/(RHOL-RHOV))

F FACTOR = QV*SQRT(RHOV)

WHERE:

SIGMA IS THE SURFACE TENSION OF LIQUID FROM THE STAGE

SIGMATO IS THE SURFACE TENSION OF LIQUID TO THE STAGE

ML IS THE MASS FLOW OF LIQUID FROM THE STAGE

MV IS THE MASS FLOW OF VAPOR TO THE STAGE

RHOL IS THE MASS DENSITY OF LIQUID FROM THE STAGE

RHOV IS THE MASS DENSITY OF VAPOR TO THE STAGE

QV IS THE VOLUMETRIC FLOW RATE OF VAPOR TO THE STAGE

TEMPERATURE

K

STAGE	LIQUID FROM	VAPOR TO
1	356.17	356.49
2	356.49	357.63
3	357.63	359.40
4	359.40	380.07
5	380.07	469.73
6	469.73	505.12
7	505.12	505.12

	MASS FLOW		VOLUME FLOW		MOLECULAR WEIGHT	
	KG/HR		L/MIN			
STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO
1	60357.	60357.	1396.1	0.46434E+06	31.952	31.952
2	22324.	60047.	515.24	0.46162E+06	31.876	31.924
3	84121.	60534.	1732.2	0.47181E+06	39.504	31.492
4	80339.	56751.	1631.9	0.48301E+06	38.682	30.355
5	80706.	57118.	1393.4	0.42753E+06	51.981	42.457
6	0.11258E+06	88997.	1982.6	0.44866E+06	73.758	67.468
7	23587.	0.0000	418.69	0.0000	113.79	

	DENSITY	VISCOSITY	SURFACE TENSION
	GM/CC	CP	DYNE/CM

STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM
1	0.72054	0.21664E-02	0.29230	0.11675E-01	17.546
2	0.72214	0.21680E-02	0.29330	0.11717E-01	18.007
3	0.80940	0.21383E-02	0.35882	0.11816E-01	20.915
4	0.82048	0.19583E-02	0.36311	0.12638E-01	24.634
5	0.96530	0.22267E-02	0.66263	0.14618E-01	36.080

U-O-S BLOCK SECTION

BLOCK: DC-1 MODEL: RADFRAC (CONTINUED)

	DENSITY		VISCOSITY		SURFACE TENSION
	GM/CC		CP		DYNE/CM
STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM
6	0.94641	0.33060E-02	0.47113	0.13840E-01	29.929
7	0.93894		0.36175		23.932

	MARANGONI INDEX	FLOW PARAM	QR	REDUCED F-FACTOR
STAGE	DYNE/CM		L/MIN	(GM-L)**.5/MIN
1		0.54833E-01	25499.	0.68345E+06
2	0.46092	0.20371E-01	25331.	0.67970E+06
3	0.79404	0.71427E-01	24283.	0.68993E+06
4	3.7195	0.69159E-01	23625.	0.67591E+06
5	11.446	0.67862E-01	20557.	0.63796E+06
6	-6.1512	0.74768E-01	26564.	0.81577E+06
7	-5.9972		0.0000	0.0000

****

***** TRAY SIZING CALCULATIONS *****

****

****

*** SECTION 1 ***

****

STARTING STAGE NUMBER		2
ENDING STAGE NUMBER		6
FLOODING CALCULATION METHOD		GLITSCH6

DESIGN PARAMETERS

PEAK CAPACITY FACTOR		1.00000
SYSTEM FOAMING FACTOR		1.00000
FLOODING FACTOR		0.80000
MINIMUM COLUMN DIAMETER	METER	0.30480
MINIMUM DC AREA/COLUMN AREA		0.100000
HOLE AREA/ACTIVE AREA		0.100000
DOWNCOMER DESIGN BASIS		EQUAL FLOW PATH LENGTH

TRAY SPECIFICATIONS

TRAY TYPE		SIEVE
NUMBER OF PASSES		1
TRAY SPACING	METER	0.60960

U-O-S BLOCK SECTION

BLOCK: DC-1 MODEL: RADFRAC (CONTINUED)

***** SIZING RESULTS @ STAGE WITH MAXIMUM DIAMETER *****

STAGE WITH MAXIMUM DIAMETER		6
COLUMN DIAMETER	METER	2.75277
DC AREA/COLUMN AREA		0.20000
DOWNCOMER VELOCITY	M/SEC	0.055522
FLOW PATH LENGTH PER PANEL	METER	1.89128
SIDE DOWNCOMER WIDTH	METER	0.43074
SIDE WEIR LENGTH	METER	2.00019
CENTER DOWNCOMER WIDTH	METER	0.0
CENTER WEIR LENGTH	METER	MISSING
OFF-CENTER DOWNCOMER WIDTH	METER	0.0
OFF-CENTER SHORT WEIR LENGTH	METER	MISSING
OFF-CENTER LONG WEIR LENGTH	METER	MISSING
TRAY CENTER TO OCDC CENTER	METER	0.0

**** SIZING PROFILES ****

STAGE	DIAMETER	TOTAL AREA	ACTIVE AREA	SIDE DC AREA
	METER	SQM	SQM	SQM
2	2.7528	5.9515	4.7612	0.59515
3	2.7528	5.9515	4.7612	0.59515

4	2.7528	5.9515	4.7612	0.59515
5	2.7528	5.9515	4.7612	0.59515
6	2.7528	5.9515	4.7612	0.59515

**** ADDITIONAL SIZING PROFILES ****

STAGE	FLOODING FACTOR	PRES. DROP ATM	DC BACKUP METER	DC BACKUP/ (TSPC+WHT)
2	67.20	0.7016E-02	0.2008	30.41
3	72.44	0.8281E-02	0.2638	39.94
4	70.11	0.8120E-02	0.2538	38.43
5	60.87	0.8282E-02	0.2241	33.94
6	80.00	0.1096E-01	0.2970	44.97

STAGE	HEIGHT OVER WEIR METER	DC REL FROTH DENS	TR LIQ REL FROTH DENS	FRA APPR TO SYS LIMIT
2	0.5528E-01	0.6062	0.1902	46.35
3	0.1342	0.6077	0.1888	44.07
4	0.1271	0.6078	0.1908	41.21
5	0.1100	0.6082	0.1970	33.90
6	0.1589	0.6082	0.1750	46.09

BLOCK: DC-2 MODEL: RADFRAC

INLETS - S-25 STAGE 3
S-26 STAGE 3
S-37 STAGE 3

	S-21	STAGE	3
OUTLETS -	S-27	STAGE	1
	S-38	STAGE	7

U-O-S BLOCK SECTION

BLOCK: DC-2 MODEL: RADFRAC (CONTINUED)

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	455.117	455.117	-0.626576E-07
MASS(KG/HR)	43114.7	43114.7	0.127329E-06
ENTHALPY(CAL/SEC)	-0.149078E+08	-0.147551E+08	-0.102388E-01

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

****

**** INPUT DATA ****

****

**** INPUT PARAMETERS ****

NUMBER OF STAGES	7
ALGORITHM OPTION	STANDARD
ABSORBER OPTION	NO
INITIALIZATION OPTION	STANDARD
HYDRAULIC PARAMETER CALCULATIONS	NO
INSIDE LOOP CONVERGENCE METHOD	BROYDEN
DESIGN SPECIFICATION METHOD	NESTED
MAXIMUM NO. OF OUTSIDE LOOP ITERATIONS	25
MAXIMUM NO. OF INSIDE LOOP ITERATIONS	10
MAXIMUM NUMBER OF FLASH ITERATIONS	30
FLASH TOLERANCE	0.000100000
OUTSIDE LOOP CONVERGENCE TOLERANCE	0.000100000

U-O-S BLOCK SECTION

BLOCK: DC-2 MODEL: RADFRAC (CONTINUED)

**** COL-SPECS ****

MOLAR VAPOR DIST / TOTAL DIST		0.0
MOLAR REFLUX RATIO		2.00000
MASS BOTTOMS RATE	KG/HR	20,000.0

**** PROFILES ****

P-SPEC	STAGE 1	PRES, ATM	0.14804

****
**** RESULTS ****
****

*** COMPONENT SPLIT FRACTIONS ***

	OUTLET STREAMS	
	S-27	S-38
COMPONENT:		
METHANOL	1.0000	.67785E-11
EG	.99980	.20130E-03
DMT	.18760E-01	.98124

WATER	1.0000	.57761E-09
DEG	.98403	.15974E-01
BIS-2-01	.19279E-10	1.0000
MPT	.99945	.54870E-03

*** SUMMARY OF KEY RESULTS ***

TOP STAGE TEMPERATURE	K	404.917
BOTTOM STAGE TEMPERATURE	K	496.128
TOP STAGE LIQUID FLOW	KMOL/HR	706.151
BOTTOM STAGE LIQUID FLOW	KMOL/HR	102.041
TOP STAGE VAPOR FLOW	KMOL/HR	0.0
BOILUP VAPOR FLOW	KMOL/HR	1,077.52
MOLAR REFLUX RATIO		2.00000
MOLAR BOILUP RATIO		10.5596
CONDENSER DUTY (W/O SUBCOOL)	CAL/SEC	-4,166,110.
REBOILER DUTY	CAL/SEC	4,318,760.

**** MAXIMUM FINAL RELATIVE ERRORS ****

DEW POINT	0.34433E-04	STAGE= 5	
BUBBLE POINT	0.35135E-04	STAGE= 5	
COMPONENT MASS BALANCE	0.13976E-05	STAGE= 5	COMP=BIS-2-01
ENERGY BALANCE	0.41364E-05	STAGE= 5	

U-O-S BLOCK SECTION

BLOCK: DC-2 MODEL: RADFRAC (CONTINUED)

**** PROFILES ****

NOTE REPORTED VALUES FOR STAGE LIQUID AND VAPOR RATES ARE THE FLOWS
FROM THE STAGE INCLUDING ANY SIDE PRODUCT.

STAGE	TEMPERATURE	PRESSURE	ENTHALPY CAL/MOL		HEAT DUTY
	K	ATM	LIQUID	VAPOR	CAL/SEC
1	404.92	0.14804	-0.10523E+06	-78352.	-.41661+07
2	416.45	0.15756	-0.10741E+06	-91067.	
3	420.56	0.16709	-0.11461E+06	-92535.	
4	430.22	0.17662	-0.12996E+06	-95971.	
5	461.25	0.18614	-0.15006E+06	-0.11127E+06	
6	488.56	0.19567	-0.15328E+06	-0.13336E+06	
7	496.13	0.20520	-0.15646E+06	-0.13855E+06	.43188+07

STAGE	FLOW RATE KMOL/HR		FEED RATE KMOL/HR			PRODUCT RATE KMOL/HR	
	LIQUID	VAPOR	LIQUID	VAPOR	MIXED	LIQUID	VAPOR
1	1059.	0.000				353.0757	

2	717.8	1059.		68.8608	
3	1165.	1002.	386.2562		
4	1079.	1063.			
5	1073.	976.5			
6	1180.	970.5			
7	102.0	1078.			102.0412

**** MASS FLOW PROFILES ****

STAGE	FLOW RATE		FEED RATE			PRODUCT RATE	
	KG/HR		KG/HR			KG/HR	
	LIQUID	VAPOR	LIQUID	VAPOR	MIXED	LIQUID	VAPOR
1	0.6934E+05	0.000				.23115+05	
2	0.4868E+05	0.6934E+05		4969.6009			
3	0.9751E+05	0.6682E+05	.38145+05				
4	0.1285E+06	0.7751E+05					
5	0.1903E+06	0.1085E+06					
6	0.2272E+06	0.1703E+06					
7	0.2000E+05	0.2072E+06				.20000+05	

U-O-S BLOCK SECTION

BLOCK: DC-2 MODEL: RADFRAC (CONTINUED)

**** MOLE-X-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.36499E-02	0.93719	0.53341E-02	0.92346E-02	0.16316E-01
2	0.70570E-04	0.93785	0.31536E-01	0.51510E-03	0.23575E-01
3	0.25407E-04	0.79974	0.13789	0.17577E-03	0.53961E-01
4	0.65939E-06	0.48941	0.38612	0.96323E-05	0.11821
5	0.54980E-08	0.96266E-01	0.85216	0.18924E-06	0.47167E-01
6	0.23084E-10	0.85918E-02	0.98104	0.19855E-08	0.71405E-02
7	0.85606E-13	0.65289E-03	0.96538	0.18456E-10	0.91642E-03

**** MOLE-X-PROFILE ****

STAGE	BIS-2-01	MPT
1	0.18385E-12	0.28274E-01
2	0.29547E-07	0.64490E-02
3	0.28893E-02	0.53242E-02
4	0.31226E-02	0.31294E-02
5	0.31443E-02	0.12649E-02
6	0.29441E-02	0.28092E-03

7	0.32995E-01	0.53709E-04			

**** MOLE-Y-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.16325	0.61693	0.55594E-03	0.12560	0.83239E-02
2	0.36499E-02	0.93719	0.53341E-02	0.92346E-02	0.16316E-01
3	0.10243E-02	0.94055	0.19122E-01	0.28153E-02	0.21902E-01
4	0.27845E-04	0.87642	0.58476E-01	0.19264E-03	0.59051E-01
5	0.72830E-06	0.54048	0.32558	0.10639E-04	0.13047
6	0.60761E-08	0.10632	0.84025	0.20913E-06	0.52030E-01
7	0.25262E-10	0.93436E-02	0.98253	0.21718E-08	0.77299E-02

**** MOLE-Y-PROFILE ****

STAGE	BIS-2-01	MPT
1	0.38862E-18	0.85341E-01
2	0.18385E-12	0.28274E-01
3	0.21152E-07	0.14583E-01
4	0.54456E-07	0.58300E-02
5	0.89788E-06	0.34508E-02
6	0.56830E-05	0.13922E-02
7	0.98210E-04	0.30244E-03

**** K-VALUES ****

STAGE	METHANOL	EG	DMT	WATER	DEG

1	44.727	0.65828	0.10422	13.601	0.51017
2	51.719	0.99929	0.16914	17.928	0.69207
3	40.316	1.1761	0.13868	16.017	0.40591
4	42.228	1.7907	0.15145	19.999	0.49949
5	132.47	5.6143	0.38206	56.221	2.7660
6	263.21	12.374	0.85648	105.33	7.2865
7	295.10	14.311	1.0178	117.67	8.4349

U-O-S BLOCK SECTION

BLOCK: DC-2 MODEL: RADFRAC (CONTINUED)

**** K-VALUES ****

STAGE	BIS-2-01	MPT
1	0.21139E-05	3.0184
2	0.62222E-05	4.3842
3	0.73211E-05	2.7390
4	0.17437E-04	1.8632
5	0.28547E-03	2.7282
6	0.19302E-02	4.9560
7	0.29765E-02	5.6311

**** MASS-X-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.17864E-02	0.88854	0.15822E-01	0.25412E-02	0.26448E-01
2	0.33343E-04	0.85836	0.90301E-01	0.13683E-03	0.36891E-01
3	0.97287E-05	0.59320	0.31999	0.37842E-04	0.68433E-01
4	0.17730E-06	0.25491	0.62920	0.14562E-05	0.10528
5	0.99279E-09	0.33672E-01	0.93254	0.19212E-07	0.28208E-01
6	0.38407E-11	0.27690E-02	0.98919	0.18573E-09	0.39346E-02

7	0.13995E-13	0.20676E-03	0.95646	0.16964E-11	0.49619E-03

**** MASS-X-PROFILE ****

STAGE	BIS-2-01	MPT
1	0.71396E-12	0.64858E-01
2	0.11077E-06	0.14281E-01
3	0.87784E-02	0.95553E-02
4	0.66620E-02	0.39438E-02
5	0.45050E-02	0.10705E-02
6	0.38865E-02	0.21906E-03
7	0.42800E-01	0.41152E-04

**** MASS-Y-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.87776E-01	0.64256	0.18115E-02	0.37969E-01	0.14823E-01
2	0.17864E-02	0.88854	0.15822E-01	0.25412E-02	0.26448E-01
3	0.49213E-03	0.87538	0.55678E-01	0.76051E-03	0.34852E-01
4	0.12239E-04	0.74620	0.15576	0.47606E-04	0.85962E-01
5	0.20998E-06	0.30185	0.56889	0.17246E-05	0.12459
6	0.11094E-08	0.37602E-01	0.92974	0.21468E-07	0.31462E-01
7	0.42101E-11	0.30164E-02	0.99235	0.20350E-09	0.42666E-02

**** MASS-Y-PROFILE ****

STAGE	BIS-2-01	MPT

1	0.16580E-17	0.21506
2	0.71396E-12	0.64858E-01
3	0.80637E-07	0.32838E-01
4	0.18992E-06	0.12010E-01
5	0.20540E-05	0.46630E-02
6	0.82328E-05	0.11914E-02
7	0.12987E-03	0.23623E-03

U-O-S BLOCK SECTION

BLOCK: DC-2 MODEL: RADFRAC (CONTINUED)

****
***** HYDRAULIC PARAMETERS *****
****

*** DEFINITIONS ***

MARANGONI INDEX = SIGMA - SIGMATO

FLOW PARAM = (ML/MV)*SQRT(RHOV/RHOL)

QR = QV*SQRT(RHOV/(RHOL-RHOV))

F FACTOR = QV*SQRT(RHOV)

WHERE:

SIGMA IS THE SURFACE TENSION OF LIQUID FROM THE STAGE

SIGMATO IS THE SURFACE TENSION OF LIQUID TO THE STAGE

ML IS THE MASS FLOW OF LIQUID FROM THE STAGE

MV IS THE MASS FLOW OF VAPOR TO THE STAGE

RHOL IS THE MASS DENSITY OF LIQUID FROM THE STAGE

RHOV IS THE MASS DENSITY OF VAPOR TO THE STAGE

QV IS THE VOLUMETRIC FLOW RATE OF VAPOR TO THE STAGE

TEMPERATURE

K

STAGE	LIQUID FROM	VAPOR TO
1	404.92	416.45
2	416.45	421.23
3	420.56	430.22
4	430.22	461.25
5	461.25	488.56
6	488.56	496.13
7	496.13	496.13

	MASS FLOW		VOLUME FLOW		MOLECULAR WEIGHT	
	KG/HR		L/MIN			
STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO
1	69344.	69344.	1145.7	0.38287E+07	65.467	65.467
2	48678.	71793.	808.36	0.39152E+07	67.817	67.042
3	97513.	77513.	1615.0	0.35421E+07	83.679	72.900
4	0.12852E+06	0.10852E+06	2095.5	0.33091E+07	119.16	111.14
5	0.19032E+06	0.17032E+06	3049.1	0.33139E+07	177.45	175.50
6	0.22717E+06	0.20717E+06	3698.4	0.35629E+07	192.59	192.26
7	20000.	0.0000	325.79	0.0000	196.00	

	DENSITY	VISCOSITY	SURFACE TENSION
	GM/CC	CP	DYNE/CM

STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM
1	1.0087	0.30186E-03	1.1596	0.11344E-01	38.187
2	1.0036	0.30562E-03	1.0330	0.11448E-01	37.084
3	1.0063	0.36472E-03	0.99028	0.11510E-01	35.661
4	1.0222	0.54658E-03	0.89970	0.11203E-01	32.288
5	1.0403	0.85658E-03	0.65413	0.10293E-01	24.965

U-O-S BLOCK SECTION

BLOCK: DC-2 MODEL: RADFRAC (CONTINUED)

	DENSITY		VISCOSITY		SURFACE TENSION
	GM/CC		CP		DYNE/CM
STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM
6	1.0237	0.96909E-03	0.52233	0.10110E-01	21.367
7	1.0232		0.49525		21.167

	MARANGONI INDEX	FLOW PARAM	QR	REDUCED F-FACTOR
STAGE	DYNE/CM		L/MIN	(GM-L)**.5/MIN
1		0.17299E-01	66241.	0.21036E+07
2	-1.1032	0.11832E-01	68331.	0.21644E+07
3	-2.6656	0.23950E-01	67446.	0.21392E+07
4	-3.3730	0.27385E-01	76539.	0.24464E+07
5	-7.3227	0.32064E-01	95132.	0.30671E+07
6	-3.5974	0.33738E-01	0.10967E+06	0.35074E+07
7	-.20080		0.0000	0.0000

****

***** PACKING SIZING CALCULATIONS *****

****

****

*** SECTION 1 ***

****

STARTING STAGE NUMBER		2
ENDING STAGE NUMBER		6
CAPACITY CALCULATION METHOD		WALLIS
PRESSURE DROP CALCULATION METHOD		WALLIS
LIQUID HOLDUP CALCULATION METHOD		STICHL
PRESSURE PROFILE UPDATED		NO

DESIGN PARAMETERS

OVERDESIGN FACTOR		1.00000
SYSTEM FOAMING FACTOR		1.00000
FRAC. APP. TO MAXIMUM CAPACITY		0.80000
MAXIMUM CAPACITY FACTOR	M/SEC	MISSING
DESIGN CAPACITY FACTOR	M/SEC	MISSING
PRESSURE DROP FOR THE SECTION	ATM	MISSING
PRESSURE DROP PER UNIT HEIGHT	MM-WATER/M	MISSING

U-O-S BLOCK SECTION

BLOCK: DC-2 MODEL: RADFRAC (CONTINUED)

PACKING SPECIFICATIONS

PACKING TYPE
FLEXIGRID

PACKING MATERIAL		METAL
PACKING SIZE		STYLE-2
VENDOR		KOCH
PACKING FACTOR	1/M	24.2000
PACKING SURFACE AREA	SQCM/CC	0.45000
PACKING VOID FRACTION		0.98000
FIRST STICHLMAIR CONSTANT		0.93276
SECOND STICHLMAIR CONSTANT		-0.059957
THIRD STICHLMAIR CONSTANT		0.90039
HETP	METER	0.12192
PACKING HEIGHT	METER	0.60960

***** SIZING RESULTS *****

COLUMN DIAMETER	METER	4.18580
MAXIMUM FRACTIONAL CAPACITY		0.80000
MAXIMUM CAPACITY FACTOR	M/SEC	0.13283
PRESSURE DROP FOR THE SECTION	ATM	0.00044245

AVERAGE PRESSURE DROP/HEIGHT	MM-WATER/M	7.49921
MAXIMUM LIQUID HOLDUP/STAGE	L	43.8025
MAX LIQ SUPERFICIAL VELOCITY	CUM/HR/SQM	16.1258

**** RATING PROFILES AT MAXIMUM COLUMN DIAMETER ****

STAGE	HEIGHT FROM TOP OF SECTION METER	FRACTIONAL CAPACITY	PRESSURE DROP ATM	PRESSURE DROP/HEIGHT MM-WATER/M	LIQUID HOLDUP L	HETP METER
2	0.000	0.4373	0.49288E-04	3.8713	15.75	0.1219
3	0.1219	0.4550	0.51087E-04	3.9647	24.99	0.1219
4	0.2438	0.5277	0.62645E-04	4.7623	29.75	0.1219
5	0.3658	0.6820	0.10527E-03	8.0645	38.33	0.1219
6	0.4877	0.8000	0.17416E-03	13.791	43.80	0.1219

STAGE	LIQUID SUPERFICIAL VELOCITY CUM/HR/SQM
2	3.525
3	7.042
4	9.137
5	13.29
6	16.13

```
BLOCK:  DC-3     MODEL: RADFRAC
------------------------------

   INLETS   - S-32     STAGE   3
   OUTLETS  - S-33     STAGE   1
              S-34     STAGE  14
```

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	130.056	130.056	-0.218535E-15
MASS(KG/HR)	8267.06	8267.06	-0.375158E-09
ENTHALPY(CAL/SEC)	-0.399216E+07	-0.379001E+07	-0.506369E-01

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

****

**** INPUT DATA ****

****

**** INPUT PARAMETERS ****

NUMBER OF STAGES	14
ALGORITHM OPTION	STANDARD
ABSORBER OPTION	NO
INITIALIZATION OPTION	STANDARD
HYDRAULIC PARAMETER CALCULATIONS	NO
INSIDE LOOP CONVERGENCE METHOD	BROYDEN
DESIGN SPECIFICATION METHOD	NESTED
MAXIMUM NO. OF OUTSIDE LOOP ITERATIONS	25
MAXIMUM NO. OF INSIDE LOOP ITERATIONS	10
MAXIMUM NUMBER OF FLASH ITERATIONS	30

FLASH TOLERANCE
0.000100000

OUTSIDE LOOP CONVERGENCE TOLERANCE
0.000100000

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

**** COL-SPECS ****

MOLAR VAPOR DIST / TOTAL DIST		0.0
MOLAR REFLUX RATIO		4.00000
MASS BOTTOMS RATE	KG/HR	7,000.00

**** PROFILES ****

P-SPEC	STAGE 1	PRES, ATM	0.14804

****
**** RESULTS ****
****

*** COMPONENT SPLIT FRACTIONS ***

	OUTLET STREAMS	
	S-33	S-34
COMPONENT:		
METHANOL	1.0000	0.0000
EG	.13444	.86556
DMT	.31455E-02	.99685

WATER	1.0000	.19829E-12
DEG	.10536	.89464
MPT	1.0000	.78384E-06

*** SUMMARY OF KEY RESULTS ***

TOP STAGE TEMPERATURE	K	371.533
BOTTOM STAGE TEMPERATURE	K	431.082
TOP STAGE LIQUID FLOW	KMOL/HR	78.4359
BOTTOM STAGE LIQUID FLOW	KMOL/HR	110.447
TOP STAGE VAPOR FLOW	KMOL/HR	0.0
BOILUP VAPOR FLOW	KMOL/HR	163.872
MOLAR REFLUX RATIO		4.00000
MOLAR BOILUP RATIO		1.48372
CONDENSER DUTY (W/O SUBCOOL)	CAL/SEC	-412,357.
REBOILER DUTY	CAL/SEC	614,523.

**** MAXIMUM FINAL RELATIVE ERRORS ****

DEW POINT	0.13057E-03	STAGE=	1
BUBBLE POINT	0.42020E-03	STAGE=	1
COMPONENT MASS BALANCE	0.33293E-05	STAGE=	3

COMP=METHANOL

ENERGY BALANCE	0.34128E-03	STAGE=	1

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

**** PROFILES ****

NOTE REPORTED VALUES FOR STAGE LIQUID AND VAPOR RATES ARE THE FLOWS
FROM THE STAGE INCLUDING ANY SIDE PRODUCT.

STAGE	TEMPERATURE	PRESSURE	ENTHALPY CAL/MOL		HEAT DUTY
	K	ATM	LIQUID	VAPOR	CAL/SEC
1	371.53	0.14804	-0.10282E+06	-55127.	-.41236+06
2	413.60	0.15756	-0.10541E+06	-87679.	
3	417.42	0.16709	-0.10563E+06	-90817.	
4	419.50	0.17662	-0.10562E+06	-91694.	
12	429.07	0.25283	-0.10518E+06	-91574.	
13	430.07	0.26236	-0.10517E+06	-91560.	
14	431.08	0.27188	-0.10528E+06	-91595.	.61452+06

STAGE	FLOW RATE KMOL/HR		FEED RATE KMOL/HR			PRODUCT RATE KMOL/HR	
	LIQUID	VAPOR	LIQUID	VAPOR	MIXED	LIQUID	VAPOR
1	98.04	0.000				19.6089	

2	85.61	98.04						
3	266.4	105.2	130.0556					
4	267.7	155.9						
12	273.6	162.5						
13	274.3	163.2						
14	110.4	163.9					110.4466	

**** MASS FLOW PROFILES ****

STAGE	FLOW RATE		FEED RATE			PRODUCT RATE	
	KG/HR		KG/HR			KG/HR	
	LIQUID	VAPOR	LIQUID	VAPOR	MIXED	LIQUID	VAPOR
1	6335.	0.000				1267.0553	
2	5461.	6335.					
3	0.1688E+05	6728.	8267.0553				
4	0.1691E+05	9882.					
12	0.1724E+05	0.1020E+05					
13	0.1730E+05	0.1024E+05					
14	7000.	0.1030E+05				7000.0000	

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

**** MOLE-X-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.31907E-01	0.85373	0.49871E-04	0.45016E-01	0.14151E-01
2	0.59110E-03	0.96726	0.30161E-03	0.25473E-02	0.17496E-01
3	0.11414E-03	0.97534	0.13207E-02	0.54838E-03	0.18955E-01
4	0.34513E-05	0.97866	0.13181E-02	0.48087E-04	0.18824E-01
12	0.39581E-17	0.98095	0.13244E-02	0.19064E-12	0.17723E-01
13	0.13646E-18	0.98002	0.14875E-02	0.17463E-13	0.18489E-01
14	0.48035E-20	0.97586	0.28061E-02	0.15848E-14	0.21334E-01

**** MOLE-X-PROFILE ****

STAGE	MPT
1	0.55146E-01
2	0.11800E-01
3	0.37209E-02
4	0.11430E-02
12	0.89104E-07
13	0.26975E-07

14	0.76743E-08

**** MOLE-Y-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.65853	0.11676	0.76456E-06	0.19542	0.52918E-03
2	0.31907E-01	0.85373	0.49871E-04	0.45016E-01	0.14151E-01
3	0.64270E-02	0.94611	0.25470E-03	0.10462E-01	0.16872E-01
4	0.19498E-03	0.97497	0.26848E-03	0.93683E-03	0.17270E-01
12	0.19646E-15	0.98468	0.28628E-03	0.35226E-11	0.15033E-01
13	0.66342E-17	0.98440	0.32146E-03	0.31862E-12	0.15279E-01
14	0.22519E-18	0.98283	0.59887E-03	0.28165E-13	0.16572E-01

**** MOLE-Y-PROFILE ****

STAGE	MPT
1	0.28755E-01
2	0.55146E-01
3	0.19878E-01
4	0.63566E-02
12	0.48128E-06
13	0.14423E-06
14	0.39984E-07

**** K-VALUES ****

STAGE	METHANOL	EG	DMT	WATER	DEG

1	20.630	0.13676	0.15321E-01	4.3386	0.37304E-01
2	53.955	0.88265	0.16530	17.664	0.80787
3	56.292	0.97005	0.19281	19.071	0.88940
4	56.475	0.99625	0.20363	19.475	0.91660
12	49.634	1.0038	0.21615	18.477	0.84823
13	48.621	1.0045	0.21611	18.247	0.82653
14	46.886	1.0071	0.21343	17.774	0.77695

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

**** K-VALUES ****

STAGE	MPT
1	0.52118
2	4.6722
3	5.3411
4	5.5601
12	5.4014
13	5.3469
14	5.2105

**** MASS-X-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.15822E-01	0.82007	0.14988E-03	0.12551E-01	0.23240E-01
2	0.29692E-03	0.94118	0.91816E-03	0.71941E-03	0.29106E-01
3	0.57704E-04	0.95518	0.40464E-02	0.15588E-03	0.31739E-01
4	0.17506E-05	0.96159	0.40519E-02	0.13714E-04	0.31623E-01
12	0.20124E-17	0.96608	0.40807E-02	0.54495E-13	0.29843E-01
13	0.69316E-19	0.96432	0.45793E-02	0.49874E-14	0.31105E-01

14	0.24285E-20	0.95568	0.85975E-02	0.45046E-15	0.35722E-01

**** MASS-X-PROFILE ****

STAGE	MPT
1	0.12817
2	0.27781E-01
3	0.88169E-02
4	0.27172E-02
12	0.21232E-06
13	0.64222E-07
14	0.18184E-07

**** MASS-Y-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.58220	0.19996	0.40964E-05	0.97136E-01	0.15495E-02
2	0.15822E-01	0.82007	0.14988E-03	0.12551E-01	0.23240E-01
3	0.32206E-02	0.91837	0.77348E-03	0.29475E-02	0.28002E-01
4	0.98580E-04	0.95483	0.82260E-03	0.26630E-03	0.28917E-01
12	0.10029E-15	0.97370	0.88565E-03	0.10110E-11	0.25416E-01
13	0.33858E-17	0.97318	0.99426E-03	0.91425E-13	0.25825E-01
14	0.11476E-18	0.97018	0.18495E-02	0.80696E-14	0.27969E-01

**** MASS-Y-PROFILE ****

STAGE	MPT

1	0.11915
2	0.12817
3	0.46685E-01
4	0.15062E-01
12	0.11515E-05
13	0.34498E-06
14	0.95498E-07

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

****
***** HYDRAULIC PARAMETERS *****
****

*** DEFINITIONS ***

MARANGONI INDEX = SIGMA - SIGMATO

FLOW PARAM = (ML/MV)*SQRT(RHOV/RHOL)

QR = QV*SQRT(RHOV/(RHOL-RHOV))

F FACTOR = QV*SQRT(RHOV)

WHERE:

SIGMA IS THE SURFACE TENSION OF LIQUID FROM THE STAGE

SIGMATO IS THE SURFACE TENSION OF LIQUID TO THE STAGE

ML IS THE MASS FLOW OF LIQUID FROM THE STAGE

MV IS THE MASS FLOW OF VAPOR TO THE STAGE

RHOL IS THE MASS DENSITY OF LIQUID FROM THE STAGE

RHOV IS THE MASS DENSITY OF VAPOR TO THE STAGE

QV IS THE VOLUMETRIC FLOW RATE OF VAPOR TO THE STAGE

TEMPERATURE

K

STAGE	LIQUID FROM	VAPOR TO
1	371.53	413.60
2	413.60	417.42
3	417.42	419.50
4	419.50	420.97
12	429.07	430.07
13	430.07	431.08
14	431.08	431.08

	MASS FLOW		VOLUME FLOW		MOLECULAR WEIGHT	
	KG/HR		L/MIN			
STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO
1	6335.3	6335.3	102.58	0.35197E+06	64.616	64.616
2	5461.3	6728.3	90.586	0.35949E+06	63.789	63.943
3	16882.	9882.0	280.48	0.50648E+06	63.378	63.378
4	16908.	9908.0	281.29	0.48622E+06	63.170	63.024
12	17244.	10244.	289.64	0.36579E+06	63.024	62.784
13	17304.	10304.	290.97	0.35534E+06	63.079	62.878
14	7000.0	0.0000	117.86	0.0000	63.379	

	DENSITY	VISCOSITY	SURFACE TENSION
	GM/CC	CP	DYNE/CM

STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM
1	1.0293	0.29999E-03	1.6934	0.11323E-01	40.903
2	1.0048	0.31193E-03	1.0619	0.11430E-01	37.611
3	1.0032	0.32518E-03	1.0205	0.11506E-01	37.322
4	1.0018	0.33962E-03	0.99527	0.11562E-01	37.137
12	0.99225	0.46675E-03	0.87492	0.11823E-01	36.082

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

	DENSITY		VISCOSITY		SURFACE TENSION
	GM/CC		CP		DYNE/CM
STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM
13	0.99115	0.48329E-03	0.86338	0.11847E-01	35.966
14	0.98991		0.85253		35.838

	MARANGONI INDEX	FLOW PARAM	QR	REDUCED F-FACTOR
STAGE	DYNE/CM		L/MIN	(GM-L)**.5/MIN
1		0.17072E-01	6009.6	0.19278E+06
2	-3.2918	0.14301E-01	6335.0	0.20078E+06
3	-7.1893	0.30758E-01	9120.3	0.28882E+06
4	-.18503	0.31421E-01	8954.0	0.28336E+06
12	-.11772	0.36509E-01	7935.3	0.24990E+06
13	-.11647	0.37083E-01	7848.4	0.24703E+06
14	-.12830		0.0000	0.0000

****

***** PACKING SIZING CALCULATIONS *****

****

****

*** SECTION 1 ***

****

STARTING STAGE NUMBER		2
ENDING STAGE NUMBER		13
CAPACITY CALCULATION METHOD		WALLIS
PRESSURE DROP CALCULATION METHOD		WALLIS
LIQUID HOLDUP CALCULATION METHOD		STICHL
PRESSURE PROFILE UPDATED		NO

DESIGN PARAMETERS

OVERDESIGN FACTOR		1.00000
SYSTEM FOAMING FACTOR		1.00000
FRAC. APP. TO MAXIMUM CAPACITY		0.80000
MAXIMUM CAPACITY FACTOR	M/SEC	MISSING
DESIGN CAPACITY FACTOR	M/SEC	MISSING
PRESSURE DROP FOR THE SECTION	ATM	MISSING
PRESSURE DROP PER UNIT HEIGHT	MM-WATER/M	MISSING

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

PACKING SPECIFICATIONS

PACKING TYPE		PALL-RING
PACKING MATERIAL		METAL
PACKING SIZE		1.5-IN
VENDOR		GENERIC
PACKING FACTOR	1/M	92.0000
PACKING SURFACE AREA	SQCM/CC	1.30000
PACKING VOID FRACTION		0.95000
FIRST STICHLMAIR CONSTANT		1.00589
SECOND STICHLMAIR CONSTANT		1.11407
THIRD STICHLMAIR CONSTANT		2.98252
HETP	METER	1.04140
PACKING HEIGHT	METER	12.4968

***** SIZING RESULTS *****

COLUMN DIAMETER	METER	1.48526
MAXIMUM FRACTIONAL CAPACITY		0.80000
MAXIMUM CAPACITY FACTOR	M/SEC	0.087733
PRESSURE DROP FOR THE SECTION	ATM	0.060919
AVERAGE PRESSURE DROP/HEIGHT	MM-WATER/M	50.3677

MAXIMUM LIQUID HOLDUP/STAGE	L	55.9852
MAX LIQ SUPERFICIAL VELOCITY	CUM/HR/SQM	10.0765

**** RATING PROFILES AT MAXIMUM COLUMN DIAMETER ****

STAGE	HEIGHT FROM TOP OF SECTION	FRACTIONAL CAPACITY	PRESSURE DROP	PRESSURE DROP/HEIGHT	LIQUID HOLDUP	HETP
	METER		ATM	MM-WATER/M	L	METER
2	0.000	0.5116	0.22500E-02	22.011	23.83	1.041
3	1.041	0.8000	0.64611E-02	63.779	55.99	1.041
4	2.083	0.7875	0.61611E-02	60.788	55.62	1.041
5	3.124	0.7755	0.58867E-02	58.050	55.31	1.041
6	4.166	0.7646	0.56464E-02	55.650	55.08	1.041
7	5.207	0.7543	0.54319E-02	53.505	54.90	1.041
8	6.248	0.7448	0.52378E-02	51.563	54.75	1.041
9	7.290	0.7357	0.50611E-02	49.795	54.62	1.041
10	8.331	0.7272	0.49001E-02	48.182	54.52	1.041
11	9.373	0.7193	0.47532E-02	46.708	54.44	1.041
12	10.41	0.7119	0.46207E-02	45.378	54.38	1.041

13	11.46	0.7056	0.45093E-02	44.256	54.40	1.041

STAGE	LIQUID SUPERFICIAL VELOCITY CUM/HR/SQM
2	3.137
3	9.713
4	9.741
5	9.774
6	9.811
7	9.849
8	9.886

U-O-S BLOCK SECTION

BLOCK: DC-3 MODEL: RADFRAC (CONTINUED)

STAGE	LIQUID SUPERFICIAL VELOCITY CUM/HR/SQM
9	9.922
10	9.958
11	9.993
12	10.03
13	10.08

BLOCK: DC-4 MODEL: RADFRAC

INLETS - S-39 STAGE 3

OUTLETS - S-40 STAGE 1

S-41 STAGE 7

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	102.041	102.041	0.00000
MASS(KG/HR)	20000.0	20000.0	0.102950E-07

ENTHALPY(CAL/SEC)	-0.443470E+07	-0.444963E+07	0.335476E-02

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

U-O-S BLOCK SECTION

BLOCK: DC-4 MODEL: RADFRAC (CONTINUED)

****
**** INPUT DATA ****
****

**** INPUT PARAMETERS ****

NUMBER OF STAGES	7
ALGORITHM OPTION	STANDARD
ABSORBER OPTION	NO
INITIALIZATION OPTION	STANDARD
HYDRAULIC PARAMETER CALCULATIONS	NO
INSIDE LOOP CONVERGENCE METHOD	BROYDEN
DESIGN SPECIFICATION METHOD	NESTED
MAXIMUM NO. OF OUTSIDE LOOP ITERATIONS	25
MAXIMUM NO. OF INSIDE LOOP ITERATIONS	10
MAXIMUM NUMBER OF FLASH ITERATIONS	30
FLASH TOLERANCE	0.000100000
OUTSIDE LOOP CONVERGENCE TOLERANCE	0.000100000

**** COL-SPECS ****

MOLAR VAPOR DIST / TOTAL DIST		0.0
MOLAR REFLUX RATIO		0.60000
MASS DISTILLATE RATE	KG/HR	11,900.0

**** PROFILES ****

P-SPEC	STAGE 1	PRES, ATM		0.14804

****
**** RESULTS ****
****

*** COMPONENT SPLIT FRACTIONS ***

	OUTLET STREAMS	
	S-40	S-41
COMPONENT:		
METHANOL	1.0000	.44012E-13
EG	1.0000	.17141E-05
DMT	.62131	.37869
WATER	1.0000	.10292E-10

U-O-S BLOCK SECTION

BLOCK: DC-4 MODEL: RADFRAC (CONTINUED)

*** COMPONENT SPLIT FRACTIONS ***

	OUTLET STREAMS	
	S-40	S-41
COMPONENT:		
DEG	.99997	.29321E-04
BIS-2-01	.63845E-05	.99999
MPT	.99977	.22676E-03

*** SUMMARY OF KEY RESULTS ***

TOP STAGE TEMPERATURE	K	483.530
BOTTOM STAGE TEMPERATURE	K	498.542
TOP STAGE LIQUID FLOW	KMOL/HR	36.8221
BOTTOM STAGE LIQUID FLOW	KMOL/HR	40.6712
TOP STAGE VAPOR FLOW	KMOL/HR	0.0
BOILUP VAPOR FLOW	KMOL/HR	94.0167
MOLAR REFLUX RATIO		0.60000
MOLAR BOILUP RATIO		2.31163
CONDENSER DUTY (W/O SUBCOOL)	CAL/SEC	-385,779.
REBOILER DUTY	CAL/SEC	370,851.

```
   ****   MAXIMUM FINAL RELATIVE ERRORS   ****

    DEW POINT                       0.71207E-06  STAGE=  1

    BUBBLE POINT                    0.70457E-06  STAGE=  1

    COMPONENT MASS BALANCE          0.14330E-05  STAGE=  7 COMP=BIS-2-
01

    ENERGY BALANCE                  0.60494E-05  STAGE=  7
```

U-O-S BLOCK SECTION

BLOCK: DC-4 MODEL: RADFRAC (CONTINUED)

**** PROFILES ****

NOTE REPORTED VALUES FOR STAGE LIQUID AND VAPOR RATES ARE THE FLOWS
FROM THE STAGE INCLUDING ANY SIDE PRODUCT.

STAGE	TEMPERATURE	PRESSURE	ENTHALPY CAL/MOL		HEAT DUTY
	K	ATM	LIQUID	VAPOR	CAL/SEC
1	483.53	0.14804	-0.15386E+06	-0.13895E+06	-.38578+06
2	486.41	0.15756	-0.15373E+06	-0.13971E+06	
3	489.28	0.16709	-0.15622E+06	-0.13957E+06	
4	491.20	0.17662	-0.15606E+06	-0.13948E+06	
5	493.01	0.18614	-0.15590E+06	-0.13937E+06	
6	494.74	0.19567	-0.15578E+06	-0.13926E+06	
7	498.54	0.20520	-0.16170E+06	-0.13902E+06	.37085+06

STAGE	FLOW RATE KMOL/HR		FEED RATE KMOL/HR			PRODUCT RATE KMOL/HR	
	LIQUID	VAPOR	LIQUID	VAPOR	MIXED	LIQUID	VAPOR
1	98.19	0.000				61.3701	

2	36.09	98.19		4.1592		
3	133.7	93.30	97.8819			
4	134.4	93.05				
5	135.1	93.74				
6	134.7	94.38				
7	40.67	94.02				40.6711

**** MASS FLOW PROFILES ****

STAGE	FLOW RATE		FEED RATE			PRODUCT RATE	
	KG/HR		KG/HR			KG/HR	
	LIQUID	VAPOR	LIQUID	VAPOR	MIXED	LIQUID	VAPOR
1	0.1904E+05	0.000				.11900+05	
2	7008.	0.1904E+05		802.0835			
3	0.2617E+05	0.1811E+05	.19198+05				
4	0.2630E+05	0.1807E+05					
5	0.2643E+05	0.1820E+05					
6	0.2636E+05	0.1833E+05					
7	8100.	0.1826E+05				8099.9998	

U-O-S BLOCK SECTION

BLOCK: DC-4 MODEL: RADFRAC (CONTINUED)

**** MOLE-X-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.14234E-12	0.10856E-02	0.99730	0.30688E-10	0.15237E-02
2	0.43958E-15	0.74232E-04	0.99957	0.24125E-12	0.17429E-03
3	0.20408E-16	0.31834E-04	0.97464	0.25647E-13	0.92640E-04
4	0.93061E-19	0.31180E-05	0.97488	0.29574E-15	0.15373E-04
5	0.43209E-21	0.30600E-06	0.97502	0.34639E-17	0.25472E-05
6	0.20407E-23	0.30022E-07	0.97480	0.41170E-19	0.41925E-06
7	0.94529E-26	0.28078E-08	0.91722	0.47659E-21	0.67416E-07

**** MOLE-X-PROFILE ****

STAGE	BIS-2-01	MPT
1	0.35027E-06	0.89282E-04
2	0.16525E-03	0.15405E-04
3	0.25222E-01	0.90312E-05
4	0.25096E-01	0.22304E-05
5	0.24981E-01	0.55290E-06
6	0.25197E-01	0.13622E-06

7	0.82782E-01	0.30556E-07			

**** MOLE-Y-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.46303E-10	0.15585E-01	0.97092	0.39144E-08	0.12985E-01
2	0.14234E-12	0.10856E-02	0.99730	0.30688E-10	0.15237E-02
3	0.65660E-14	0.46885E-03	0.99861	0.32547E-11	0.80272E-03
4	0.29327E-16	0.45747E-04	0.99974	0.36856E-13	0.13310E-03
5	0.13344E-18	0.44695E-05	0.99990	0.42406E-15	0.22014E-04
6	0.61829E-21	0.43665E-06	0.99992	0.49564E-17	0.36158E-05
7	0.29195E-23	0.41795E-07	0.99971	0.58774E-19	0.57146E-06

**** MOLE-Y-PROFILE ****

STAGE	BIS-2-01	MPT
1	0.65473E-09	0.51292E-03
2	0.35027E-06	0.89282E-04
3	0.60485E-04	0.52967E-04
4	0.64206E-04	0.12965E-04
5	0.67821E-04	0.31848E-05
6	0.72400E-04	0.77799E-06
7	0.28540E-03	0.18193E-06

**** K-VALUES ****

STAGE	METHANOL	EG	DMT	WATER	DEG

1	325.30	14.356	0.97354	127.56	8.5222
2	323.81	14.624	0.99773	127.20	8.7423
3	321.74	14.728	1.0246	126.90	8.6649
4	315.14	14.672	1.0255	124.62	8.6581
5	308.81	14.606	1.0255	122.42	8.6423
6	302.97	14.544	1.0258	120.39	8.6244
7	308.84	14.885	1.0899	123.32	8.4766

U-O-S BLOCK SECTION

BLOCK: DC-4 MODEL: RADFRAC (CONTINUED)

**** K-VALUES ****

STAGE	BIS-2-01	MPT
1	0.18692E-02	5.7450
2	0.21197E-02	5.7955
3	0.23981E-02	5.8649
4	0.25585E-02	5.8130
5	0.27149E-02	5.7602
6	0.28734E-02	5.7113
7	0.34476E-02	5.9540

**** MASS-X-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.23521E-13	0.34749E-03	0.99875	0.28511E-11	0.83390E-03
2	0.72539E-16	0.23729E-04	0.99965	0.22383E-13	0.95257E-04
3	0.33415E-17	0.10097E-04	0.96716	0.23611E-14	0.50239E-04
4	0.15238E-19	0.98894E-06	0.96739	0.27226E-16	0.83366E-05
5	0.70751E-22	0.97057E-07	0.96754	0.31889E-18	0.13814E-05
6	0.33413E-24	0.95219E-08	0.96727	0.37900E-20	0.22735E-06

7	0.15209E-26	0.87506E-09	0.89432	0.43111E-22	0.35923E-07

**** MASS-X-PROFILE ****

STAGE	BIS-2-01	MPT
1	0.45925E-06	0.69148E-04
2	0.21637E-03	0.11915E-04
3	0.32769E-01	0.69308E-05
4	0.32604E-01	0.17116E-05
5	0.32456E-01	0.42431E-06
6	0.32734E-01	0.10453E-06
7	0.10568	0.23041E-07

**** MASS-Y-PROFILE ****

STAGE	METHANOL	EG	DMT	WATER	DEG
1	0.77693E-11	0.50655E-02	0.98731	0.36928E-09	0.72162E-02
2	0.23521E-13	0.34749E-03	0.99875	0.28511E-11	0.83390E-03
3	0.10842E-14	0.14996E-03	0.99929	0.30215E-12	0.43898E-03
4	0.48395E-17	0.14623E-04	0.99982	0.34195E-14	0.72744E-04
5	0.22018E-19	0.14286E-05	0.99990	0.39341E-16	0.12030E-04
6	0.10202E-21	0.13956E-06	0.99990	0.45981E-18	0.19760E-05
7	0.48169E-24	0.13358E-07	0.99963	0.54522E-20	0.31227E-06

**** MASS-Y-PROFILE ****

STAGE	BIS-2-01	MPT

1	0.87169E-09	0.40337E-03
2	0.45925E-06	0.69148E-04
3	0.79244E-04	0.40991E-04
4	0.84068E-04	0.10028E-04
5	0.88795E-04	0.24630E-05
6	0.94788E-04	0.60166E-06
7	0.37363E-03	0.14069E-06

U-O-S BLOCK SECTION

BLOCK: DC-4 MODEL: RADFRAC (CONTINUED)

****
***** HYDRAULIC PARAMETERS *****
****

*** DEFINITIONS ***

MARANGONI INDEX = SIGMA - SIGMATO

FLOW PARAM = (ML/MV)*SQRT(RHOV/RHOL)

QR = QV*SQRT(RHOV/(RHOL-RHOV))

F FACTOR = QV*SQRT(RHOV)

WHERE:

SIGMA IS THE SURFACE TENSION OF LIQUID FROM THE STAGE

SIGMATO IS THE SURFACE TENSION OF LIQUID TO THE STAGE

ML IS THE MASS FLOW OF LIQUID FROM THE STAGE

MV IS THE MASS FLOW OF VAPOR TO THE STAGE

RHOL IS THE MASS DENSITY OF LIQUID FROM THE STAGE

RHOV IS THE MASS DENSITY OF VAPOR TO THE STAGE

QV IS THE VOLUMETRIC FLOW RATE OF VAPOR TO THE STAGE

TEMPERATURE

K

STAGE	LIQUID FROM	VAPOR TO
1	483.53	486.41
2	486.41	489.28
3	489.28	491.20
4	491.20	493.01
5	493.01	494.74
6	494.74	498.54
7	498.54	498.54

	MASS FLOW		VOLUME FLOW		MOLECULAR WEIGHT	
	KG/HR		L/MIN			
STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO
1	19040.	19040.	308.14	0.41456E+06	193.91	193.91
2	7008.2	18908.	113.74	0.41390E+06	194.17	194.00
3	26169.	18069.	423.78	0.35393E+06	195.69	194.17
4	26304.	18204.	426.85	0.33955E+06	195.69	194.19
5	26428.	18328.	429.70	0.32636E+06	195.69	194.19
6	26358.	18258.	429.36	0.31239E+06	195.70	194.20
7	8100.0	0.0000	130.92	0.0000	199.16	

	DENSITY	VISCOSITY	SURFACE TENSION
	GM/CC	CP	DYNE/CM

STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM
1	1.0298	0.76548E-03	0.54533	0.99041E-02	21.657
2	1.0270	0.76138E-03	0.53291	0.99545E-02	21.382
3	1.0292	0.85085E-03	0.52271	0.99865E-02	21.625
4	1.0271	0.89353E-03	0.51470	0.10019E-01	21.447
5	1.0250	0.93597E-03	0.50733	0.10050E-01	21.281

U-O-S BLOCK SECTION

BLOCK: DC-4 MODEL: RADFRAC (CONTINUED)

	DENSITY		VISCOSITY		SURFACE TENSION
	GM/CC		CP		DYNE/CM
STAGE	LIQUID FROM	VAPOR TO	LIQUID FROM	VAPOR TO	LIQUID FROM
6	1.0232	0.97413E-03	0.50040	0.10119E-01	21.127
7	1.0312		0.48878		21.903

	MARANGONI INDEX	FLOW PARAM	QR	REDUCED F-FACTOR
STAGE	DYNE/CM		L/MIN	(GM-L)**.5/MIN
1		0.27263E-01	11306.	0.36270E+06
2	-.27482	0.10092E-01	11274.	0.36116E+06
3	-.75841E-01	0.41642E-01	10181.	0.32647E+06
4	-.17795	0.42620E-01	10019.	0.32096E+06
5	-.16650	0.43572E-01	9866.2	0.31574E+06
6	-.15345	0.44544E-01	9643.5	0.30832E+06
7	0.77601		0.0000	0.0000

****

***** PACKING SIZING CALCULATIONS *****

****

****

*** SECTION 1 ***

****

STARTING STAGE NUMBER		2
ENDING STAGE NUMBER		6
CAPACITY CALCULATION METHOD		WALLIS
PRESSURE DROP CALCULATION METHOD		WALLIS
LIQUID HOLDUP CALCULATION METHOD		STICHL
PRESSURE PROFILE UPDATED		NO

DESIGN PARAMETERS

OVERDESIGN FACTOR		1.00000
SYSTEM FOAMING FACTOR		1.00000
FRAC. APP. TO MAXIMUM CAPACITY		0.80000
MAXIMUM CAPACITY FACTOR	M/SEC	MISSING
DESIGN CAPACITY FACTOR	M/SEC	MISSING
PRESSURE DROP FOR THE SECTION	ATM	MISSING
PRESSURE DROP PER UNIT HEIGHT	MM-WATER/M	MISSING

U-O-S BLOCK SECTION

BLOCK: DC-4 MODEL: RADFRAC (CONTINUED)

PACKING SPECIFICATIONS

PACKING TYPE		PALL-RING
PACKING MATERIAL		METAL
PACKING SIZE		1.5-IN
VENDOR		GENERIC
PACKING FACTOR	1/M	92.0000
PACKING SURFACE AREA	SQCM/CC	1.30000
PACKING VOID FRACTION		0.95000
FIRST STICHLMAIR CONSTANT		1.00589
SECOND STICHLMAIR CONSTANT		1.11407
THIRD STICHLMAIR CONSTANT		2.98252
HETP	METER	2.49936
PACKING HEIGHT	METER	12.4968

***** SIZING RESULTS *****

COLUMN DIAMETER	METER	1.59942
MAXIMUM FRACTIONAL CAPACITY		0.80000
MAXIMUM CAPACITY FACTOR	M/SEC	0.093523
PRESSURE DROP FOR THE SECTION	ATM	0.074605
AVERAGE PRESSURE DROP/HEIGHT	MM-WATER/M	61.6825

MAXIMUM LIQUID HOLDUP/STAGE	L	185.677
MAX LIQ SUPERFICIAL VELOCITY	CUM/HR/SQM	12.8321

**** RATING PROFILES AT MAXIMUM COLUMN DIAMETER ****

STAGE	HEIGHT FROM TOP OF SECTION METER	FRACTIONAL CAPACITY	PRESSURE DROP ATM	PRESSURE DROP/HEIGHT MM-WATER/M	LIQUID HOLDUP L	HETP METER
2	0.000	0.7665	0.14744E-01	60.188	75.72	2.499
3	2.499	0.8000	0.15914E-01	64.938	185.7	2.499
4	4.999	0.7898	0.15297E-01	62.346	185.2	2.499
5	7.498	0.7801	0.14735E-01	59.977	184.9	2.499
6	9.997	0.7649	0.13914E-01	56.547	183.0	2.499

STAGE	LIQUID SUPERFICIAL VELOCITY CUM/HR/SQM
2	3.397
3	12.66
4	12.75
5	12.83
6	12.82

```
BLOCK:  DEBALER  MODEL: SEP
---------------------------
  INLET STREAM:          PPS-1
  OUTLET STREAMS:        PPS-3       PPS-2
  PROPERTY OPTION SET:   NRTL      RENON (NRTL) / IDEAL GAS
```

U-O-S BLOCK SECTION

BLOCK: DEBALER MODEL: SEP (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	171.634	171.634	0.00000
MASS(KG/HR)	26655.0	26655.0	-0.136484E-15
ENTHALPY(CAL/SEC)	-0.235841E+07	-0.235841E+07	0.00000

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR STREAM PPS-3

TWO PHASE TP FLASH		
PRESSURE DROP	ATM	0.0
MAXIMUM NO. ITERATIONS		30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR STREAM PPS-2

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= PPS-2	CPT=	PET	FRACTION=	0.0
		HDPE		0.0
		ALUM		0.0
		IRON		0.75000
		POLY(-01		0.0

SUBSTREAM= CIPSD

STREAM= PPS-3	CPT=	PET	FRACTION=	1.00000
		HDPE		1.00000
		ALUM		1.00000
		IRON		0.25000
		POLY(-01		1.00000

U-O-S BLOCK SECTION

BLOCK: DEBALER MODEL: SEP (CONTINUED)

*** RESULTS ***

HEAT DUTY	CAL/SEC	0.0000

COMPONENT = PET

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-3	MIXED	1.00000
PPS-3	CIPSD	1.00000

COMPONENT = HDPE

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-3	CIPSD	1.00000

COMPONENT = ALUM

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-3	CIPSD	1.00000

COMPONENT = IRON

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-3	CIPSD	0.25000
PPS-2	CIPSD	0.75000

COMPONENT = POLY(-01

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-3	CIPSD	1.00000

BLOCK: DEC-1 MODEL: SEP

INLET STREAM:	S-31	
OUTLET STREAMS:	S-32	S-35
PROPERTY OPTION SET:	NRTL	RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	353.076	353.076	-0.160995E-15
MASS(KG/HR)	23114.7	23114.7	-0.157388E-15
ENTHALPY(CAL/SEC)	-0.107834E+08	-0.107836E+08	0.171235E-04

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

U-O-S BLOCK SECTION

BLOCK: DEC-1 MODEL: SEP (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM S-32

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR STREAM S-35

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= S-32	CPT=	METHANOL	FRACTION= 0.48551
		EG	0.37631
		DMT	0.16509
		WATER	0.27073
		DEG	0.45719

BIS-2-01	0.0
MPT	0.10832

*** RESULTS ***

HEAT DUTY	CAL/SEC	-184.62

COMPONENT = METHANOL

STREAM	SUBSTREAM	SPLIT FRACTION
S-32	MIXED	0.48551
S-35	MIXED	0.51449

COMPONENT = EG

STREAM	SUBSTREAM	SPLIT FRACTION
S-32	MIXED	0.37631
S-35	MIXED	0.62369

COMPONENT = DMT

STREAM	SUBSTREAM	SPLIT FRACTION
S-32	MIXED	0.16509
S-35	MIXED	0.83491

U-O-S BLOCK SECTION

BLOCK: DEC-1 MODEL: SEP (CONTINUED)

COMPONENT = WATER

STREAM	SUBSTREAM	SPLIT FRACTION
S-32	MIXED	0.27073
S-35	MIXED	0.72927

COMPONENT = DEG

STREAM	SUBSTREAM	SPLIT FRACTION
S-32	MIXED	0.45719
S-35	MIXED	0.54281

COMPONENT = BIS-2-01

STREAM	SUBSTREAM	SPLIT FRACTION
S-35	MIXED	1.00000

COMPONENT = MPT

STREAM	SUBSTREAM	SPLIT FRACTION
S-32	MIXED	0.10832
S-35	MIXED	0.89168

BLOCK: DEC-2 MODEL: SEP

INLET STREAM: S-35

OUTLET STREAMS: S-36 S-37

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	223.020	223.020	0.127440E-15
MASS(KG/HR)	14847.6	14847.6	0.245021E-15
ENTHALPY(CAL/SEC)	-0.679142E+07	-0.679491E+07	0.513763E-03

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

U-O-S BLOCK SECTION

BLOCK: DEC-2 MODEL: SEP (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM S-36

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR STREAM S-37

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= S-36 CPT= MPT FRACTION= 1.00000

*** RESULTS ***

HEAT DUTY	CAL/SEC	-3491.0

COMPONENT = METHANOL

STREAM	SUBSTREAM	SPLIT FRACTION
S-37	MIXED	1.00000

COMPONENT = EG

STREAM	SUBSTREAM	SPLIT FRACTION
S-37	MIXED	1.00000

COMPONENT = DMT

STREAM	SUBSTREAM	SPLIT FRACTION
S-37	MIXED	1.00000

COMPONENT = WATER

STREAM	SUBSTREAM	SPLIT FRACTION
S-37	MIXED	1.00000

COMPONENT = DEG

STREAM	SUBSTREAM	SPLIT FRACTION
S-37	MIXED	1.00000

COMPONENT = BIS-2-01

STREAM	SUBSTREAM	SPLIT FRACTION
S-37	MIXED	1.00000

U-O-S BLOCK SECTION

BLOCK: DEC-2 MODEL: SEP (CONTINUED)

COMPONENT = MPT

STREAM	SUBSTREAM	SPLIT FRACTION
S-36	MIXED	1.00000

BLOCK: DEWATER MODEL: CFUGE

INLET STREAM: PPS-26

OUTLET STREAMS: PPS-27 PPS-28

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	468.550	468.550	0.00000
MASS(KG/HR)	19883.4	19883.4	0.00000
ENTHALPY(CAL/SEC)	-0.866359E+07	-0.852028E+07	-0.165414E-01

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR

UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

CALCULATION METHOD	SOLIDS SEPARATOR
CLASSIFICATION CHARACTERISTIC	SETTLING VELOCITY
FLUID RECOVERY TO FLUID OUTLET	0.80000
SOLIDS RECOVERY TO SOLIDS OUTLET	1.00000
SEPARATION SHARPNESS	0.0
FINES OFFSET	0.0

TWO PHASE PQ FLASH

SPECIFIED PRESSURE	ATM	1.00000
SPECIFIED HEAT DUTY	CAL/SEC	143,308.
MAXIMUM NO. ITERATIONS		30
CONVERGENCE TOLERANCE		0.000100000

*** RESULTS ***

FLUID FRACTION TO FLUID OUTLET	0.80000
SOLIDS FRACTION TO SOLID OUTLET	1.00000
SOLIDS LOAD OF FLUID	0.0
FLUID LOAD OF SOLIDS	0.10017

SEPARATION EFFICIENCY FOR SUBSTREAM CIPSD

PARTICLE SIZE METER	EFFICIENCY
0.10741E-02	1.0000

0.12332E-02 0.10000E+36

0.14159E-02 0.10000E+36

0.16257E-02 0.10000E+36

0.18665E-02 0.10000E+36

0.21431E-02 0.10000E+36

0.24606E-02 0.10000E+36

0.28251E-02 0.10000E+36

0.32437E-02 0.10000E+36

0.37242E-02 0.10000E+36

0.42760E-02 0.10000E+36

0.49095E-02 0.10000E+36

0.56368E-02 0.10000E+36

0.64720E-02 0.10000E+36

0.74308E-02 0.10000E+36

0.85317E-02 0.10000E+36

0.97957E-02 0.10000E+36

0.11247E-01 0.10000E+36

0.12913E-01 0.10000E+36

0.14826E-01 0.10000E+36

0.17023E-01 0.10000E+36

0.19545E-01 0.10000E+36

0.22441E-01 0.10000E+36

0.25765E-01 0.10000E+36

0.29583E-01 0.10000E+36

0.33965E-01 0.10000E+36

0.38997E-01 0.10000E+36

0.44775E-01 0.10000E+36

0.51409E-01 0.10000E+36

0.59025E-01 0.10000E+36

0.67770E-01 0.10000E+36

0.77810E-01	0.10000E+36
0.89338E-01	0.10000E+36
0.10257	0.10000E+36
0.11777	0.10000E+36
0.13522	0.10000E+36
0.15525	0.10000E+36
0.17825	0.10000E+36
0.20466	0.10000E+36
0.23498	0.10000E+36
0.26980	0.10000E+36
0.30977	0.10000E+36
0.35566	0.10000E+36
0.40835	0.10000E+36
0.46885	0.10000E+36
0.53831	0.10000E+36
0.61807	0.10000E+36
0.70964	0.10000E+36
0.81477	0.10000E+36
0.93548	0.10000E+36

U-O-S BLOCK SECTION

BLOCK: EVAP MODEL: FLASH2

INLET STREAM: S-11

OUTLET VAPOR STREAM: S-12

OUTLET LIQUID STREAM: S-22

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1415.50	1415.50	-0.160632E-15
MASS(KG/HR)	66419.3	66419.3	0.101001E-12
ENTHALPY(CAL/SEC)	-0.257277E+08	-0.231016E+08	-0.102072

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

TWO PHASE TP FLASH

SPECIFIED TEMPERATURE K 413.150

SPECIFIED PRESSURE ATM 0.14804

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

*** RESULTS ***

OUTLET TEMPERATURE K 413.15

OUTLET PRESSURE ATM 0.14804

HEAT DUTY CAL/SEC
0.26261E+07

VAPOR FRACTION 0.98245

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
METHANOL	0.82941	0.12808E-01	0.84400	65.897
EG	0.88699E-01	0.74968E-01	0.88944E-01	1.1864
DMT	0.70628E-01	0.77195	0.58100E-01	0.75264E-01
WATER	0.69453E-02	0.30655E-03	0.70639E-02	23.043
DEG	0.19342E-02	0.42150E-02	0.18934E-02	0.44921
BIS-2-01	0.23833E-02	0.13575	0.89713E-06	0.66088E-05
MPT	0.83601E-09	0.12106E-08	0.82932E-09	0.68507

U-O-S BLOCK SECTION

BLOCK: FILMFLAK MODEL: SEP

INLET STREAM: PPS-14

OUTLET STREAMS: PPS-16 PPS-15

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	340.498	340.498	0.166942E-15
MASS(KG/HR)	18018.0	18018.0	0.201908E-15
ENTHALPY(CAL/SEC)	-0.502938E+07	-0.502938E+07	0.185177E-15

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR STREAM PPS-16

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR STREAM PPS-15

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= PPS-16 CPT= PET FRACTION= 1.00000

HDPE 1.00000

SUBSTREAM= CIPSD

STREAM= PPS-16 CPT= PET FRACTION= 1.00000

HDPE 1.00000

U-O-S BLOCK SECTION

BLOCK: FILMFLAK MODEL: SEP (CONTINUED)

*** RESULTS ***

HEAT DUTY CAL/SEC -0.88977E-09

COMPONENT = PET

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-16	CIPSD	1.00000

COMPONENT = HDPE

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-16	CIPSD	1.00000

COMPONENT = WATER

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-15	MIXED	1.00000

COMPONENT = POLY(-01

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-15	CIPSD	1.00000

BLOCK: FRICWASH MODEL: SWASH

INLET STREAMS: PPS-23 PPS-24

OUTLET STREAMS: PPS-26 PPS-25

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	871.402	871.402	0.00000
MASS(KG/HR)	27140.9	27140.9	0.00000
ENTHALPY(CAL/SEC)	-0.161616E+08	-0.161616E+08	-0.150186E-06

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

MIXING EFFICIENCY		1.0000
LIQUID TO SOLID RATIO		0.57480
DUTY	CAL/SEC	0.0000
MAXIMUM NO. OF FLASH ITERATION		30
FLASH TOLERANCE		0.10000E-03
MAXIMUM NO. OF ITERATION		30
CONVERGENCE TOLERANCE		0.10000E-03

U-O-S BLOCK SECTION

BLOCK: FRICWASH MODEL: SWASH (CONTINUED)

*** RESULTS ***

BYPASS FRACTION		0.0000
OUTLET TEMPERATURE	K	366.32

BLOCK: HOTWASH MODEL: SWASH

INLET STREAMS:	PPS-20	PPS-21
OUTLET STREAMS:	PPS-23	PPS-22
PROPERTY OPTION SET:	NRTL	RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1293.63	1293.63	0.00000
MASS(KG/HR)	34747.4	34747.4	0.00000
ENTHALPY(CAL/SEC)	-0.240631E+08	-0.240630E+08	-0.120400E-05

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR

UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

MIXING EFFICIENCY		1.0000
LIQUID TO SOLID RATIO		0.57480
DUTY	CAL/SEC	0.0000
MAXIMUM NO. OF FLASH ITERATION		30
FLASH TOLERANCE		0.10000E-03
MAXIMUM NO. OF ITERATION		30
CONVERGENCE TOLERANCE		0.10000E-03

*** RESULTS ***

BYPASS FRACTION		0.0000
OUTLET TEMPERATURE	K	360.00

U-O-S BLOCK SECTION

BLOCK: HX-1 MODEL: HEATX

THIS BLOCK RUNS WITH ASPEN EDR 38.0 WITH ADVANCED METHOD FOR SHELL&TUBE

HOT SIDE:

INLET STREAM: S-13

OUTLET STREAM: S-16

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

COLD SIDE:

INLET STREAM: S-14

OUTLET STREAM: S-15

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

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*****************************************************************
*
     *
*
     *     A POTENTIAL TUBE VIBRATIEON PROBLEM IS INDICATED
*
     *
*

*****************************************************************
*
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*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	208771.	208771.	0.00000
MASS(KG/HR)	0.379737E+07	0.379737E+07	0.00000
ENTHALPY(CAL/SEC)	-0.394524E+10	-0.394524E+10	-0.605150E-10

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR HOT SIDE:

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE 0.000100000

FLASH SPECS FOR COLD SIDE:

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

```
   CONVERGENCE TOLERANCE
0.000100000
```

U-O-S BLOCK SECTION

BLOCK: HX-1 MODEL: HEATX (CONTINUED)

SHELL&TUBE INPUT FILE NAME
B7.EDR

SHELL&TUBE PROGRAM MODE
SIMULATION

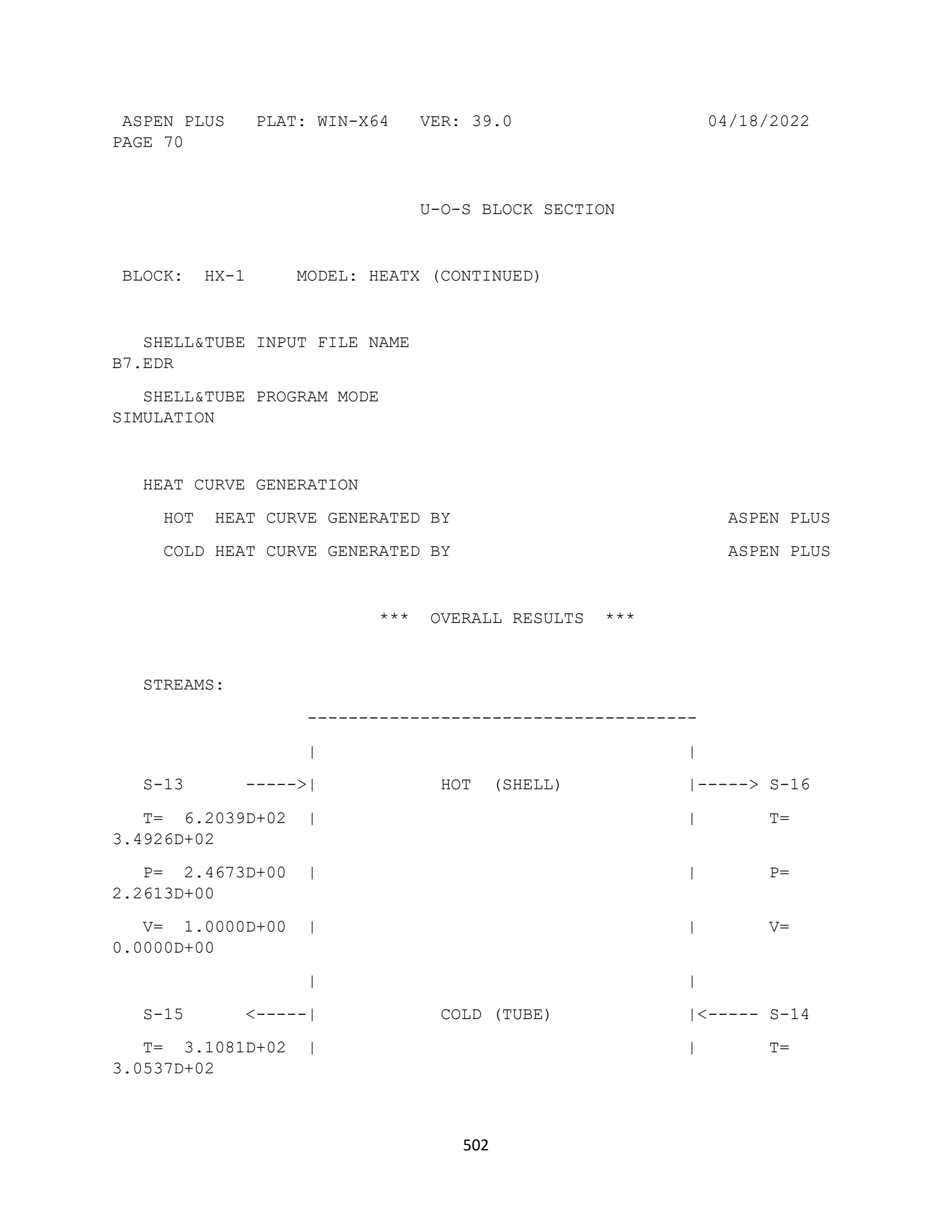
HEAT CURVE GENERATION

HOT HEAT CURVE GENERATED BY ASPEN PLUS

COLD HEAT CURVE GENERATED BY ASPEN PLUS

*** OVERALL RESULTS ***

STREAMS:



P= 2.9093D-01 | | P= 1.0000D+00

V= 0.0000D+00 | | V= 0.0000D+00

UNIT RESULTS:

CALCULATED HEAT DUTY	CAL/SEC	5609125.0551
CALCULATED (REQUIRED) AREA	SQM	568.1034
ACTUAL EXCHANGER AREA	SQM	568.2127
% OVER (UNDER) DESIGN		0.0192
AVERAGE COEFFICIENT	CAL/SEC-SQCM-K	0.0120
UA	CAL/SEC-K	68289.4819
LMTD (CORRECTED)	K	82.1375
LMTD CORRECTION FACTOR		0.6046
NUMBER OF SHELLS IN SERIES		1
NUMBER OF SHELLS IN PARALLEL		1
HIGH RHOV2 INDICATION		YES
VIBRATION INDICATION		YES

SHELLSIDE RESULTS:

MEAN SHELL METAL TEMPERATURE	K	399.8477
TOTAL PRESSURE DROP	ATM	0.2060
WINDOW PRESSURE DROP	ATM	0.0818
CROSSFLOW PRESSURE DROP	ATM	0.0913
BULK FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0311
WALL FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0311

THERMAL RESISTANCE	SEC-SQCM-K/CAL	32.1723
MAXIMUM FOULING RESISTANCE	SEC-SQCM-K/CAL	14.753134
FOULING RESISTANCE	SEC-SQCM-K/CAL	14.7475
CROSSFLOW VELOCITY	M/SEC	20.2553
WINDOW VELOCITY	M/SEC	32.9176
MIDPOINT VELOCITY	M/SEC	26.5865
SHELL ENTRANCE RHOV^2	KG/M-SQSEC	1226.4345
SHELL EXIT RHOV^2	KG/M-SQSEC	246.1176
BUNDLE ENTRANCE RHOV^2	KG/M-SQSEC	4717.9922
BUNDLE EXIT RHOV^2	KG/M-SQSEC	121.0539
FOULING % OF OVERALL RESISTANCE		17.7273
FILM % OF OVERALL RESISTANCE		38.6730
FRICTIONAL PRESSURE DROP	ATM	0.2075

U-O-S BLOCK SECTION

BLOCK: HX-1 MODEL: HEATX (CONTINUED)

TUBESIDE RESULTS:

MEAN TUBE METAL TEMPERATURE	K	340.6065
TOTAL PRESSURE DROP	ATM	0.7091
BULK FILM COEFFICIENT	CAL/SEC-SQCM-K	0.2542
WALL FILM COEFFICIENT	CAL/SEC-SQCM-K	0.2542
THERMAL RESISTANCE	SEC-SQCM-K/CAL	3.9343
MAXIMUM FOULING RESISTANCE	SEC-SQCM-K/CAL	26.769799
FOULING RESISTANCE	SEC-SQCM-K/CAL	26.7595
INPUT VELOCITY	M/SEC	3.2540
OUTLET VELOCITY	M/SEC	3.2716
FOULING % OF OVERALL RESISTANCE		32.1665
FILM % OF OVERALL RESISTANCE		4.7292
FRICTIONAL PRESSURE DROP	ATM	0.7085

U-O-S BLOCK SECTION

HEATX COLD-TQCU HX-1 TQCURV INLET

PRESSURE PROFILE: CONSTANT2

PRESSURE DROP: -0.7091 ATM

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

DUTY	PRES	TEMP	VFRAC
CAL/SEC	ATM	K	
0.0	1.0000	310.8140	0.0
2.6710+05	1.0000	310.5555	0.0
5.3420+05	1.0000	310.2970	0.0
8.0130+05	1.0000	310.0384	0.0
1.0003+06	1.0000	309.8457	0.0
1.0684+06	1.0000	309.7797	0.0
1.3355+06	1.0000	309.5210	0.0
1.6026+06	1.0000	309.2622	0.0
1.8697+06	1.0000	309.0034	0.0
2.1368+06	1.0000	308.7444	0.0

```
!  2.4039+06 !     1.0000 !   308.4854 !     0.0    !
!  2.6710+06 !     1.0000 !   308.2264 !     0.0    !
!  2.9381+06 !     1.0000 !   307.9672 !     0.0    !
!  3.2052+06 !     1.0000 !   307.7080 !     0.0    !
!  3.4723+06 !     1.0000 !   307.4488 !     0.0    !
!------------+------------+------------+------------!
!  3.7394+06 !     1.0000 !   307.1894 !     0.0    !
!  4.0065+06 !     1.0000 !   306.9300 !     0.0    !
!  4.2736+06 !     1.0000 !   306.6706 !     0.0    !
!  4.5407+06 !     1.0000 !   306.4110 !     0.0    !
!  4.8078+06 !     1.0000 !   306.1514 !     0.0    !
!------------+------------+------------+------------!
!  5.0749+06 !     1.0000 !   305.8918 !     0.0    !
!  5.3281+06 !     1.0000 !   305.6455 !     0.0    !
!  5.3420+06 !     1.0000 !   305.6320 !     0.0    !
!  5.6091+06 !     1.0000 !   305.3722 !     0.0    !
-------------------------------------------------------
```

U-O-S BLOCK SECTION

HEATX HOT-TQCUR HX-1 TQCURV INLET

PRESSURE PROFILE: CONSTANT2

PRESSURE DROP: 0.0 ATM

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

DUTY	PRES	TEMP	VFRAC
CAL/SEC	ATM	K	
0.0	2.4673	620.3938	1.0000
2.6710+05	2.4673	587.0642	1.0000
5.3420+05	2.4673	552.5192	1.0000
8.0130+05	2.4673	516.5315	1.0000
1.0003+06	2.4673	488.6063	DEW>1.0000
1.0684+06	2.4673	484.9388	0.9917
1.3355+06	2.4673	469.6665	0.9600
1.6026+06	2.4673	453.4917	0.9280
1.8697+06	2.4673	438.3780	0.8924
2.1368+06	2.4673	423.6386	0.8540

```
!  2.4039+06 !     2.4673 !   407.8179 !     0.8133 !
!  2.6710+06 !     2.4673 !   391.7836 !     0.7662 !
!  2.9381+06 !     2.4673 !   379.3396 !     0.7065 !
!  3.2052+06 !     2.4673 !   372.0968 !     0.6356 !
!  3.4723+06 !     2.4673 !   368.2836 !     0.5590 !
!------------+------------+------------+------------!
!  3.7394+06 !     2.4673 !   366.2187 !     0.4801 !
!  4.0065+06 !     2.4673 !   365.0363 !     0.4002 !
!  4.2736+06 !     2.4673 !   364.3246 !     0.3198 !
!  4.5407+06 !     2.4673 !   363.8792 !     0.2390 !
!  4.8078+06 !     2.4673 !   363.5922 !     0.1581 !
!------------+------------+------------+------------!
!  5.0749+06 !     2.4673 !   363.4033 !  7.7012-02 !
!  5.3281+06 !     2.4673 !   363.2825 ! BUB>0.0    !
!  5.3420+06 !     2.4673 !   362.5706 !     0.0    !
!  5.6091+06 !     2.4673 !   349.2585 !     0.0    !
-----------------------------------------------------
```

U-O-S BLOCK SECTION

BLOCK: HX-2 MODEL: HEATX

THIS BLOCK RUNS WITH ASPEN EDR 38.0 WITH ADVANCED METHOD FOR SHELL&TUBE

HOT SIDE:

INLET STREAM: S-17

OUTLET STREAM: S-20

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

COLD SIDE:

INLET STREAM: S-18

OUTLET STREAM: S-19

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	3244.04	3244.04	0.00000
MASS(KG/HR)	74896.1	74896.1	0.194295E-15
ENTHALPY(CAL/SEC)	-0.572883E+08	-0.572883E+08	0.105146E-07

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR HOT SIDE:

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR COLD SIDE:

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

SHELL&TUBE INPUT FILE NAME

MEOHHX_1.EDR

SHELL&TUBE PROGRAM MODE
SIMULATION

HEAT CURVE GENERATION

HOT HEAT CURVE GENERATED BY ASPEN PLUS

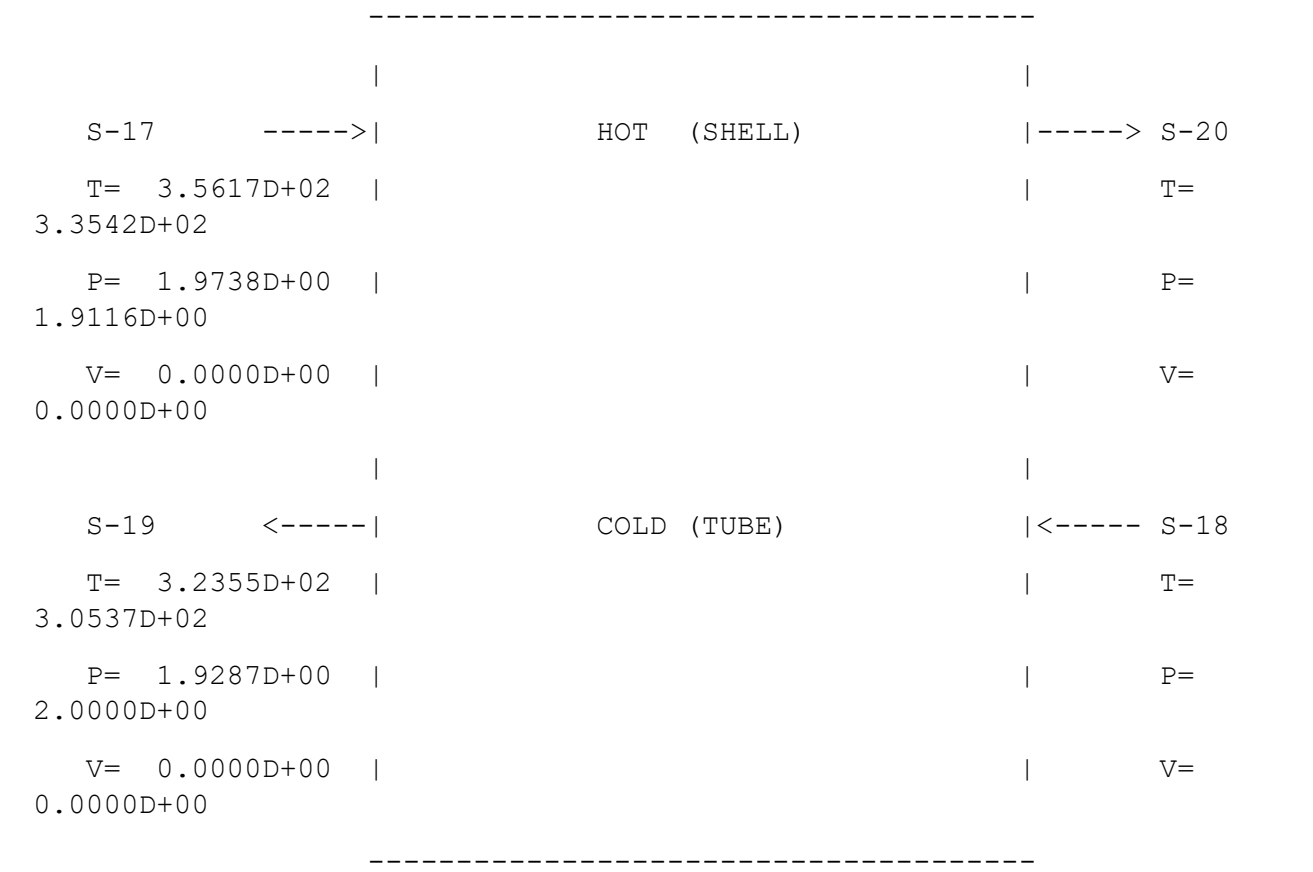
COLD HEAT CURVE GENERATED BY ASPEN PLUS

*** OVERALL RESULTS ***

U-O-S BLOCK SECTION

BLOCK: HX-2 MODEL: HEATX (CONTINUED)

STREAMS:



UNIT RESULTS:

CALCULATED HEAT DUTY	CAL/SEC	187704.2973
CALCULATED (REQUIRED) AREA	SQM	49.9180
ACTUAL EXCHANGER AREA	SQM	49.9013
% OVER (UNDER) DESIGN		-0.0336
AVERAGE COEFFICIENT	CAL/SEC-SQCM-K	0.0130
UA	CAL/SEC-K	6493.2039

LMTD (CORRECTED)	K	28.9078
LMTD CORRECTION FACTOR		0.9348
NUMBER OF SHELLS IN SERIES		1
NUMBER OF SHELLS IN PARALLEL		1
HIGH RHOV2 INDICATION		YES
VIBRATION INDICATION		NO

SHELLSIDE RESULTS:

MEAN SHELL METAL TEMPERATURE	K	344.3601
TOTAL PRESSURE DROP	ATM	0.0622
WINDOW PRESSURE DROP	ATM	0.0165
CROSSFLOW PRESSURE DROP	ATM	0.0254
BULK FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0522
WALL FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0522
THERMAL RESISTANCE	SEC-SQCM-K/CAL	19.1618
MAXIMUM FOULING RESISTANCE	SEC-SQCM-K/CAL	14.738634
FOULING RESISTANCE	SEC-SQCM-K/CAL	14.7475
CROSSFLOW VELOCITY	M/SEC	0.4425
WINDOW VELOCITY	M/SEC	0.4383
MIDPOINT VELOCITY	M/SEC	0.4404
SHELL ENTRANCE RHOV^2	KG/M-SQSEC	680.8555

SHELL EXIT RHOV^2 KG/M-SQSEC
288.5383

BUNDLE ENTRANCE RHOV^2 KG/M-SQSEC
80.4378

BUNDLE EXIT RHOV^2 KG/M-SQSEC
77.4450

FOULING % OF OVERALL RESISTANCE
19.1831

FILM % OF OVERALL RESISTANCE
24.9252

FRICTIONAL PRESSURE DROP ATM
0.0623

U-O-S BLOCK SECTION

BLOCK: HX-2 MODEL: HEATX (CONTINUED)

TUBESIDE RESULTS:

MEAN TUBE METAL TEMPERATURE	K	331.3018
TOTAL PRESSURE DROP	ATM	0.0713
BULK FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0792
WALL FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0792
THERMAL RESISTANCE	SEC-SQCM-K/CAL	12.6223
MAXIMUM FOULING RESISTANCE	SEC-SQCM-K/CAL	28.392060
FOULING RESISTANCE	SEC-SQCM-K/CAL	28.4090
INPUT VELOCITY	M/SEC	0.7294
OUTLET VELOCITY	M/SEC	0.7428
FOULING % OF OVERALL RESISTANCE		36.9537
FILM % OF OVERALL RESISTANCE		16.4187
FRICTIONAL PRESSURE DROP	ATM	0.0712

U-O-S BLOCK SECTION

HEATX COLD-TQCU HX-2 TQCURV INLET

PRESSURE PROFILE: CONSTANT2

PRESSURE DROP: -7.1271-02 ATM

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

DUTY	PRES	TEMP	VFRAC
CAL/SEC	ATM	K	
0.0	2.0000	323.5507	0.0
8938.2999	2.0000	322.6933	0.0
1.7877+04	2.0000	321.8351	0.0
2.6815+04	2.0000	320.9760	0.0
3.5753+04	2.0000	320.1161	0.0
4.4691+04	2.0000	319.2553	0.0
5.3630+04	2.0000	318.3936	0.0
6.2568+04	2.0000	317.5312	0.0
7.1506+04	2.0000	316.6679	0.0
8.0445+04	2.0000	315.8037	0.0

```
!  8.9383+04 !     2.0000 !   314.9388 !     0.0    !
!  9.8321+04 !     2.0000 !   314.0730 !     0.0    !
!  1.0726+05 !     2.0000 !   313.2065 !     0.0    !
!  1.1620+05 !     2.0000 !   312.3391 !     0.0    !
!  1.2514+05 !     2.0000 !   311.4709 !     0.0    !
!------------+------------+------------+------------!
!  1.3407+05 !     2.0000 !   310.6020 !     0.0    !
!  1.4301+05 !     2.0000 !   309.7323 !     0.0    !
!  1.5195+05 !     2.0000 !   308.8618 !     0.0    !
!  1.6089+05 !     2.0000 !   307.9905 !     0.0    !
!  1.6983+05 !     2.0000 !   307.1185 !     0.0    !
!------------+------------+------------+------------!
!  1.7877+05 !     2.0000 !   306.2458 !     0.0    !
!  1.8770+05 !     2.0000 !   305.3723 !     0.0    !
-----------------------------------------------------
```

U-O-S BLOCK SECTION

HEATX HOT-TQCUR HX-2 TQCURV INLET

PRESSURE PROFILE: CONSTANT2

PRESSURE DROP: 0.0 ATM

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

DUTY	PRES	TEMP	VFRAC
CAL/SEC	ATM	K	
0.0	1.9738	356.1653	0.0
8938.2999	1.9738	355.2214	0.0
1.7877+04	1.9738	354.2735	0.0
2.6815+04	1.9738	353.3214	0.0
3.5753+04	1.9738	352.3651	0.0
4.4691+04	1.9738	351.4045	0.0
5.3630+04	1.9738	350.4397	0.0
6.2568+04	1.9738	349.4705	0.0
7.1506+04	1.9738	348.4970	0.0
8.0445+04	1.9738	347.5190	0.0

```
!  8.9383+04 !     1.9738 !   346.5365 !     0.0    !
!  9.8321+04 !     1.9738 !   345.5494 !     0.0    !
!  1.0726+05 !     1.9738 !   344.5577 !     0.0    !
!  1.1620+05 !     1.9738 !   343.5614 !     0.0    !
!  1.2514+05 !     1.9738 !   342.5604 !     0.0    !
!------------+------------+------------+------------!
!  1.3407+05 !     1.9738 !   341.5545 !     0.0    !
!  1.4301+05 !     1.9738 !   340.5438 !     0.0    !
!  1.5195+05 !     1.9738 !   339.5282 !     0.0    !
!  1.6089+05 !     1.9738 !   338.5077 !     0.0    !
!  1.6983+05 !     1.9738 !   337.4820 !     0.0    !
!------------+------------+------------+------------!
!  1.7877+05 !     1.9738 !   336.4513 !     0.0    !
!  1.8770+05 !     1.9738 !   335.4154 !     0.0    !
-----------------------------------------------------
```

U-O-S BLOCK SECTION

BLOCK: HX-3 MODEL: HEATX

THIS BLOCK RUNS WITH ASPEN EDR 38.0 WITH ADVANCED METHOD FOR SHELL&TUBE

HOT SIDE:

INLET STREAM: S-42

OUTLET STREAM: S-45

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

COLD SIDE:

INLET STREAM: S-43

OUTLET STREAM: S-44

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	103732.	103732.	0.00000
MASS(KG/HR)	0.187613E+07	0.187613E+07	0.00000
ENTHALPY(CAL/SEC)	-0.196430E+10	-0.196430E+10	-0.587089E-09

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR HOT SIDE:

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR COLD SIDE:

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

SHELL&TUBE INPUT FILE NAME
B15.EDR

SHELL&TUBE PROGRAM MODE
SIMULATION

HEAT CURVE GENERATION

HOT HEAT CURVE GENERATED BY ASPEN PLUS

COLD HEAT CURVE GENERATED BY ASPEN PLUS

*** OVERALL RESULTS ***

U-O-S BLOCK SECTION

BLOCK: HX-3 MODEL: HEATX (CONTINUED)

STREAMS:

S-42	HOT (SHELL)	S-45
T= 4.9868D+02		T= 3.0741D+02
P= 1.9738D+00		P= 1.9629D+00
V= 0.0000D+00		V= 0.0000D+00
S-44	COLD (TUBE)	S-43
T= 3.0567D+02		T= 3.0537D+02
P= 8.1205D-01		P= 1.0000D+00
V= 0.0000D+00		V= 0.0000D+00

UNIT RESULTS:

CALCULATED HEAT DUTY	CAL/SEC	152541.4662
CALCULATED (REQUIRED) AREA	SQM	94.1393
ACTUAL EXCHANGER AREA	SQM	93.6555
% OVER (UNDER) DESIGN		-0.5139
AVERAGE COEFFICIENT	CAL/SEC-SQCM-K	0.0034
UA	CAL/SEC-K	3191.2044

LMTD (CORRECTED)	K	47.8006
LMTD CORRECTION FACTOR		1.1397
NUMBER OF SHELLS IN SERIES		1
NUMBER OF SHELLS IN PARALLEL		1
HIGH RHOV2 INDICATION		NO
VIBRATION INDICATION		NO

SHELLSIDE RESULTS:

MEAN SHELL METAL TEMPERATURE	K	354.3020
TOTAL PRESSURE DROP	ATM	0.0110
WINDOW PRESSURE DROP	ATM	0.0000
CROSSFLOW PRESSURE DROP	ATM	0.0008
BULK FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0041
WALL FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0041
THERMAL RESISTANCE	SEC-SQCM-K/CAL	245.4223
MAXIMUM FOULING RESISTANCE	SEC-SQCM-K/CAL	14.229411
FOULING RESISTANCE	SEC-SQCM-K/CAL	14.7475
CROSSFLOW VELOCITY	M/SEC	0.0235
WINDOW VELOCITY	M/SEC	0.0192
MIDPOINT VELOCITY	M/SEC	0.0213
SHELL ENTRANCE RHOV^2	KG/M-SQSEC	177.4939

SHELL EXIT RHOV^2 KG/M-SQSEC
149.7501

BUNDLE ENTRANCE RHOV^2 KG/M-SQSEC
8.6336

BUNDLE EXIT RHOV^2 KG/M-SQSEC
7.2841

FOULING % OF OVERALL RESISTANCE
4.9992

FILM % OF OVERALL RESISTANCE
83.1951

FRICTIONAL PRESSURE DROP ATM
0.0110

U-O-S BLOCK SECTION

BLOCK: HX-3 MODEL: HEATX (CONTINUED)

TUBESIDE RESULTS:

MEAN TUBE METAL TEMPERATURE	K	310.9391
TOTAL PRESSURE DROP	ATM	0.1879
BULK FILM COEFFICIENT	CAL/SEC-SQCM-K	0.2226
WALL FILM COEFFICIENT	CAL/SEC-SQCM-K	0.2226
THERMAL RESISTANCE	SEC-SQCM-K/CAL	4.4914
MAXIMUM FOULING RESISTANCE	SEC-SQCM-K/CAL	27.411108
FOULING RESISTANCE	SEC-SQCM-K/CAL	28.4090
INPUT VELOCITY	M/SEC	3.0151
OUTLET VELOCITY	M/SEC	3.0160
FOULING % OF OVERALL RESISTANCE		9.6303
FILM % OF OVERALL RESISTANCE		1.5225
FRICTIONAL PRESSURE DROP	ATM	0.1879

U-O-S BLOCK SECTION

HEATX COLD-TQCU HX-3 TQCURV INLET

PRESSURE PROFILE: CONSTANT2

PRESSURE DROP: -0.1879 ATM

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

DUTY	PRES	TEMP	VFRAC
CAL/SEC	ATM	K	
0.0	1.0000	305.6690	0.0
7263.8793	1.0000	305.6548	0.0
1.4528+04	1.0000	305.6407	0.0
2.1792+04	1.0000	305.6266	0.0
2.9056+04	1.0000	305.6124	0.0
3.6319+04	1.0000	305.5983	0.0
4.3583+04	1.0000	305.5842	0.0
5.0847+04	1.0000	305.5701	0.0
5.8111+04	1.0000	305.5559	0.0
6.5375+04	1.0000	305.5418	0.0

```
!  7.2639+04 !     1.0000 !   305.5277 !     0.0    !
!  7.9903+04 !     1.0000 !   305.5135 !     0.0    !
!  8.7167+04 !     1.0000 !   305.4994 !     0.0    !
!  9.4430+04 !     1.0000 !   305.4853 !     0.0    !
!  1.0169+05 !     1.0000 !   305.4711 !     0.0    !
!------------+------------+------------+------------!
!  1.0896+05 !     1.0000 !   305.4570 !     0.0    !
!  1.1622+05 !     1.0000 !   305.4429 !     0.0    !
!  1.2349+05 !     1.0000 !   305.4288 !     0.0    !
!  1.3075+05 !     1.0000 !   305.4146 !     0.0    !
!  1.3801+05 !     1.0000 !   305.4005 !     0.0    !
!------------+------------+------------+------------!
!  1.4528+05 !     1.0000 !   305.3864 !     0.0    !
!  1.5254+05 !     1.0000 !   305.3722 !     0.0    !
-----------------------------------------------------
```

U-O-S BLOCK SECTION

HEATX HOT-TQCUR HX-3 TQCURV INLET

PRESSURE PROFILE: CONSTANT2

PRESSURE DROP: 0.0 ATM

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

DUTY	PRES	TEMP	VFRAC
CAL/SEC	ATM	K	
0.0	1.9738	498.6816	0.0
7263.8793	1.9738	491.0503	0.0
1.4528+04	1.9738	483.3149	0.0
2.1792+04	1.9738	475.4705	0.0
2.9056+04	1.9738	467.5119	0.0
3.6319+04	1.9738	459.4331	0.0
4.3583+04	1.9738	451.2277	0.0
5.0847+04	1.9738	442.8884	0.0
5.8111+04	1.9738	434.4073	0.0
6.5375+04	1.9738	425.7756	0.0

```
!  7.2639+04 !     1.9738 !   416.9834 !     0.0    !
!  7.9903+04 !     1.9738 !   408.0260 !     0.0    !
!  8.7167+04 !     1.9738 !   398.9139 !     0.0    !
!  9.4430+04 !     1.9738 !   389.6374 !     0.0    !
!  1.0169+05 !     1.9738 !   380.1830 !     0.0    !
!------------+------------+------------+------------!
!  1.0896+05 !     1.9738 !   370.5301 !     0.0    !
!  1.1622+05 !     1.9738 !   360.6615 !     0.0    !
!  1.2349+05 !     1.9738 !   350.5592 !     0.0    !
!  1.3075+05 !     1.9738 !   340.2040 !     0.0    !
!  1.3801+05 !     1.9738 !   329.5748 !     0.0    !
!------------+------------+------------+------------!
!  1.4528+05 !     1.9738 !   318.6496 !     0.0    !
!  1.5254+05 !     1.9738 !   307.4055 !     0.0    !
-------------------------------------------------------
```

U-O-S BLOCK SECTION

BLOCK: HX-4 MODEL: HEATX

THIS BLOCK RUNS WITH ASPEN EDR 38.0 WITH ADVANCED METHOD FOR SHELL&TUBE

HOT SIDE:

INLET STREAM: S-28

OUTLET STREAM: S-31

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

COLD SIDE:

INLET STREAM: S-29

OUTLET STREAM: S-30

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	5247.93	5247.93	0.00000
MASS(KG/HR)	111297.	111297.	0.00000
ENTHALPY(CAL/SEC)	-0.103626E+09	-0.103626E+09	-0.844733E-08

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR HOT SIDE:

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR COLD SIDE:

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

SHELL&TUBE INPUT FILE NAME HX-
4_1.EDR

SHELL&TUBE PROGRAM MODE
SIMULATION

HEAT CURVE GENERATION

HOT HEAT CURVE GENERATED BY ASPEN PLUS

COLD HEAT CURVE GENERATED BY ASPEN PLUS

*** OVERALL RESULTS ***

U-O-S BLOCK SECTION

BLOCK: HX-4 MODEL: HEATX (CONTINUED)

STREAMS:

```
                  ---------------------------------------
                  |                                     |
S-28      ----->|            HOT  (SHELL)             |-----> S-31
T=  4.0503D+02    |                                     |       T=
2.9562D+02
P=  1.9738D+00    |                                     |       P=
1.9251D+00
V=  0.0000D+00    |                                     |       V=
0.0000D+00
                  |                                     |
S-30      <-----|            COLD (TUBE)              |<----- S-29
T=  2.9700D+02    |                                     |       T=
2.7759D+02
P=  6.2624D-01    |                                     |       P=
1.0000D+00
V=  0.0000D+00    |                                     |       V=
0.0000D+00
                  ---------------------------------------
```

UNIT RESULTS:

CALCULATED HEAT DUTY	CAL/SEC	463629.3657
CALCULATED (REQUIRED) AREA	SQM	176.3302
ACTUAL EXCHANGER AREA	SQM	178.0509
% OVER (UNDER) DESIGN		0.9758
AVERAGE COEFFICIENT	CAL/SEC-SQCM-K	0.0065
UA	CAL/SEC-K	11536.3670

LMTD (CORRECTED)	K	40.1885
LMTD CORRECTION FACTOR		0.7994
NUMBER OF SHELLS IN SERIES		1
NUMBER OF SHELLS IN PARALLEL		1
HIGH RHOV2 INDICATION		NO
VIBRATION INDICATION		NO

SHELLSIDE RESULTS:

MEAN SHELL METAL TEMPERATURE	K	327.5949
TOTAL PRESSURE DROP	ATM	0.0487
WINDOW PRESSURE DROP	ATM	0.0024
CROSSFLOW PRESSURE DROP	ATM	0.0234
BULK FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0104
WALL FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0104
THERMAL RESISTANCE	SEC-SQCM-K/CAL	96.1576
MAXIMUM FOULING RESISTANCE	SEC-SQCM-K/CAL	15.257125
FOULING RESISTANCE	SEC-SQCM-K/CAL	14.7475
CROSSFLOW VELOCITY	M/SEC	0.0805
WINDOW VELOCITY	M/SEC	0.0725
MIDPOINT VELOCITY	M/SEC	0.0765
SHELL ENTRANCE RHOV^2	KG/M-SQSEC	796.4637

SHELL EXIT RHOV^2 KG/M-SQSEC
721.7033

BUNDLE ENTRANCE RHOV^2 KG/M-SQSEC
51.1516

BUNDLE EXIT RHOV^2 KG/M-SQSEC
46.3618

FOULING % OF OVERALL RESISTANCE
9.6485

FILM % OF OVERALL RESISTANCE
62.9109

FRICTIONAL PRESSURE DROP ATM
0.0487

U-O-S BLOCK SECTION

BLOCK: HX-4 MODEL: HEATX (CONTINUED)

TUBESIDE RESULTS:

MEAN TUBE METAL TEMPERATURE	K	298.8074
TOTAL PRESSURE DROP	ATM	0.3738
BULK FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0861
WALL FILM COEFFICIENT	CAL/SEC-SQCM-K	0.0861
THERMAL RESISTANCE	SEC-SQCM-K/CAL	11.6117
MAXIMUM FOULING RESISTANCE	SEC-SQCM-K/CAL	29.390866
FOULING RESISTANCE	SEC-SQCM-K/CAL	28.4090
INPUT VELOCITY	M/SEC	1.1011
OUTLET VELOCITY	M/SEC	1.1216
FOULING % OF OVERALL RESISTANCE		18.5866
FILM % OF OVERALL RESISTANCE		7.5969
FRICTIONAL PRESSURE DROP	ATM	0.3735

U-O-S BLOCK SECTION

HEATX COLD-TQCU HX-4 TQCURV INLET

PRESSURE PROFILE: CONSTANT2

PRESSURE DROP: -0.3738 ATM

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

DUTY	PRES	TEMP	VFRAC
CAL/SEC	ATM	K	
0.0	1.0000	296.9978	0.0
2.2078+04	1.0000	296.0805	0.0
4.4155+04	1.0000	295.1625	0.0
6.6233+04	1.0000	294.2438	0.0
8.8310+04	1.0000	293.3244	0.0
1.1039+05	1.0000	292.4043	0.0
1.3247+05	1.0000	291.4835	0.0
1.5454+05	1.0000	290.5620	0.0
1.7662+05	1.0000	289.6398	0.0
1.9870+05	1.0000	288.7170	0.0

```
!  2.2078+05 !     1.0000 !   287.7935 !     0.0    !
!  2.4285+05 !     1.0000 !   286.8694 !     0.0    !
!  2.6493+05 !     1.0000 !   285.9446 !     0.0    !
!  2.8701+05 !     1.0000 !   285.0192 !     0.0    !
!  3.0909+05 !     1.0000 !   284.0932 !     0.0    !
!------------+------------+------------+------------!
!  3.3116+05 !     1.0000 !   283.1666 !     0.0    !
!  3.5324+05 !     1.0000 !   282.2394 !     0.0    !
!  3.7532+05 !     1.0000 !   281.3116 !     0.0    !
!  3.9740+05 !     1.0000 !   280.3831 !     0.0    !
!  4.1947+05 !     1.0000 !   279.4542 !     0.0    !
!------------+------------+------------+------------!
!  4.4155+05 !     1.0000 !   278.5246 !     0.0    !
!  4.6363+05 !     1.0000 !   277.5945 !     0.0    !
-----------------------------------------------------
```

U-O-S BLOCK SECTION

HEATX HOT-TQCUR HX-4 TQCURV INLET

PRESSURE PROFILE: CONSTANT2

PRESSURE DROP: 0.0 ATM

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

DUTY	PRES	TEMP	VFRAC
CAL/SEC	ATM	K	
0.0	1.9738	405.0321	0.0
2.2078+04	1.9738	400.0386	0.0
4.4155+04	1.9738	395.0165	0.0
6.6233+04	1.9738	389.9661	0.0
8.8310+04	1.9738	384.8877	0.0
1.1039+05	1.9738	379.7817	0.0
1.3247+05	1.9738	374.6484	0.0
1.5454+05	1.9738	369.4883	0.0
1.7662+05	1.9738	364.3020	0.0
1.9870+05	1.9738	359.0901	0.0

```
 !  2.2078+05 !     1.9738 !   353.8533 !     0.0    !
 !  2.4285+05 !     1.9738 !   348.5927 !     0.0    !
 !  2.6493+05 !     1.9738 !   343.3096 !     0.0    !
 !  2.8701+05 !     1.9738 !   338.0059 !     0.0    !
 !  3.0909+05 !     1.9738 !   332.6842 !     0.0    !
 !------------+------------+------------+------------!
 !  3.3116+05 !     1.9738 !   327.3486 !     0.0    !
 !  3.5324+05 !     1.9738 !   322.0047 !     0.0    !
 !  3.7532+05 !     1.9738 !   316.6611 !     0.0    !
 !  3.9740+05 !     1.9738 !   311.3302 !     0.0    !
 !  4.1947+05 !     1.9738 !   306.0293 !     0.0    !
 !------------+------------+------------+------------!
 !  4.4155+05 !     1.9738 !   300.7831 !     0.0    !
 !  4.6363+05 !     1.9738 !   295.6235 !     0.0    !
 ---------------------------------------------------


 BLOCK:  JAWCRUSH MODEL: CRUSHER
 -------------------------------
   INLET STREAM:          PPS-9
   OUTLET STREAM:         PPS-10
   PROPERTY OPTION SET:   NRTL      RENON (NRTL) / IDEAL GAS

                      ***  MASS AND ENERGY BALANCE  ***
                                      IN              OUT
RELATIVE DIFF.
```

U-O-S BLOCK SECTION

BLOCK: JAWCRUSH MODEL: CRUSHER (CONTINUED)

TOTAL BALANCE

MOLE(KMOL/HR)	406.200	406.200	-0.139939E-15
MASS(KG/HR)	30644.0	30644.0	-0.138941E-06
ENTHALPY(CAL/SEC)	-0.700009E+07	-0.700009E+07	0.274731E-06

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

PSD CALCULATION METHOD:	DISTRIBUTION FUNCTION
COMMINUTION LAW:	KICK'S LAW
BOND WORK INDEX FOR SUBSTREAM MIXED ,KWHR/TON	2.32000
BOND WORK INDEX FOR SUBSTREAM CIPSD ,KWHR/TON	2.32000
MAXIMUM NO. OF FLASH ITERATIONS	30
FLASH TOLERANCE	0.000100000

*** RESULTS ***

POWER REQUIREMENT KW	0.071625
PARTICLE DIAMETER WHICH IS	
LARGER THAN 80% OF INLET MASS METER	0.072035
PARTICLE DIAMETER WHICH IS	
LARGER THAN 80% OF OUTLET MASS METER	0.066380
D80 REDUCTION RATIO	1.08520
PARTICLE DIAMETER WHICH IS	
LARGER THAN 50% OF INLET MASS METER	0.063552
PARTICLE DIAMETER WHICH IS	
LARGER THAN 50% OF OUTLET MASS METER	0.053712
D50 REDUCTION RATIO	1.18319
SAUTER DIAMETER AT INLET METER	0.061933
SAUTER DIAMETER AT OUTLET METER	0.056108

BLOCK: M-1 MODEL: MIXER

INLET STREAMS: S-1 S-20-2

OUTLET STREAM: S-2

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1304.08	1304.08	0.00000
MASS(KG/HR)	41967.0	41967.0	-0.173373E-15
ENTHALPY(CAL/SEC)	-0.204928E+08	-0.204928E+08	0.310827E-07

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

U-O-S BLOCK SECTION

BLOCK: M-1 MODEL: MIXER (CONTINUED)

*** INPUT DATA ***

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

OUTLET PRESSURE: MINIMUM OF INLET STREAM PRESSURES

BLOCK: M-2 MODEL: MIXER

INLET STREAMS: S-7 S-6

OUTLET STREAM: S-8

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1415.50	1415.50	0.00000
MASS(KG/HR)	66419.3	66419.3	0.219092E-15
ENTHALPY(CAL/SEC)	-0.273441E+08	-0.273441E+08	-0.736942E-08

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

TWO PHASE FLASH

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

OUTLET PRESSURE: MINIMUM OF INLET STREAM PRESSURES

BLOCK: M-3 MODEL: FSPLIT

INLET STREAM: S-45

OUTLET STREAMS: S-47 S-46

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

U-O-S BLOCK SECTION

BLOCK: M-3 MODEL: FSPLIT (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	40.6712	40.6712	-0.272673E-08
MASS(KG/HR)	8100.00	8100.00	-0.256750E-07
ENTHALPY(CAL/SEC)	-0.197922E+07	-0.197922E+07	0.535876E-07

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FRACTION OF FLOW STRM=S-46 FRAC= 0.050000

*** RESULTS ***

```
  STREAM= S-47           SPLIT=          0.95000     KEY=  0
STREAM-ORDER=   2
          S-46                          0.050000          0
1


 BLOCK:  METALDET MODEL: SEP
 ---------------------------
   INLET STREAM:          PPS-3
   OUTLET STREAMS:        PPS-4       PPS-5
   PROPERTY OPTION SET:   NRTL      RENON (NRTL) / IDEAL GAS


                      ***  MASS AND ENERGY BALANCE  ***
                                       IN              OUT
RELATIVE DIFF.
    TOTAL BALANCE
       MOLE(KMOL/HR )            167.864         167.864
0.00000
       MASS(KG/HR   )            26444.5         26444.5
0.137570E-15
       ENTHALPY(CAL/SEC )      -0.235841E+07   -0.235841E+07
0.00000


                      ***  CO2 EQUIVALENT SUMMARY ***
    FEED STREAMS CO2E             0.00000      KG/HR
    PRODUCT STREAMS CO2E          0.00000      KG/HR
    NET STREAMS CO2E PRODUCTION   0.00000      KG/HR
    UTILITIES CO2E PRODUCTION     0.00000      KG/HR
    TOTAL CO2E PRODUCTION         0.00000      KG/HR
```

U-O-S BLOCK SECTION

BLOCK: METALDET MODEL: SEP (CONTINUED)

*** INPUT DATA ***

FLASH SPECS FOR STREAM PPS-4

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR STREAM PPS-5

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= PPS-4	CPT= METHANOL	FRACTION=	0.0
	EG		0.0
	DMT		0.0
	PET		0.0
	NA2CO3		0.0

		HDPE	0.0
		ALUM	0.0
		WATER	0.0
		DEG	0.0
		BIS-2-01	0.0
		MPT	0.0
		IRON	1.00000
		POLY(-01	0.0

SUBSTREAM= CIPSD

STREAM= PPS-5	CPT=	PET	FRACTION=	1.00000
		HDPE		1.00000
		IRON		0.0
		POLY(-01		1.00000

*** RESULTS ***

HEAT DUTY CAL/SEC 0.0000

COMPONENT = PET

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-5	MIXED	1.00000
PPS-5	CIPSD	1.00000

U-O-S BLOCK SECTION

BLOCK: METALDET MODEL: SEP (CONTINUED)

COMPONENT = HDPE

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-5	CIPSD	1.00000

COMPONENT = ALUM

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-5	CIPSD	1.00000

COMPONENT = IRON

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-4	CIPSD	1.00000

COMPONENT = POLY(-01

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-5	CIPSD	1.00000

BLOCK: P-1 MODEL: PUMP

INLET STREAM: S-3

OUTLET STREAM: S-4

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1415.50	1415.50	0.00000
MASS(KG/HR)	62415.5	62415.5	0.00000
ENTHALPY(CAL/SEC)	-0.236865E+08	-0.236755E+08	-0.466859E-03

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

OUTLET PRESSURE ATM	18.0000
DRIVER EFFICIENCY	1.00000

FLASH SPECIFICATIONS:

LIQUID PHASE CALCULATION

NO FLASH PERFORMED

MAXIMUM NUMBER OF ITERATIONS	30
TOLERANCE	0.000100000

U-O-S BLOCK SECTION

BLOCK: P-1 MODEL: PUMP (CONTINUED)

*** RESULTS ***

VOLUMETRIC FLOW RATE	L/MIN	1,058.12
PRESSURE CHANGE	ATM	17.0000
NPSH AVAILABLE	M-KGF/KG	4.58648
FLUID POWER	KW	30.3772
BRAKE POWER	KW	46.2987
ELECTRICITY	KW	46.2987
PUMP EFFICIENCY USED		0.65611
NET WORK REQUIRED	KW	46.2987
HEAD DEVELOPED	M-KGF/KG	178.664

BLOCK: P-2 MODEL: PUMP

INLET STREAM: S-10

OUTLET STREAM: S-11

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1415.50	1415.50	0.00000
MASS(KG/HR)	66419.3	66419.3	0.00000

ENTHALPY(CAL/SEC) -0.257209E+08 -0.257277E+08
0.265188E-03

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

EQUIPMENT TYPE: TURBINE

OUTLET PRESSURE ATM	0.98692
DRIVER EFFICIENCY	1.00000

FLASH SPECIFICATIONS:

LIQUID PHASE CALCULATION

NO FLASH PERFORMED

MAXIMUM NUMBER OF ITERATIONS	30

TOLERANCE
0.000100000

U-O-S BLOCK SECTION

BLOCK: P-2 MODEL: PUMP (CONTINUED)

*** RESULTS ***

VOLUMETRIC FLOW RATE	L/MIN	1,445.67
PRESSURE CHANGE	ATM	-17.0131
NPSH AVAILABLE	M-KGF/KG	19.0642
FLUID POWER	KW	-41.5354
BRAKE POWER	KW	-28.5652
ELECTRICITY	KW	-28.5652
PUMP EFFICIENCY USED		0.68773
NET WORK REQUIRED	KW	-28.5652
HEAD DEVELOPED	M-KGF/KG	-229.565

BLOCK: P-3 MODEL: PUMP

INLET STREAM: S-22

OUTLET STREAM: S-23

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	27.5930	27.5930	0.00000
MASS(KG/HR)	5108.84	5108.84	0.00000

ENTHALPY(CAL/SEC) -0.130281E+07 -0.130265E+07 -
0.120193E-03

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

OUTLET PRESSURE ATM	3.94769
PUMP EFFICIENCY	0.70000
DRIVER EFFICIENCY	1.00000

FLASH SPECIFICATIONS:

LIQUID PHASE CALCULATION

NO FLASH PERFORMED

MAXIMUM NUMBER OF ITERATIONS	30

TOLERANCE
0.000100000

U-O-S BLOCK SECTION

BLOCK: P-3 MODEL: PUMP (CONTINUED)

*** RESULTS ***

VOLUMETRIC FLOW RATE	L/MIN	71.5202
PRESSURE CHANGE	ATM	3.79965
NPSH AVAILABLE	M-KGF/KG	0.0
FLUID POWER	KW	0.45892
BRAKE POWER	KW	0.65560
ELECTRICITY	KW	0.65560
PUMP EFFICIENCY USED		0.70000
NET WORK REQUIRED	KW	0.65560
HEAD DEVELOPED	M-KGF/KG	32.9760

BLOCK: P-4 MODEL: PUMP

INLET STREAM: S-27

OUTLET STREAM: S-28

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	353.076	353.076	0.00000
MASS(KG/HR)	23114.7	23114.7	-0.157388E-15

ENTHALPY(CAL/SEC) -0.103203E+08 -0.103198E+08 -
0.507865E-04

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

OUTLET PRESSURE ATM	1.97385
DRIVER EFFICIENCY	1.00000

FLASH SPECIFICATIONS:

LIQUID PHASE CALCULATION

NO FLASH PERFORMED

MAXIMUM NUMBER OF ITERATIONS	30

TOLERANCE
0.000100000

U-O-S BLOCK SECTION

BLOCK: P-4 MODEL: PUMP (CONTINUED)

*** RESULTS ***

VOLUMETRIC FLOW RATE	L/MIN	381.903
PRESSURE CHANGE	ATM	1.82581
NPSH AVAILABLE	M-KGF/KG	0.0
FLUID POWER	KW	1.17753
BRAKE POWER	KW	2.19442
ELECTRICITY	KW	2.19442
PUMP EFFICIENCY USED		0.53660
NET WORK REQUIRED	KW	2.19442
HEAD DEVELOPED	M-KGF/KG	18.7011

BLOCK: P-5 MODEL: PUMP

INLET STREAM: S-38

OUTLET STREAM: S-39

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	102.041	102.041	0.00000
MASS(KG/HR)	20000.0	20000.0	0.00000

ENTHALPY(CAL/SEC) -0.443485E+07 -0.443470E+07 -
0.330900E-04

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

OUTLET PRESSURE ATM	0.98692
PUMP EFFICIENCY	0.70000
DRIVER EFFICIENCY	1.00000

FLASH SPECIFICATIONS:

LIQUID PHASE CALCULATION

NO FLASH PERFORMED

MAXIMUM NUMBER OF ITERATIONS	30

TOLERANCE
0.000100000

U-O-S BLOCK SECTION

BLOCK: P-5 MODEL: PUMP (CONTINUED)

*** RESULTS ***

VOLUMETRIC FLOW RATE	L/MIN	325.788
PRESSURE CHANGE	ATM	0.78173
NPSH AVAILABLE	M-KGF/KG	0.0
FLUID POWER	KW	0.43009
BRAKE POWER	KW	0.61441
ELECTRICITY	KW	0.61441
PUMP EFFICIENCY USED		0.70000
NET WORK REQUIRED	KW	0.61441
HEAD DEVELOPED	M-KGF/KG	7.89418

BLOCK: P-6 MODEL: PUMP

INLET STREAM: S-41

OUTLET STREAM: S-42

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	40.6712	40.6712	0.00000
MASS(KG/HR)	8100.00	8100.00	0.00000

ENTHALPY(CAL/SEC) -0.182682E+07 -0.182668E+07 -
0.730356E-04

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

OUTLET PRESSURE ATM	1.97385
PUMP EFFICIENCY	0.70000
DRIVER EFFICIENCY	1.00000

FLASH SPECIFICATIONS:

LIQUID PHASE CALCULATION

NO FLASH PERFORMED

MAXIMUM NUMBER OF ITERATIONS	30

TOLERANCE
0.000100000

U-O-S BLOCK SECTION

BLOCK: P-6 MODEL: PUMP (CONTINUED)

*** RESULTS ***

VOLUMETRIC FLOW RATE	L/MIN	130.919
PRESSURE CHANGE	ATM	1.76865
NPSH AVAILABLE	M-KGF/KG	0.0
FLUID POWER	KW	0.39103
BRAKE POWER	KW	0.55861
ELECTRICITY	KW	0.55861
PUMP EFFICIENCY USED		0.70000
NET WORK REQUIRED	KW	0.55861
HEAD DEVELOPED	M-KGF/KG	17.7218

BLOCK: R-1 MODEL: RSTOIC

INLET STREAM: S-8

OUTLET STREAM: S-9

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	GENERATION	RELATIVE DIFF.
TOTAL BALANCE				
MOLE(KMOL/HR)	1415.50	1415.50	0.00000	0.160632E-15
MASS(KG/HR)	66419.3	66419.3		0.00000

ENTHALPY(CAL/SEC) -0.273441E+08 -0.257591E+08 -
0.579639E-01

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

STOICHIOMETRY MATRIX:

REACTION # 1:

SUBSTREAM MIXED :

METHANOL -2.00 EG 2.00 DMT 1.00 BIS-2-01
-1.00

SUBSTREAM CIPSD :

NO PARTICIPATING COMPONENTS

REACTION # 2:

SUBSTREAM MIXED :

EG -2.00 WATER 1.00 DEG 1.00

SUBSTREAM CIPSD :

NO PARTICIPATING COMPONENTS

U-O-S BLOCK SECTION

BLOCK: R-1 MODEL: RSTOIC (CONTINUED)

REACTION CONVERSION SPECS: NUMBER= 2

REACTION # 1:

SUBSTREAM:MIXED KEY COMP:BIS-2-01 CONV FRAC: 0.7770

REACTION # 2:

SUBSTREAM:MIXED KEY COMP:EG CONV FRAC: 0.5000E-01

TWO PHASE TP FLASH

SPECIFIED TEMPERATURE	K	433.150
SPECIFIED PRESSURE	ATM	18.0000
MAXIMUM NO. ITERATIONS		30
CONVERGENCE TOLERANCE		0.000100000

SIMULTANEOUS REACTIONS

GENERATE COMBUSTION REACTIONS FOR FEED SPECIES NO

*** RESULTS ***

OUTLET TEMPERATURE	K	433.15
OUTLET PRESSURE	ATM	18.000
HEAT DUTY	CAL/SEC	0.15850E+07
VAPOR FRACTION		0.0000

REACTION EXTENTS:

REACTION NUMBER	REACTION EXTENT KMOL/HR
1	52.606
2	0.52362E-01

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
METHANOL	0.84602	0.84602	0.99553	1.0951
EG	0.75885E-01	0.75885E-01	0.24451E-02	0.29986E-01
DMT	0.62324E-01	0.62324E-01	0.35807E-04	0.53467E-03
WATER	0.50482E-02	0.50482E-02	0.19873E-02	0.36635
DEG	0.37067E-04	0.37067E-04	0.10290E-07	0.25835E-03
BIS-2-01	0.10687E-01	0.10687E-01	0.22742E-08	0.19803E-06
MPT	0.83601E-09	0.83601E-09	0.58792E-11	0.65446E-02

U-O-S BLOCK SECTION

BLOCK: R-2 MODEL: RSTOIC

INLET STREAM: S-9

OUTLET STREAM: S-10

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	GENERATION	RELATIVE DIFF.
TOTAL BALANCE				
MOLE(KMOL/HR)	1415.50	1415.50	0.156125E-14	0.00000
MASS(KG/HR)	66419.3	66419.3		0.00000
ENTHALPY(CAL/SEC)	-0.257591E+08	-0.257209E+08		-0.148588E-02

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

STOICHIOMETRY MATRIX:

```
 REACTION #   1:
  SUBSTREAM MIXED   :
  METHANOL  -2.00    EG         2.00    DMT        1.00    BIS-2-01
-1.00
  SUBSTREAM CIPSD   :
  NO PARTICIPATING COMPONENTS

 REACTION #   2:
  SUBSTREAM MIXED   :
  EG        -2.00    WATER      1.00    DEG        1.00
  SUBSTREAM CIPSD   :
  NO PARTICIPATING COMPONENTS


REACTION CONVERSION SPECS: NUMBER=    2
  REACTION #   1:
  SUBSTREAM:MIXED    KEY COMP:BIS-2-01 CONV FRAC: 0.7770
  REACTION #   2:
  SUBSTREAM:MIXED    KEY COMP:EG       CONV FRAC: 0.5000E-01



TWO    PHASE  TP  FLASH
SPECIFIED TEMPERATURE K                                  433.150
SPECIFIED PRESSURE    ATM                                 18.0000
MAXIMUM NO. ITERATIONS                                    30
CONVERGENCE TOLERANCE
0.000100000
SIMULTANEOUS REACTIONS
GENERATE COMBUSTION REACTIONS FOR FEED SPECIES          NO
```

U-O-S BLOCK SECTION

BLOCK: R-2 MODEL: RSTOIC (CONTINUED)

*** RESULTS ***

OUTLET TEMPERATURE	K	433.15
OUTLET PRESSURE	ATM	18.000
HEAT DUTY	CAL/SEC	38275.
VAPOR FRACTION		0.0000

REACTION EXTENTS:

REACTION NUMBER	REACTION EXTENT KMOL/HR
1	11.731
2	2.6801

V-L PHASE EQUILIBRIUM :

COMP	F(I)	X(I)	Y(I)	K(I)
METHANOL	0.82941	0.82941	0.99461	1.1055
EG	0.88699E-01	0.88699E-01	0.24963E-02	0.25945E-01

DMT	0.70628E-01	0.70628E-01	0.43075E-04	0.56225E-03
WATER	0.69453E-02	0.69453E-02	0.28490E-02	0.37816
DEG	0.19342E-02	0.19342E-02	0.59241E-06	0.28236E-03
BIS-2-01	0.23833E-02	0.23833E-02	0.53583E-09	0.20727E-06
MPT	0.83601E-09	0.83601E-09	0.63367E-11	0.69877E-02

BLOCK: SEP-1 MODEL: SEP

INLET STREAM: S-4

OUTLET STREAMS: S-5 S-6

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1415.50	1415.50	-0.160632E-15
MASS(KG/HR)	62415.5	62415.5	-0.233146E-15
ENTHALPY(CAL/SEC)	-0.236755E+08	-0.236755E+08	-0.179582E-11

U-O-S BLOCK SECTION

BLOCK: SEP-1 MODEL: SEP (CONTINUED)

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR STREAM S-5

TWO PHASE TP FLASH

PRESSURE DROP	ATM	0.0
MAXIMUM NO. ITERATIONS		30
CONVERGENCE TOLERANCE		0.000100000

FLASH SPECS FOR STREAM S-6

TWO PHASE TP FLASH

PRESSURE DROP	ATM	0.0
MAXIMUM NO. ITERATIONS		30
CONVERGENCE TOLERANCE		0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= S-5 CPT= PET FRACTION= 0.98180

SUBSTREAM= CIPSD

STREAM= S-5 CPT= PET FRACTION= 0.98180

*** RESULTS ***

HEAT DUTY CAL/SEC 0.24657E-04

COMPONENT = METHANOL

STREAM	SUBSTREAM	SPLIT FRACTION
S-6	MIXED	1.00000

COMPONENT = EG

STREAM	SUBSTREAM	SPLIT FRACTION
S-6	MIXED	1.00000

COMPONENT = DMT

STREAM	SUBSTREAM	SPLIT FRACTION
S-6	MIXED	1.00000

U-O-S BLOCK SECTION

BLOCK: SEP-1 MODEL: SEP (CONTINUED)

COMPONENT = PET

STREAM	SUBSTREAM	SPLIT FRACTION
S-5	MIXED	0.98180
S-6	MIXED	0.018200

COMPONENT = NA2CO3

STREAM	SUBSTREAM	SPLIT FRACTION
S-6	MIXED	1.00000

COMPONENT = WATER

STREAM	SUBSTREAM	SPLIT FRACTION
S-6	MIXED	1.00000

COMPONENT = DEG

STREAM	SUBSTREAM	SPLIT FRACTION
S-6	MIXED	1.00000

COMPONENT = BIS-2-01

STREAM	SUBSTREAM	SPLIT FRACTION
S-6	MIXED	1.00000

COMPONENT = MPT

STREAM	SUBSTREAM	SPLIT FRACTION
S-6	MIXED	1.00000

BLOCK: SINK MODEL: SEP

INLET STREAMS: PPS-16 PPS-18

OUTLET STREAMS: PPS-19 PPS-20

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	910.778	910.778	0.00000
MASS(KG/HR)	28051.1	28051.1	-0.129691E-15
ENTHALPY(CAL/SEC)	-0.165765E+08	-0.165765E+08	0.393185E-07

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

U-O-S BLOCK SECTION

BLOCK: SINK MODEL: SEP (CONTINUED)

*** INPUT DATA ***

INLET PRESSURE: MINIMUM OF INLET STREAM PRESSURES

FLASH SPECS FOR STREAM PPS-19

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR STREAM PPS-20

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= PPS-19 CPT= HDPE FRACTION= 1.00000

SUBSTREAM= CIPSD

STREAM= PPS-19 CPT= PET FRACTION= 0.0

HDPE 1.00000

*** RESULTS ***

HEAT DUTY CAL/SEC -0.35876

COMPONENT = PET

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-20	CIPSD	1.00000

COMPONENT = HDPE

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-19	CIPSD	1.00000

COMPONENT = WATER

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-20	MIXED	1.00000

U-O-S BLOCK SECTION

BLOCK: SLSEP MODEL: SEP

INLET STREAM: S-23

OUTLET STREAMS: S-24 S-25

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	27.5930	27.5930	0.128754E-15
MASS(KG/HR)	5108.84	5108.84	0.00000
ENTHALPY(CAL/SEC)	-0.130265E+07	-0.130265E+07	-0.722055E-07

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR STREAM S-24

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

FLASH SPECS FOR STREAM S-25

TWO PHASE TP FLASH

PRESSURE DROP ATM 0.0

MAXIMUM NO. ITERATIONS 30

CONVERGENCE TOLERANCE
0.000100000

U-O-S BLOCK SECTION

BLOCK: SLSEP MODEL: SEP (CONTINUED)

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= S-24	CPT= METHANOL	FRACTION=	0.050000
	EG		0.050000
	DMT		0.050000
	PET		1.00000
	NA2CO3		1.00000
	WATER		0.050000
	DEG		0.050000

SUBSTREAM= CIPSD

STREAM= S-24	CPT= PET	FRACTION=	1.00000

*** RESULTS ***

HEAT DUTY CAL/SEC 0.94058E-01

COMPONENT = METHANOL

STREAM	SUBSTREAM	SPLIT FRACTION
S-24	MIXED	0.050000
S-25	MIXED	0.95000

COMPONENT = EG

STREAM	SUBSTREAM	SPLIT FRACTION
S-24	MIXED	0.050000
S-25	MIXED	0.95000

COMPONENT = DMT

STREAM	SUBSTREAM	SPLIT FRACTION
S-24	MIXED	0.050000
S-25	MIXED	0.95000

COMPONENT = PET

STREAM	SUBSTREAM	SPLIT FRACTION
S-24	MIXED	1.00000

COMPONENT = NA2CO3

STREAM	SUBSTREAM	SPLIT FRACTION
S-24	MIXED	1.00000

COMPONENT = WATER

STREAM	SUBSTREAM	SPLIT FRACTION
S-24	MIXED	0.050000
S-25	MIXED	0.95000

COMPONENT = DEG

STREAM	SUBSTREAM	SPLIT FRACTION
S-24	MIXED	0.050000
S-25	MIXED	0.95000

COMPONENT = BIS-2-01

STREAM	SUBSTREAM	SPLIT FRACTION
S-25	MIXED	1.00000

U-O-S BLOCK SECTION

BLOCK: SLSEP MODEL: SEP (CONTINUED)

COMPONENT = MPT

STREAM	SUBSTREAM	SPLIT FRACTION
S-25	MIXED	1.00000

BLOCK: SLURMIX MODEL: MIXER

INLET STREAMS:	S-2	S-47	PPS-33-2
OUTLET STREAM:	S-3		
PROPERTY OPTION SET:	NRTL	RENON (NRTL) / IDEAL GAS	

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	1415.50	1415.50	0.00000
MASS(KG/HR)	62415.5	62415.5	0.233146E-15
ENTHALPY(CAL/SEC)	-0.236865E+08	-0.236865E+08	-0.189831E-12

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR

```
    UTILITIES CO2E PRODUCTION     0.00000      KG/HR
    TOTAL CO2E PRODUCTION         0.00000      KG/HR


                          ***  INPUT DATA  ***
   ONE    PHASE      FLASH   SPECIFIED PHASE IS  LIQUID
   MAXIMUM NO. ITERATIONS                                    30
   CONVERGENCE TOLERANCE
0.000100000
   OUTLET PRESSURE   ATM                                     1.00000


 BLOCK:  THERMDRY MODEL: DRYER
 ------------------------------
   INLET STREAMS:         PPS-28      PPS-29
   OUTLET STREAMS:        PPS-31      PPS-30
   PROPERTY OPTION SET:   NRTL      RENON (NRTL) / IDEAL GAS



*****************************************************************************
*
     *
*
     *     AN EVAPORATION RATE IS NEGATIVE
*
     *
*

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U-O-S BLOCK SECTION

BLOCK: THERMDRY MODEL: DRYER (CONTINUED)

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	313.831	313.831	-0.181127E-15
MASS(KG/HR)	18928.5	18928.5	0.00000
ENTHALPY(CAL/SEC)	-0.263286E+07	-0.262570E+07	-0.272151E-02

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

DRYER TYPE: SHORTCUT

DRYING MODEL:		SPECIFIED EXIT MOISTURE
OPERATING PRESSURE	ATM	1.00000
ADDITIONAL HEAT INPUT	CAL/SEC	7165.

*** RESULTS ***

EXHAUST TEMPERATURE	K	321.3
EXHAUST DEW POINT	K	342.9
EXIT SOLIDS TEMPERATURE	K	321.3
EXHAUST GAS SUPERHEAT	K	-21.61

EVAPORATION RATES KG/HR

WATER -.1275E+03

BLOCK: TROMMEL MODEL: SEP

INLET STREAM: PPS-5

OUTLET STREAMS: PPS-6 PPS-7

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

*** MASS AND ENERGY BALANCE ***

	IN	OUT	RELATIVE DIFF.
TOTAL BALANCE			
MOLE(KMOL/HR)	166.608	166.608	0.00000
MASS(KG/HR)	26374.3	26374.3	0.00000
ENTHALPY(CAL/SEC)	-0.235841E+07	-0.235841E+07	0.00000

U-O-S BLOCK SECTION

BLOCK: TROMMEL MODEL: SEP (CONTINUED)

*** CO2 EQUIVALENT SUMMARY ***

FEED STREAMS CO2E	0.00000	KG/HR
PRODUCT STREAMS CO2E	0.00000	KG/HR
NET STREAMS CO2E PRODUCTION	0.00000	KG/HR
UTILITIES CO2E PRODUCTION	0.00000	KG/HR
TOTAL CO2E PRODUCTION	0.00000	KG/HR

*** INPUT DATA ***

FLASH SPECS FOR STREAM PPS-6

TWO PHASE TP FLASH

PRESSURE DROP	ATM	0.0
MAXIMUM NO. ITERATIONS		30
CONVERGENCE TOLERANCE		0.000100000

FLASH SPECS FOR STREAM PPS-7

TWO PHASE TP FLASH

PRESSURE DROP	ATM	0.0
MAXIMUM NO. ITERATIONS		30
CONVERGENCE TOLERANCE		0.000100000

FRACTION OF FEED

SUBSTREAM= MIXED

STREAM= PPS-6	CPT= PET	FRACTION=	0.0
	HDPE		0.0
	ALUM		1.00000
	POLY(-01		0.0

SUBSTREAM= CIPSD

STREAM= PPS-6	CPT= PET	FRACTION=	0.0
	HDPE		0.0
	ALUM		1.00000
	POLY(-01		0.0

*** RESULTS ***

HEAT DUTY CAL/SEC 0.0000

COMPONENT = PET

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-7	MIXED	1.00000
PPS-7	CIPSD	1.00000

COMPONENT = HDPE

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-7	CIPSD	1.00000

U-O-S BLOCK SECTION

BLOCK: TROMMEL MODEL: SEP (CONTINUED)

COMPONENT = ALUM

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-6	CIPSD	1.00000

COMPONENT = POLY(-01

STREAM	SUBSTREAM	SPLIT FRACTION
PPS-7	CIPSD	1.00000

STREAM SECTION

SUBSTREAM ATTR PSD TYPE: PSD

INTERVAL	LOWER LIMIT		UPPER LIMIT	
1	1.0000-03	METER	1.1482-03	METER
2	1.1482-03	METER	1.3183-03	METER
3	1.3183-03	METER	1.5136-03	METER
4	1.5136-03	METER	1.7378-03	METER
5	1.7378-03	METER	1.9953-03	METER
6	1.9953-03	METER	2.2909-03	METER
7	2.2909-03	METER	2.6303-03	METER
8	2.6303-03	METER	3.0200-03	METER
9	3.0200-03	METER	3.4674-03	METER
10	3.4674-03	METER	3.9811-03	METER
11	3.9811-03	METER	4.5709-03	METER
12	4.5709-03	METER	5.2481-03	METER
13	5.2481-03	METER	6.0256-03	METER
14	6.0256-03	METER	6.9183-03	METER
15	6.9183-03	METER	7.9433-03	METER
16	7.9433-03	METER	9.1201-03	METER
17	9.1201-03	METER	1.0471-02	METER
18	1.0471-02	METER	1.2023-02	METER
19	1.2023-02	METER	1.3804-02	METER
20	1.3804-02	METER	1.5849-02	METER
21	1.5849-02	METER	1.8197-02	METER
22	1.8197-02	METER	2.0893-02	METER

23	2.0893-02	METER	2.3988-02	METER
24	2.3988-02	METER	2.7542-02	METER
25	2.7542-02	METER	3.1623-02	METER
26	3.1623-02	METER	3.6308-02	METER
27	3.6308-02	METER	4.1687-02	METER
28	4.1687-02	METER	4.7863-02	METER
29	4.7863-02	METER	5.4954-02	METER
30	5.4954-02	METER	6.3096-02	METER
31	6.3096-02	METER	7.2444-02	METER
32	7.2444-02	METER	8.3176-02	METER
33	8.3176-02	METER	9.5499-02	METER
34	9.5499-02	METER	0.1096	METER
35	0.1096	METER	0.1259	METER
36	0.1259	METER	0.1445	METER
37	0.1445	METER	0.1660	METER
38	0.1660	METER	0.1905	METER
39	0.1905	METER	0.2188	METER
40	0.2188	METER	0.2512	METER
41	0.2512	METER	0.2884	METER
42	0.2884	METER	0.3311	METER
43	0.3311	METER	0.3802	METER
44	0.3802	METER	0.4365	METER
45	0.4365	METER	0.5012	METER
46	0.5012	METER	0.5754	METER
47	0.5754	METER	0.6607	METER
48	0.6607	METER	0.7586	METER
49	0.7586	METER	0.8710	METER
50	0.8710	METER	1.0000	METER

STREAM SECTION

PPS-1 PPS-10 PPS-11 PPS-12 PPS-13

STREAM ID	PPS-1	PPS-10	PPS-11	PPS-12	PPS-13
FROM :	----	JAWCRUSH	CONCRUSH	BALLMILL	B6
TO :	DEBALER	CONCRUSH	BALLMILL	B6	---
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	2.6655+04	3.0644+04	3.0644+04	3.0644+04	1.2626+04
CAL/SEC	-2.3584+06	-7.0001+06	-7.0001+06	-6.9989+06	-1.1609+06
SUBSTREAM: MIXED					
PHASE:	SOLID	SOLID	SOLID	SOLID	SOLID
COMPONENTS: KMOL/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	65.7019	65.7019	65.7019	65.7019	65.7019
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	244.7921	244.7920	244.7920	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
COMPONENTS: KG/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	1.2626+04	1.2626+04	1.2626+04	1.2626+04	1.2626+04
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	4409.9979	4409.9969	4409.9969	0.0
DEG	0.0	0.0	0.0	0.0	0.0

BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	65.7019	310.4941	310.4941	310.4941	65.7019
KG/HR	1.2626+04	1.7036+04	1.7036+04	1.7036+04	1.2626+04
L/MIN	29.5823	111.2150	111.2150	111.2258	29.5823
STATE VARIABLES:					
TEMP K	298.1500	389.1981	389.1978	390.0362	390.0362
PRES ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC	0.0	0.0	0.0	0.0	0.0
LFRAC	0.0	0.0	0.0	0.0	0.0
SFRAC	1.0000	1.0000	1.0000	1.0000	1.0000

STREAM SECTION

PPS-1 PPS-10 PPS-11 PPS-12 PPS-13 (CONTINUED)

STREAM ID	PPS-1	PPS-10	PPS-11	PPS-12	PPS-13
ENTHALPY:					
CAL/MOL	-6.4612+04	-6.7797+04	-6.7797+04	-6.7786+04	-6.3608+04
CAL/GM	-336.2218	-1235.6428	-1235.6427	-1235.4505	-330.9968
CAL/SEC	-1.1792+06	-5.8473+06	-5.8473+06	-5.8464+06	-1.1609+06
ENTROPY:					
CAL/MOL-K	-216.7101	-78.3140	-78.3140	-78.2870	-213.7745
CAL/GM-K	-1.1277	-1.4273	-1.4273	-1.4268	-1.1124
DENSITY:					
MOL/CC	3.7016-02	4.6531-02	4.6531-02	4.6526-02	3.7016-02
GM/CC	7.1135	2.5530	2.5530	2.5528	7.1135
AVG MW	192.1711	54.8674	54.8674	54.8674	192.1711
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	2.2657-10	1.1328-10	5.6642-11	1.0000	1.0000
FRAC2	2.5960-11	1.2980-11	6.4901-12	0.0	0.0

FRAC3	3.3395-11	1.6698-11	8.3489-12	0.0
0.0				
FRAC4	4.3672-11	2.1836-11	1.0918-11	0.0
0.0				
FRAC5	5.8194-11	2.9097-11	1.4549-11	0.0
0.0				
FRAC6	7.9221-11	3.9610-11	1.9805-11	0.0
0.0				
FRAC7	1.1050-10	5.5251-11	2.7625-11	0.0
0.0				
FRAC8	1.5846-10	7.9228-11	3.9614-11	0.0
0.0				
FRAC9	2.3446-10	1.1723-10	5.8615-11	0.0
0.0				
FRAC10	3.5946-10	1.7973-10	8.9865-11	0.0
0.0				
FRAC11	5.7366-10	2.8683-10	1.4342-10	0.0
0.0				
FRAC12	9.5782-10	4.7891-10	0.5000	0.0
0.0				
FRAC13	1.6824-09	8.4120-10	4.2060-10	0.0
0.0				
FRAC14	3.1274-09	1.5637-09	7.8186-10	0.0
0.0				
FRAC15	6.1918-09	3.0959-09	1.5479-09	0.0
0.0				
FRAC16	1.3143-08	6.5714-09	3.2857-09	0.0
0.0				
FRAC17	3.0111-08	1.5056-08	7.5278-09	0.0
0.0				
FRAC18	7.4948-08	3.7474-08	1.8737-08	0.0
0.0				
FRAC19	2.0388-07	1.0194-07	5.0970-08	0.0
0.0				
FRAC20	6.0900-07	3.0450-07	1.5225-07	0.0
0.0				

FRAC21	2.0029-06	1.0014-06	5.0072-07	0.0
0.0				
FRAC22	7.2483-06	3.6242-06	1.8121-06	0.0
0.0				
FRAC23	2.8706-05	1.4353-05	7.1766-06	0.0
0.0				
FRAC24	1.2285-04	6.1425-05	3.0713-05	0.0
0.0				
FRAC25	5.5530-04	2.7765-04	1.3883-04	0.0
0.0				
FRAC26	2.5548-03	1.2774-03	6.3870-04	0.0
0.0				
FRAC27	1.1309-02	5.6543-03	2.8271-03	0.0
0.0				
FRAC28	4.4364-02	3.0332-02	1.5166-02	0.0
0.0				
FRAC29	0.1374	0.5606	0.2803	0.0
0.0				
FRAC30	0.2875	0.1437	7.1872-02	0.0
0.0				
FRAC31	0.3306	0.1653	8.2640-02	0.0
0.0				
FRAC32	0.1610	8.0505-02	4.0253-02	0.0
0.0				
FRAC33	2.3867-02	1.1934-02	5.9669-03	0.0
0.0				
FRAC34	6.8541-04	3.4270-04	1.7135-04	0.0
0.0				
FRAC35	1.9694-06	9.8470-07	4.9235-07	0.0
0.0				
FRAC36	2.2075-10	1.1038-10	5.5189-11	0.0
0.0				
FRAC37	2.2205-16	1.1102-16	5.5511-17	0.0
0.0				
FRAC38	0.0	0.0	0.0	0.0
0.0				

FRAC39	0.0	0.0	0.0	0.0	0.0

STREAM SECTION

PPS-1 PPS-10 PPS-11 PPS-12 PPS-13 (CONTINUED)

STREAM ID	PPS-1	PPS-10	PPS-11	PPS-12	PPS-13
FRAC40	0.0	0.0	0.0	0.0	0.0
FRAC41	0.0	0.0	0.0	0.0	0.0
FRAC42	0.0	0.0	0.0	0.0	0.0
FRAC43	0.0	0.0	0.0	0.0	0.0
FRAC44	0.0	0.0	0.0	0.0	0.0
FRAC45	0.0	0.0	0.0	0.0	0.0
FRAC46	0.0	0.0	0.0	0.0	0.0
FRAC47	0.0	0.0	0.0	0.0	0.0
FRAC48	0.0	0.0	0.0	0.0	0.0
FRAC49	0.0	0.0	0.0	0.0	0.0
FRAC50	0.0	0.0	0.0	0.0	0.0

SUBSTREAM: CIPSD STRUCTURE: CONVENTIONAL

COMPONENTS: KMOL/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	65.7019	65.7019	65.7019	65.7019	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	20.0030	20.0030	20.0030	20.0030	0.0
ALUM	5.1995	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	5.0259	0.0	0.0	0.0	0.0
POLY(-01	10.0015	10.0015	10.0015	10.0015	0.0
AIR	0.0	0.0	0.0	0.0	0.0

COMPONENTS: KG/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	1.2626+04	1.2626+04	1.2626+04	1.2626+04	0.0

NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	561.1600	561.1600	561.1600	561.1601	0.0
ALUM	140.2900	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	280.6800	0.0	0.0	0.0	0.0
POLY(-01	420.8700	420.8700	420.8700	420.8701	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	105.9317	95.7064	95.7064	95.7064	0.0
KG/HR	1.4029+04	1.3608+04	1.3608+04	1.3608+04	0.0
L/MIN	44.5431	43.0918	43.0918	43.0918	0.0

STREAM SECTION

PPS-1 PPS-10 PPS-11 PPS-12 PPS-13 (CONTINUED)

STREAM ID		PPS-1	PPS-10	PPS-11	PPS-12	PPS-13
STATE VARIABLES:						
TEMP	K	298.1500	389.1981	389.1978	390.0362	MISSING
PRES	ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC		0.0	0.0	0.0	0.0	MISSING
LFRAC		0.0	0.0	0.0	0.0	MISSING
SFRAC		1.0000	1.0000	1.0000	1.0000	MISSING
ENTHALPY:						
	CAL/MOL	-4.0074+04	-4.3361+04	-4.3361+04	-4.3352+04	MISSING
	CAL/GM	-302.5972	-304.9608	-304.9608	-304.8964	MISSING
	CAL/SEC	-1.1792+06	-1.1528+06	-1.1528+06	-1.1525+06	MISSING
ENTROPY:						
	CAL/MOL-K	-134.4097	-145.8581	-145.8581	-145.8346	MISSING
	CAL/GM-K	-1.0149	-1.0258	-1.0258	-1.0257	MISSING
DENSITY:						

MOL/CC	3.9636-02	3.7016-02	3.7016-02	3.7016-02
MISSING				
GM/CC	5.2492	5.2632	5.2632	5.2632
MISSING				
AVG MW	132.4343	142.1852	142.1852	142.1852
MISSING				

SUBSTREAM ATTRIBUTES:

PSD

FRAC1	2.2657-10	1.1328-10	5.6642-11	1.0000
MISSING				
FRAC2	2.5960-11	1.2980-11	6.4901-12	0.0
MISSING				
FRAC3	3.3395-11	1.6698-11	8.3489-12	0.0
MISSING				
FRAC4	4.3672-11	2.1836-11	1.0918-11	0.0
MISSING				
FRAC5	5.8194-11	2.9097-11	1.4549-11	0.0
MISSING				
FRAC6	7.9221-11	3.9610-11	1.9805-11	0.0
MISSING				
FRAC7	1.1050-10	5.5251-11	2.7625-11	0.0
MISSING				
FRAC8	1.5846-10	7.9228-11	3.9614-11	0.0
MISSING				
FRAC9	2.3446-10	1.1723-10	5.8615-11	0.0
MISSING				
FRAC10	3.5946-10	1.7973-10	8.9865-11	0.0
MISSING				
FRAC11	5.7366-10	2.8683-10	1.4342-10	0.0
MISSING				
FRAC12	9.5782-10	4.7891-10	0.5000	0.0
MISSING				
FRAC13	1.6824-09	8.4120-10	4.2060-10	0.0
MISSING				
FRAC14	3.1274-09	1.5637-09	7.8186-10	0.0
MISSING				

FRAC15	6.1918-09	3.0959-09	1.5479-09	0.0
MISSING				
FRAC16	1.3143-08	6.5714-09	3.2857-09	0.0
MISSING				
FRAC17	3.0111-08	1.5056-08	7.5278-09	0.0
MISSING				
FRAC18	7.4948-08	3.7474-08	1.8737-08	0.0
MISSING				
FRAC19	2.0388-07	1.0194-07	5.0970-08	0.0
MISSING				
FRAC20	6.0900-07	3.0450-07	1.5225-07	0.0
MISSING				
FRAC21	2.0029-06	1.0014-06	5.0072-07	0.0
MISSING				
FRAC22	7.2483-06	3.6242-06	1.8121-06	0.0
MISSING				
FRAC23	2.8706-05	1.4353-05	7.1766-06	0.0
MISSING				
FRAC24	1.2285-04	6.1425-05	3.0713-05	0.0
MISSING				
FRAC25	5.5530-04	2.7765-04	1.3883-04	0.0
MISSING				
FRAC26	2.5548-03	1.2774-03	6.3870-04	0.0
MISSING				
FRAC27	1.1309-02	5.6543-03	2.8271-03	0.0
MISSING				
FRAC28	4.4364-02	3.0332-02	1.5166-02	0.0
MISSING				
FRAC29	0.1374	0.5606	0.2803	0.0
MISSING				
FRAC30	0.2875	0.1437	7.1872-02	0.0
MISSING				
FRAC31	0.3306	0.1653	8.2640-02	0.0
MISSING				
FRAC32	0.1610	8.0505-02	4.0253-02	0.0
MISSING				

FRAC33	2.3867-02	1.1934-02	5.9668-03	0.0

MISSING

STREAM SECTION

PPS-1 PPS-10 PPS-11 PPS-12 PPS-13 (CONTINUED)

STREAM ID	PPS-1	PPS-10	PPS-11	PPS-12	PPS-13
FRAC34	6.8541-04	3.4270-04	1.7135-04	0.0	MISSING
FRAC35	1.9694-06	9.8470-07	4.9235-07	0.0	MISSING
FRAC36	2.2075-10	1.1038-10	5.5189-11	0.0	MISSING
FRAC37	2.2205-16	1.1102-16	5.5511-17	0.0	MISSING
FRAC38	0.0	0.0	0.0	0.0	MISSING
FRAC39	0.0	0.0	0.0	0.0	MISSING
FRAC40	0.0	0.0	0.0	0.0	MISSING
FRAC41	0.0	0.0	0.0	0.0	MISSING
FRAC42	0.0	0.0	0.0	0.0	MISSING
FRAC43	0.0	0.0	0.0	0.0	MISSING
FRAC44	0.0	0.0	0.0	0.0	MISSING
FRAC45	0.0	0.0	0.0	0.0	MISSING
FRAC46	0.0	0.0	0.0	0.0	MISSING

FRAC47	0.0	0.0	0.0	0.0
MISSING				
FRAC48	0.0	0.0	0.0	0.0
MISSING				
FRAC49	0.0	0.0	0.0	0.0
MISSING				
FRAC50	0.0	0.0	0.0	0.0
MISSING				

STREAM SECTION

PPS-14 PPS-15 PPS-16 PPS-17 PPS-18

STREAM ID	PPS-14	PPS-15	PPS-16	PPS-17	PPS-18
FROM :	B6	FILMFLAK	FILMFLAK	----	B7
TO :	FILMFLAK	----	SINK	B7	SINK
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
CONV. MAX. REL. ERR:	0.0	0.0	0.0	0.0	-6.6276-07
TOTAL STREAM:					
KG/HR	1.8018+04	4830.8670	1.3187+04	9057.9730	1.4864+04
CAL/SEC	-5.0294+06	-3.8741+06	-1.1553+06	-9.5338+06	-1.5421+07
SUBSTREAM: MIXED					
PHASE:	VAPOR	VAPOR	MISSING	LIQUID	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0

PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	244.7920	244.7920	0.0	502.7939	825.0726
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0

COMPONENTS: KG/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0

WATER	4409.9969	4409.9969	0.0	9057.9730
1.4864+04				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
TOTAL FLOW:				
KMOL/HR	244.7920	244.7920	0.0	502.7939
825.0726				
KG/HR	4409.9969	4409.9969	0.0	9057.9730
1.4864+04				
L/MIN	1.3058+05	1.3058+05	0.0	151.8841
263.3197				
STATE VARIABLES:				
TEMP K	390.0362	390.0362	MISSING	298.1500
351.5751				
PRES ATM	1.0000	1.0000	1.0000	1.0000
1.0000				
VFRAC	1.0000	1.0000	MISSING	0.0
0.0				
LFRAC	0.0	0.0	MISSING	1.0000
1.0000				
SFRAC	0.0	0.0	MISSING	0.0
0.0				

STREAM SECTION

PPS-14 PPS-15 PPS-16 PPS-17 PPS-18 (CONTINUED)

STREAM ID	PPS-14	PPS-15	PPS-16	PPS-17	PPS-18
ENTHALPY:					
CAL/MOL	-5.7015+04	-5.7015+04	MISSING	-6.8262+04	-6.7287+04
CAL/GM	-3164.7901	-3164.7901	MISSING	-3789.1277	-3734.9839
CAL/SEC	-3.8769+06	-3.8769+06	MISSING	-9.5338+06	-1.5421+07
ENTROPY:					
CAL/MOL-K	-8.4408	-8.4408	MISSING	-38.9652	-35.9761
CAL/GM-K	-0.4685	-0.4685	MISSING	-2.1629	-1.9970
DENSITY:					
MOL/CC	3.1245-05	3.1245-05	MISSING	5.5173-02	5.2222-02
GM/CC	5.6289-04	5.6289-04	MISSING	0.9940	0.9408
AVG MW	18.0153	18.0153	MISSING	18.0153	18.0153
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	1.0000	1.0000	MISSING	MISSING	MISSING
FRAC2	0.0	0.0	MISSING	MISSING	MISSING

FRAC3	0.0	0.0	MISSING	MISSING
MISSING				
FRAC4	0.0	0.0	MISSING	MISSING
MISSING				
FRAC5	0.0	0.0	MISSING	MISSING
MISSING				
FRAC6	0.0	0.0	MISSING	MISSING
MISSING				
FRAC7	0.0	0.0	MISSING	MISSING
MISSING				
FRAC8	0.0	0.0	MISSING	MISSING
MISSING				
FRAC9	0.0	0.0	MISSING	MISSING
MISSING				
FRAC10	0.0	0.0	MISSING	MISSING
MISSING				
FRAC11	0.0	0.0	MISSING	MISSING
MISSING				
FRAC12	0.0	0.0	MISSING	MISSING
MISSING				
FRAC13	0.0	0.0	MISSING	MISSING
MISSING				
FRAC14	0.0	0.0	MISSING	MISSING
MISSING				
FRAC15	0.0	0.0	MISSING	MISSING
MISSING				
FRAC16	0.0	0.0	MISSING	MISSING
MISSING				
FRAC17	0.0	0.0	MISSING	MISSING
MISSING				
FRAC18	0.0	0.0	MISSING	MISSING
MISSING				
FRAC19	0.0	0.0	MISSING	MISSING
MISSING				
FRAC20	0.0	0.0	MISSING	MISSING
MISSING				

FRAC21	0.0	0.0	MISSING	MISSING	MISSING
FRAC22	0.0	0.0	MISSING	MISSING	MISSING
FRAC23	0.0	0.0	MISSING	MISSING	MISSING
FRAC24	0.0	0.0	MISSING	MISSING	MISSING
FRAC25	0.0	0.0	MISSING	MISSING	MISSING
FRAC26	0.0	0.0	MISSING	MISSING	MISSING
FRAC27	0.0	0.0	MISSING	MISSING	MISSING
FRAC28	0.0	0.0	MISSING	MISSING	MISSING
FRAC29	0.0	0.0	MISSING	MISSING	MISSING
FRAC30	0.0	0.0	MISSING	MISSING	MISSING
FRAC31	0.0	0.0	MISSING	MISSING	MISSING
FRAC32	0.0	0.0	MISSING	MISSING	MISSING
FRAC33	0.0	0.0	MISSING	MISSING	MISSING
FRAC34	0.0	0.0	MISSING	MISSING	MISSING
FRAC35	0.0	0.0	MISSING	MISSING	MISSING
FRAC36	0.0	0.0	MISSING	MISSING	MISSING
FRAC37	0.0	0.0	MISSING	MISSING	MISSING
FRAC38	0.0	0.0	MISSING	MISSING	MISSING

FRAC39	0.0	0.0	MISSING	MISSING	MISSING

STREAM SECTION

PPS-14 PPS-15 PPS-16 PPS-17 PPS-18 (CONTINUED)

STREAM ID	PPS-14	PPS-15	PPS-16	PPS-17	PPS-18
FRAC40	0.0	0.0	MISSING	MISSING	MISSING
FRAC41	0.0	0.0	MISSING	MISSING	MISSING
FRAC42	0.0	0.0	MISSING	MISSING	MISSING
FRAC43	0.0	0.0	MISSING	MISSING	MISSING
FRAC44	0.0	0.0	MISSING	MISSING	MISSING
FRAC45	0.0	0.0	MISSING	MISSING	MISSING
FRAC46	0.0	0.0	MISSING	MISSING	MISSING
FRAC47	0.0	0.0	MISSING	MISSING	MISSING
FRAC48	0.0	0.0	MISSING	MISSING	MISSING
FRAC49	0.0	0.0	MISSING	MISSING	MISSING
FRAC50	0.0	0.0	MISSING	MISSING	MISSING

SUBSTREAM: CIPSD STRUCTURE: CONVENTIONAL

COMPONENTS: KMOL/HR

METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	65.7019	0.0	65.7019	0.0
0.0				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	20.0030	0.0	20.0030	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	0.0	0.0	0.0	0.0
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	10.0015	10.0015	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				

COMPONENTS: KG/HR

METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	1.2626+04	0.0	1.2626+04	0.0
0.0				

NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	561.1601	0.0	561.1601	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	420.8701	420.8701	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	95.7064	10.0015	85.7049	0.0	0.0
KG/HR	1.3608+04	420.8701	1.3187+04	0.0	0.0
L/MIN	43.0918	4.5032	38.5886	0.0	0.0

STREAM SECTION

PPS-14 PPS-15 PPS-16 PPS-17 PPS-18 (CONTINUED)

STREAM ID		PPS-14	PPS-15	PPS-16	PPS-17	PPS-18
STATE VARIABLES:						
TEMP	K	390.0362	390.0362	390.0362	MISSING	MISSING
PRES	ATM	1.0000	1.0000	1.0000	1.0000	MISSING
VFRAC		0.0	0.0	0.0	MISSING	MISSING
LFRAC		0.0	0.0	0.0	MISSING	MISSING
SFRAC		1.0000	1.0000	1.0000	MISSING	MISSING
ENTHALPY:						
CAL/MOL		-4.3352+04	1004.0803	-4.8528+04	MISSING	MISSING
CAL/GM		-304.8964	23.8609	-315.3887	MISSING	MISSING
CAL/SEC		-1.1525+06	2789.5341	-1.1553+06	MISSING	MISSING
ENTROPY:						
CAL/MOL-K		-145.8346	2.9356	-163.1956	MISSING	MISSING
CAL/GM-K		-1.0257	6.9761-02	-1.0606	MISSING	MISSING
DENSITY:						

MOL/CC	3.7016-02	3.7016-02	3.7016-02	MISSING	MISSING
GM/CC	5.2632	1.5577	5.6956	MISSING	MISSING
AVG MW	142.1852	42.0806	153.8671	MISSING	MISSING

SUBSTREAM ATTRIBUTES:

PSD

FRAC1	1.0000	1.0000	1.0000	MISSING	MISSING
FRAC2	0.0	0.0	0.0	MISSING	MISSING
FRAC3	0.0	0.0	0.0	MISSING	MISSING
FRAC4	0.0	0.0	0.0	MISSING	MISSING
FRAC5	0.0	0.0	0.0	MISSING	MISSING
FRAC6	0.0	0.0	0.0	MISSING	MISSING
FRAC7	0.0	0.0	0.0	MISSING	MISSING
FRAC8	0.0	0.0	0.0	MISSING	MISSING
FRAC9	0.0	0.0	0.0	MISSING	MISSING
FRAC10	0.0	0.0	0.0	MISSING	MISSING
FRAC11	0.0	0.0	0.0	MISSING	MISSING
FRAC12	0.0	0.0	0.0	MISSING	MISSING
FRAC13	0.0	0.0	0.0	MISSING	MISSING
FRAC14	0.0	0.0	0.0	MISSING	MISSING

FRAC15	0.0	0.0	0.0	MISSING
MISSING				
FRAC16	0.0	0.0	0.0	MISSING
MISSING				
FRAC17	0.0	0.0	0.0	MISSING
MISSING				
FRAC18	0.0	0.0	0.0	MISSING
MISSING				
FRAC19	0.0	0.0	0.0	MISSING
MISSING				
FRAC20	0.0	0.0	0.0	MISSING
MISSING				
FRAC21	0.0	0.0	0.0	MISSING
MISSING				
FRAC22	0.0	0.0	0.0	MISSING
MISSING				
FRAC23	0.0	0.0	0.0	MISSING
MISSING				
FRAC24	0.0	0.0	0.0	MISSING
MISSING				
FRAC25	0.0	0.0	0.0	MISSING
MISSING				
FRAC26	0.0	0.0	0.0	MISSING
MISSING				
FRAC27	0.0	0.0	0.0	MISSING
MISSING				
FRAC28	0.0	0.0	0.0	MISSING
MISSING				
FRAC29	0.0	0.0	0.0	MISSING
MISSING				
FRAC30	0.0	0.0	0.0	MISSING
MISSING				
FRAC31	0.0	0.0	0.0	MISSING
MISSING				
FRAC32	0.0	0.0	0.0	MISSING
MISSING				

FRAC33	0.0	0.0	0.0	MISSING	MISSING

STREAM SECTION

PPS-14 PPS-15 PPS-16 PPS-17 PPS-18 (CONTINUED)

STREAM ID	PPS-14	PPS-15	PPS-16	PPS-17	PPS-18
FRAC34	0.0	0.0	0.0	MISSING	MISSING
FRAC35	0.0	0.0	0.0	MISSING	MISSING
FRAC36	0.0	0.0	0.0	MISSING	MISSING
FRAC37	0.0	0.0	0.0	MISSING	MISSING
FRAC38	0.0	0.0	0.0	MISSING	MISSING
FRAC39	0.0	0.0	0.0	MISSING	MISSING
FRAC40	0.0	0.0	0.0	MISSING	MISSING
FRAC41	0.0	0.0	0.0	MISSING	MISSING
FRAC42	0.0	0.0	0.0	MISSING	MISSING
FRAC43	0.0	0.0	0.0	MISSING	MISSING
FRAC44	0.0	0.0	0.0	MISSING	MISSING
FRAC45	0.0	0.0	0.0	MISSING	MISSING
FRAC46	0.0	0.0	0.0	MISSING	MISSING

FRAC47	0.0	0.0	0.0	MISSING	MISSING
FRAC48	0.0	0.0	0.0	MISSING	MISSING
FRAC49	0.0	0.0	0.0	MISSING	MISSING
FRAC50	0.0	0.0	0.0	MISSING	MISSING

STREAM SECTION

PPS-19 PPS-2 PPS-20 PPS-21 PPS-22

STREAM ID	PPS-19	PPS-2	PPS-20	PPS-21	PPS-22
FROM :	SINK	DEBALER	SINK	----	HOTWASH
TO :	----	----	HOTWASH	HOTWASH	---
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	561.1601	210.5100	2.7490+04	7257.4779	1.4864+04
CAL/SEC	3375.9937	3.7126-13	-1.6580+07	-7.4831+06	-1.5385+07
SUBSTREAM: MIXED					
PHASE:	MISSING	MISSING	LIQUID	LIQUID	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	825.0726	402.8512	825.0755
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
COMPONENTS: KG/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	1.4864+04	7257.4779	1.4864+04
DEG	0.0	0.0	0.0	0.0	0.0

BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	0.0	0.0	825.0726	402.8512	825.0755
KG/HR	0.0	0.0	1.4864+04	7257.4779	1.4864+04
L/MIN	0.0	0.0	263.9485	131.7206	265.7813
STATE VARIABLES:					
TEMP K	MISSING	MISSING	353.7519	373.1500	359.9998
PRES ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC	MISSING	MISSING	0.0	0.0	0.0
LFRAC	MISSING	MISSING	1.0000	1.0000	1.0000
SFRAC	MISSING	MISSING	0.0	0.0	0.0

STREAM SECTION

PPS-19 PPS-2 PPS-20 PPS-21 PPS-22 (CONTINUED)

STREAM ID	PPS-19	PPS-2	PPS-20	PPS-21	PPS-22
ENTHALPY:					
CAL/MOL	MISSING	MISSING	-6.7246+04	-6.6872+04	-6.7126+04
CAL/GM	MISSING	MISSING	-3732.6979	-3711.9388	-3726.0854
CAL/SEC	MISSING	MISSING	-1.5412+07	-7.4831+06	-1.5385+07
ENTROPY:					
CAL/MOL-K	MISSING	MISSING	-35.8605	-34.8472	-35.5310
CAL/GM-K	MISSING	MISSING	-1.9906	-1.9343	-1.9723
DENSITY:					
MOL/CC	MISSING	MISSING	5.2098-02	5.0973-02	5.1739-02
GM/CC	MISSING	MISSING	0.9386	0.9183	0.9321
AVG MW	MISSING	MISSING	18.0153	18.0153	18.0153
SUBSTREAM ATTRIBUTES:					
PSD					

SUBSTREAM: CIPSD STRUCTURE: CONVENTIONAL

COMPONENTS: KMOL/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	65.7019	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	20.0030	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	3.7694	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0

COMPONENTS: KG/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	1.2626+04	0.0	0.0

NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	561.1601	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	210.5100	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	20.0030	3.7694	65.7019	0.0	0.0
KG/HR	561.1601	210.5100	1.2626+04	0.0	0.0
L/MIN	9.0064	0.4400	29.5823	0.0	0.0

STREAM SECTION

PPS-19 PPS-2 PPS-20 PPS-21 PPS-22 (CONTINUED)

STREAM ID		PPS-19	PPS-2	PPS-20	PPS-21	PPS-22
STATE VARIABLES:						
TEMP	K	353.7519	298.1500	353.7519	MISSING	MISSING
PRES	ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC		0.0	0.0	0.0	MISSING	MISSING
LFRAC		0.0	0.0	0.0	MISSING	MISSING
SFRAC		1.0000	1.0000	1.0000	MISSING	MISSING
ENTHALPY:						
CAL/MOL		607.5869	3.5458-13	-6.4005+04	MISSING	MISSING
CAL/GM		21.6579	6.3491-15	-333.0601	MISSING	MISSING
CAL/SEC		3375.9937	3.7126-13	-1.1681+06	MISSING	MISSING
ENTROPY:						
CAL/MOL-K		1.8686	1.3851-15	-214.8415	MISSING	MISSING
CAL/GM-K		6.6607-02	2.4801-17	-1.1180	MISSING	MISSING
DENSITY:						

MOL/CC	3.7016-02	0.1428	3.7016-02	MISSING
MISSING				
GM/CC	1.0385	7.9735	7.1135	MISSING
MISSING				
AVG MW	28.0538	55.8470	192.1711	MISSING
MISSING				

SUBSTREAM ATTRIBUTES:

PSD

FRAC1	1.0000	2.2657-10	1.0000	MISSING
MISSING				
FRAC2	0.0	2.5960-11	0.0	MISSING
MISSING				
FRAC3	0.0	3.3395-11	0.0	MISSING
MISSING				
FRAC4	0.0	4.3672-11	0.0	MISSING
MISSING				
FRAC5	0.0	5.8194-11	0.0	MISSING
MISSING				
FRAC6	0.0	7.9221-11	0.0	MISSING
MISSING				
FRAC7	0.0	1.1050-10	0.0	MISSING
MISSING				
FRAC8	0.0	1.5846-10	0.0	MISSING
MISSING				
FRAC9	0.0	2.3446-10	0.0	MISSING
MISSING				
FRAC10	0.0	3.5946-10	0.0	MISSING
MISSING				
FRAC11	0.0	5.7366-10	0.0	MISSING
MISSING				
FRAC12	0.0	9.5782-10	0.0	MISSING
MISSING				
FRAC13	0.0	1.6824-09	0.0	MISSING
MISSING				
FRAC14	0.0	3.1274-09	0.0	MISSING
MISSING				

FRAC15	0.0	6.1918-09	0.0	MISSING
MISSING				
FRAC16	0.0	1.3143-08	0.0	MISSING
MISSING				
FRAC17	0.0	3.0111-08	0.0	MISSING
MISSING				
FRAC18	0.0	7.4948-08	0.0	MISSING
MISSING				
FRAC19	0.0	2.0388-07	0.0	MISSING
MISSING				
FRAC20	0.0	6.0900-07	0.0	MISSING
MISSING				
FRAC21	0.0	2.0029-06	0.0	MISSING
MISSING				
FRAC22	0.0	7.2483-06	0.0	MISSING
MISSING				
FRAC23	0.0	2.8706-05	0.0	MISSING
MISSING				
FRAC24	0.0	1.2285-04	0.0	MISSING
MISSING				
FRAC25	0.0	5.5530-04	0.0	MISSING
MISSING				
FRAC26	0.0	2.5548-03	0.0	MISSING
MISSING				
FRAC27	0.0	1.1309-02	0.0	MISSING
MISSING				
FRAC28	0.0	4.4364-02	0.0	MISSING
MISSING				
FRAC29	0.0	0.1374	0.0	MISSING
MISSING				
FRAC30	0.0	0.2875	0.0	MISSING
MISSING				
FRAC31	0.0	0.3306	0.0	MISSING
MISSING				
FRAC32	0.0	0.1610	0.0	MISSING
MISSING				

FRAC33	0.0	2.3867-02	0.0	MISSING	MISSING

STREAM SECTION

PPS-19 PPS-2 PPS-20 PPS-21 PPS-22 (CONTINUED)

STREAM ID	PPS-19	PPS-2	PPS-20	PPS-21	PPS-22
FRAC34	0.0	6.8541-04	0.0	MISSING	MISSING
FRAC35	0.0	1.9694-06	0.0	MISSING	MISSING
FRAC36	0.0	2.2075-10	0.0	MISSING	MISSING
FRAC37	0.0	2.2205-16	0.0	MISSING	MISSING
FRAC38	0.0	0.0	0.0	MISSING	MISSING
FRAC39	0.0	0.0	0.0	MISSING	MISSING
FRAC40	0.0	0.0	0.0	MISSING	MISSING
FRAC41	0.0	0.0	0.0	MISSING	MISSING
FRAC42	0.0	0.0	0.0	MISSING	MISSING
FRAC43	0.0	0.0	0.0	MISSING	MISSING
FRAC44	0.0	0.0	0.0	MISSING	MISSING
FRAC45	0.0	0.0	0.0	MISSING	MISSING
FRAC46	0.0	0.0	0.0	MISSING	MISSING

FRAC47	0.0	0.0	0.0	MISSING	MISSING
FRAC48	0.0	0.0	0.0	MISSING	MISSING
FRAC49	0.0	0.0	0.0	MISSING	MISSING
FRAC50	0.0	0.0	0.0	MISSING	MISSING

STREAM SECTION

PPS-23 PPS-24 PPS-25 PPS-26 PPS-27

STREAM ID	PPS-23	PPS-24	PPS-25	PPS-26	PPS-27
FROM :	HOTWASH	----	FRICWASH	FRICWASH	DEWATER
TO :	FRICWASH	FRICWASH	----	DEWATER	B7
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	1.9883+04	7257.4779	7257.4779	1.9883+04	5805.9412
CAL/SEC	-8.6785+06	-7.4831+06	-7.4980+06	-8.6636+06	-5.8874+06
SUBSTREAM: MIXED					
PHASE:	LIQUID	LIQUID	LIQUID	LIQUID	MIXED
COMPONENTS: KMOL/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	402.8484	402.8512	402.8512	402.8484
322.2787				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				

COMPONENTS: KG/HR

METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	0.0	0.0	0.0	0.0
0.0				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	7257.4265	7257.4779	7257.4779	7257.4265
5805.9412				
DEG	0.0	0.0	0.0	0.0
0.0				

BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	402.8484	402.8512	402.8512	402.8484	322.2787
KG/HR	7257.4265	7257.4779	7257.4779	7257.4265	5805.9412
L/MIN	129.7694	131.7206	130.6962	130.6953	1.8812+04
STATE VARIABLES:					
TEMP K	359.9998	373.1500	366.3222	366.3222	373.1678
PRES ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC	0.0	0.0	0.0	0.0	0.1138
LFRAC	1.0000	1.0000	1.0000	1.0000	0.8862
SFRAC	0.0	0.0	0.0	0.0	0.0

STREAM SECTION

PPS-23 PPS-24 PPS-25 PPS-26 PPS-27 (CONTINUED)

STREAM ID	PPS-23	PPS-24	PPS-25	PPS-26	PPS-27
ENTHALPY:					
CAL/MOL	-6.7126+04	-6.6872+04	-6.7005+04	-6.7005+04	-6.5765+04
CAL/GM	-3726.0854	-3711.9388	-3719.3242	-3719.3242	-3650.5192
CAL/SEC	-7.5116+06	-7.4831+06	-7.4980+06	-7.4980+06	-5.8874+06
ENTROPY:					
CAL/MOL-K	-35.5310	-34.8472	-35.2007	-35.2007	-31.8821
CAL/GM-K	-1.9723	-1.9343	-1.9539	-1.9539	-1.7697
DENSITY:					
MOL/CC	5.1739-02	5.0973-02	5.1372-02	5.1372-02	2.8553-04
GM/CC	0.9321	0.9183	0.9255	0.9255	5.1439-03
AVG MW	18.0153	18.0153	18.0153	18.0153	18.0153
SUBSTREAM ATTRIBUTES:					
PSD					

SUBSTREAM: CIPSD STRUCTURE: CONVENTIONAL

COMPONENTS: KMOL/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	65.7019	0.0	0.0	65.7019	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0

COMPONENTS: KG/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	1.2626+04	0.0	0.0	1.2626+04	0.0

NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	0.0	0.0	0.0	0.0
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
TOTAL FLOW:				
KMOL/HR	65.7019	0.0	0.0	65.7019
0.0				
KG/HR	1.2626+04	0.0	0.0	1.2626+04
0.0				
L/MIN	29.5823	0.0	0.0	29.5823
0.0				

STREAM SECTION

PPS-23 PPS-24 PPS-25 PPS-26 PPS-27 (CONTINUED)

STREAM ID		PPS-23	PPS-24	PPS-25	PPS-26	PPS-27
STATE VARIABLES:						
TEMP	K	359.9998	MISSING	MISSING	366.3222	MISSING
PRES	ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC		0.0	MISSING	MISSING	0.0	MISSING
LFRAC		0.0	MISSING	MISSING	0.0	MISSING
SFRAC		1.0000	MISSING	MISSING	1.0000	MISSING
ENTHALPY:						
CAL/MOL		-6.3936+04	MISSING	MISSING	-6.3867+04	MISSING
CAL/GM		-332.7048	MISSING	MISSING	-332.3453	MISSING
CAL/SEC		-1.1669+06	MISSING	MISSING	-1.1656+06	MISSING
ENTROPY:						
CAL/MOL-K		-214.6502	MISSING	MISSING	-214.4600	MISSING
CAL/GM-K		-1.1170	MISSING	MISSING	-1.1160	MISSING
DENSITY:						

MOL/CC	3.7016-02	MISSING	MISSING	3.7016-02	MISSING
GM/CC	7.1135	MISSING	MISSING	7.1135	MISSING
AVG MW	192.1711	MISSING	MISSING	192.1711	MISSING

SUBSTREAM ATTRIBUTES:

PSD

FRAC1	1.0000	MISSING	MISSING	1.0000	MISSING
FRAC2	0.0	MISSING	MISSING	0.0	MISSING
FRAC3	0.0	MISSING	MISSING	0.0	MISSING
FRAC4	0.0	MISSING	MISSING	0.0	MISSING
FRAC5	0.0	MISSING	MISSING	0.0	MISSING
FRAC6	0.0	MISSING	MISSING	0.0	MISSING
FRAC7	0.0	MISSING	MISSING	0.0	MISSING
FRAC8	0.0	MISSING	MISSING	0.0	MISSING
FRAC9	0.0	MISSING	MISSING	0.0	MISSING
FRAC10	0.0	MISSING	MISSING	0.0	MISSING
FRAC11	0.0	MISSING	MISSING	0.0	MISSING
FRAC12	0.0	MISSING	MISSING	0.0	MISSING
FRAC13	0.0	MISSING	MISSING	0.0	MISSING
FRAC14	0.0	MISSING	MISSING	0.0	MISSING

FRAC15	0.0	MISSING	MISSING	0.0
MISSING				
FRAC16	0.0	MISSING	MISSING	0.0
MISSING				
FRAC17	0.0	MISSING	MISSING	0.0
MISSING				
FRAC18	0.0	MISSING	MISSING	0.0
MISSING				
FRAC19	0.0	MISSING	MISSING	0.0
MISSING				
FRAC20	0.0	MISSING	MISSING	0.0
MISSING				
FRAC21	0.0	MISSING	MISSING	0.0
MISSING				
FRAC22	0.0	MISSING	MISSING	0.0
MISSING				
FRAC23	0.0	MISSING	MISSING	0.0
MISSING				
FRAC24	0.0	MISSING	MISSING	0.0
MISSING				
FRAC25	0.0	MISSING	MISSING	0.0
MISSING				
FRAC26	0.0	MISSING	MISSING	0.0
MISSING				
FRAC27	0.0	MISSING	MISSING	0.0
MISSING				
FRAC28	0.0	MISSING	MISSING	0.0
MISSING				
FRAC29	0.0	MISSING	MISSING	0.0
MISSING				
FRAC30	0.0	MISSING	MISSING	0.0
MISSING				
FRAC31	0.0	MISSING	MISSING	0.0
MISSING				
FRAC32	0.0	MISSING	MISSING	0.0
MISSING				

FRAC33	0.0	MISSING	MISSING	0.0	MISSING

STREAM SECTION

PPS-23 PPS-24 PPS-25 PPS-26 PPS-27 (CONTINUED)

STREAM ID	PPS-23	PPS-24	PPS-25	PPS-26	PPS-27
FRAC34	0.0	MISSING	MISSING	0.0	MISSING
FRAC35	0.0	MISSING	MISSING	0.0	MISSING
FRAC36	0.0	MISSING	MISSING	0.0	MISSING
FRAC37	0.0	MISSING	MISSING	0.0	MISSING
FRAC38	0.0	MISSING	MISSING	0.0	MISSING
FRAC39	0.0	MISSING	MISSING	0.0	MISSING
FRAC40	0.0	MISSING	MISSING	0.0	MISSING
FRAC41	0.0	MISSING	MISSING	0.0	MISSING
FRAC42	0.0	MISSING	MISSING	0.0	MISSING
FRAC43	0.0	MISSING	MISSING	0.0	MISSING
FRAC44	0.0	MISSING	MISSING	0.0	MISSING
FRAC45	0.0	MISSING	MISSING	0.0	MISSING
FRAC46	0.0	MISSING	MISSING	0.0	MISSING

FRAC47	0.0	MISSING	MISSING	0.0 MISSING
FRAC48	0.0	MISSING	MISSING	0.0 MISSING
FRAC49	0.0	MISSING	MISSING	0.0 MISSING
FRAC50	0.0	MISSING	MISSING	0.0 MISSING

STREAM SECTION

PPS-28 PPS-29 PPS-3 PPS-30 PPS-30-2

STREAM ID	PPS-28	PPS-29	PPS-3	PPS-30	PPS-30-2
FROM :	DEWATER	----	DEBALER	THERMDRY	---
TO :	THERMDRY	THERMDRY	METALDET	----	B1
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	1.4077+04	4851.0000	2.6444+04	6174.9499	4851.0000
CAL/SEC	-2.6329+06	4.1414-11	-2.3584+06	-1.3177+06	4.1414-11
SUBSTREAM: MIXED					
PHASE:	MIXED	VAPOR	SOLID	MIXED	VAPOR
COMPONENTS: KMOL/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	65.7019	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	80.5697	0.0	0.0	73.4904	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	167.5595	0.0	167.5595	167.5595
COMPONENTS: KG/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	1.2626+04	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	1451.4853	0.0	0.0	1323.9499	0.0
DEG	0.0	0.0	0.0	0.0	0.0

BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	4851.0000	0.0	4851.0000	4851.0000
TOTAL FLOW:					
KMOL/HR	80.5697	167.5595	65.7019	241.0499	167.5595
KG/HR	1451.4853	4851.0000	1.2626+04	6174.9499	4851.0000
L/MIN	5314.0271	6.8322+04	29.5823	8.2843+04	6.8322+04
STATE VARIABLES:					
TEMP K	373.1678	298.1500	298.1500	321.3354	298.1500
PRES ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC	0.1287	1.0000	0.0	0.7819	1.0000
LFRAC	0.8713	0.0	0.0	0.2181	0.0
SFRAC	0.0	0.0	1.0000	0.0	0.0

STREAM SECTION

PPS-28 PPS-29 PPS-3 PPS-30 PPS-30-2 (CONTINUED)

STREAM ID	PPS-28	PPS-29	PPS-3	PPS-30	PPS-30-2
ENTHALPY:					
CAL/MOL	-6.5621+04	8.8977-13	-6.4612+04	-1.9679+04	8.8977-13
CAL/GM	-3642.4964	3.0734-14	-336.2218	-768.2194	3.0734-14
CAL/SEC	-1.4686+06	4.1414-11	-1.1792+06	-1.3177+06	4.1414-11
ENTROPY:					
CAL/MOL-K	-31.4948	0.0	-216.7101	-8.1666	0.0
CAL/GM-K	-1.7482	0.0	-1.1277	-0.3188	0.0
DENSITY:					
MOL/CC	2.5269-04	4.0875-05	3.7016-02	4.8495-05	4.0875-05
GM/CC	4.5524-03	1.1834-03	7.1135	1.2423-03	1.1834-03
AVG MW	18.0153	28.9509	192.1711	25.6169	28.9509
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	MISSING	MISSING	2.2657-10	MISSING	MISSING
FRAC2	MISSING	MISSING	2.5960-11	MISSING	MISSING

FRAC3	MISSING	MISSING	3.3395-11	MISSING
MISSING				
FRAC4	MISSING	MISSING	4.3672-11	MISSING
MISSING				
FRAC5	MISSING	MISSING	5.8194-11	MISSING
MISSING				
FRAC6	MISSING	MISSING	7.9221-11	MISSING
MISSING				
FRAC7	MISSING	MISSING	1.1050-10	MISSING
MISSING				
FRAC8	MISSING	MISSING	1.5846-10	MISSING
MISSING				
FRAC9	MISSING	MISSING	2.3446-10	MISSING
MISSING				
FRAC10	MISSING	MISSING	3.5946-10	MISSING
MISSING				
FRAC11	MISSING	MISSING	5.7366-10	MISSING
MISSING				
FRAC12	MISSING	MISSING	9.5782-10	MISSING
MISSING				
FRAC13	MISSING	MISSING	1.6824-09	MISSING
MISSING				
FRAC14	MISSING	MISSING	3.1274-09	MISSING
MISSING				
FRAC15	MISSING	MISSING	6.1918-09	MISSING
MISSING				
FRAC16	MISSING	MISSING	1.3143-08	MISSING
MISSING				
FRAC17	MISSING	MISSING	3.0111-08	MISSING
MISSING				
FRAC18	MISSING	MISSING	7.4948-08	MISSING
MISSING				
FRAC19	MISSING	MISSING	2.0388-07	MISSING
MISSING				
FRAC20	MISSING	MISSING	6.0900-07	MISSING
MISSING				

FRAC21	MISSING	MISSING	2.0029-06	MISSING
MISSING				
FRAC22	MISSING	MISSING	7.2483-06	MISSING
MISSING				
FRAC23	MISSING	MISSING	2.8706-05	MISSING
MISSING				
FRAC24	MISSING	MISSING	1.2285-04	MISSING
MISSING				
FRAC25	MISSING	MISSING	5.5530-04	MISSING
MISSING				
FRAC26	MISSING	MISSING	2.5548-03	MISSING
MISSING				
FRAC27	MISSING	MISSING	1.1309-02	MISSING
MISSING				
FRAC28	MISSING	MISSING	4.4364-02	MISSING
MISSING				
FRAC29	MISSING	MISSING	0.1374	MISSING
MISSING				
FRAC30	MISSING	MISSING	0.2875	MISSING
MISSING				
FRAC31	MISSING	MISSING	0.3306	MISSING
MISSING				
FRAC32	MISSING	MISSING	0.1610	MISSING
MISSING				
FRAC33	MISSING	MISSING	2.3867-02	MISSING
MISSING				
FRAC34	MISSING	MISSING	6.8541-04	MISSING
MISSING				
FRAC35	MISSING	MISSING	1.9694-06	MISSING
MISSING				
FRAC36	MISSING	MISSING	2.2075-10	MISSING
MISSING				
FRAC37	MISSING	MISSING	2.2205-16	MISSING
MISSING				
FRAC38	MISSING	MISSING	0.0	MISSING
MISSING				

FRAC39	MISSING	MISSING	0.0	MISSING
MISSING				

STREAM SECTION

PPS-28 PPS-29 PPS-3 PPS-30 PPS-30-2 (CONTINUED)

STREAM ID	PPS-28	PPS-29	PPS-3	PPS-30	PPS-30-2
FRAC40	MISSING	MISSING	0.0	MISSING	MISSING
FRAC41	MISSING	MISSING	0.0	MISSING	MISSING
FRAC42	MISSING	MISSING	0.0	MISSING	MISSING
FRAC43	MISSING	MISSING	0.0	MISSING	MISSING
FRAC44	MISSING	MISSING	0.0	MISSING	MISSING
FRAC45	MISSING	MISSING	0.0	MISSING	MISSING
FRAC46	MISSING	MISSING	0.0	MISSING	MISSING
FRAC47	MISSING	MISSING	0.0	MISSING	MISSING
FRAC48	MISSING	MISSING	0.0	MISSING	MISSING
FRAC49	MISSING	MISSING	0.0	MISSING	MISSING
FRAC50	MISSING	MISSING	0.0	MISSING	MISSING

SUBSTREAM: CIPSD STRUCTURE: CONVENTIONAL

COMPONENTS: KMOL/HR

METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	65.7019	0.0	65.7019	0.0
0.0				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	20.0030	0.0
0.0				
ALUM	0.0	0.0	5.1995	0.0
0.0				
WATER	0.0	0.0	0.0	0.0
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	1.2565	0.0
0.0				
POLY(-01	0.0	0.0	10.0015	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
COMPONENTS: KG/HR				
METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	1.2626+04	0.0	1.2626+04	0.0
0.0				

NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	561.1600	0.0
0.0				
ALUM	0.0	0.0	140.2900	0.0
0.0				
WATER	0.0	0.0	0.0	0.0
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	70.1700	0.0
0.0				
POLY(-01	0.0	0.0	420.8700	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
TOTAL FLOW:				
KMOL/HR	65.7019	0.0	102.1623	0.0
0.0				
KG/HR	1.2626+04	0.0	1.3818+04	0.0
0.0				
L/MIN	29.5823	0.0	44.1031	0.0
0.0				

STREAM SECTION

PPS-28 PPS-29 PPS-3 PPS-30 PPS-30-2 (CONTINUED)

STREAM ID		PPS-28	PPS-29	PPS-3	PPS-30	PPS-30-2
STATE VARIABLES:						
TEMP	K	373.1678	MISSING	298.1500	MISSING	MISSING
PRES	ATM	1.0000	1.0000	1.0000	MISSING	1.0000
VFRAC		0.0	MISSING	0.0	MISSING	MISSING
LFRAC		0.0	MISSING	0.0	MISSING	MISSING
SFRAC		1.0000	MISSING	1.0000	MISSING	MISSING
ENTHALPY:						
CAL/MOL		-6.3792+04	MISSING	-4.1553+04	MISSING	MISSING
CAL/GM		-331.9560	MISSING	-307.2069	MISSING	MISSING
CAL/SEC		-1.1642+06	MISSING	-1.1792+06	MISSING	MISSING
ENTROPY:						
CAL/MOL-K		-214.2576	MISSING	-139.3689	MISSING	MISSING
CAL/GM-K		-1.1149	MISSING	-1.0304	MISSING	MISSING
DENSITY:						

MOL/CC	3.7016-02	MISSING	3.8607-02	MISSING	MISSING
GM/CC	7.1135	MISSING	5.2220	MISSING	MISSING
AVG MW	192.1711	MISSING	135.2601	MISSING	MISSING

SUBSTREAM ATTRIBUTES:

PSD

FRAC1	1.0000	MISSING	2.2657-10	MISSING	MISSING
FRAC2	0.0	MISSING	2.5960-11	MISSING	MISSING
FRAC3	0.0	MISSING	3.3395-11	MISSING	MISSING
FRAC4	0.0	MISSING	4.3672-11	MISSING	MISSING
FRAC5	0.0	MISSING	5.8194-11	MISSING	MISSING
FRAC6	0.0	MISSING	7.9221-11	MISSING	MISSING
FRAC7	0.0	MISSING	1.1050-10	MISSING	MISSING
FRAC8	0.0	MISSING	1.5846-10	MISSING	MISSING
FRAC9	0.0	MISSING	2.3446-10	MISSING	MISSING
FRAC10	0.0	MISSING	3.5946-10	MISSING	MISSING
FRAC11	0.0	MISSING	5.7366-10	MISSING	MISSING
FRAC12	0.0	MISSING	9.5782-10	MISSING	MISSING
FRAC13	0.0	MISSING	1.6824-09	MISSING	MISSING
FRAC14	0.0	MISSING	3.1274-09	MISSING	MISSING

FRAC15	0.0	MISSING	6.1918-09	MISSING
MISSING				
FRAC16	0.0	MISSING	1.3143-08	MISSING
MISSING				
FRAC17	0.0	MISSING	3.0111-08	MISSING
MISSING				
FRAC18	0.0	MISSING	7.4948-08	MISSING
MISSING				
FRAC19	0.0	MISSING	2.0388-07	MISSING
MISSING				
FRAC20	0.0	MISSING	6.0900-07	MISSING
MISSING				
FRAC21	0.0	MISSING	2.0029-06	MISSING
MISSING				
FRAC22	0.0	MISSING	7.2483-06	MISSING
MISSING				
FRAC23	0.0	MISSING	2.8706-05	MISSING
MISSING				
FRAC24	0.0	MISSING	1.2285-04	MISSING
MISSING				
FRAC25	0.0	MISSING	5.5530-04	MISSING
MISSING				
FRAC26	0.0	MISSING	2.5548-03	MISSING
MISSING				
FRAC27	0.0	MISSING	1.1309-02	MISSING
MISSING				
FRAC28	0.0	MISSING	4.4364-02	MISSING
MISSING				
FRAC29	0.0	MISSING	0.1374	MISSING
MISSING				
FRAC30	0.0	MISSING	0.2875	MISSING
MISSING				
FRAC31	0.0	MISSING	0.3306	MISSING
MISSING				
FRAC32	0.0	MISSING	0.1610	MISSING
MISSING				

FRAC33	0.0	MISSING	2.3867-02	MISSING
MISSING				

STREAM SECTION

PPS-28 PPS-29 PPS-3 PPS-30 PPS-30-2 (CONTINUED)

STREAM ID	PPS-28	PPS-29	PPS-3	PPS-30	PPS-30-2
FRAC34	0.0	MISSING	6.8541-04	MISSING	MISSING
FRAC35	0.0	MISSING	1.9694-06	MISSING	MISSING
FRAC36	0.0	MISSING	2.2075-10	MISSING	MISSING
FRAC37	0.0	MISSING	2.2205-16	MISSING	MISSING
FRAC38	0.0	MISSING	0.0	MISSING	MISSING
FRAC39	0.0	MISSING	0.0	MISSING	MISSING
FRAC40	0.0	MISSING	0.0	MISSING	MISSING
FRAC41	0.0	MISSING	0.0	MISSING	MISSING
FRAC42	0.0	MISSING	0.0	MISSING	MISSING
FRAC43	0.0	MISSING	0.0	MISSING	MISSING
FRAC44	0.0	MISSING	0.0	MISSING	MISSING
FRAC45	0.0	MISSING	0.0	MISSING	MISSING
FRAC46	0.0	MISSING	0.0	MISSING	MISSING

FRAC47	0.0	MISSING	0.0	MISSING	MISSING
FRAC48	0.0	MISSING	0.0	MISSING	MISSING
FRAC49	0.0	MISSING	0.0	MISSING	MISSING
FRAC50	0.0	MISSING	0.0	MISSING	MISSING

STREAM SECTION

PPS-31 PPS-32 PPS-33 PPS-33-2 PPS-34

STREAM ID	PPS-31	PPS-32	PPS-33	PPS-33-2	PPS-34
FROM :	THERMDRY	B1	CYC	----	CYC
TO :	B1	CYC	----	SLURMIX	---
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	1.2754+04	1.7605+04	1.2754+04	1.2753+04	4851.0000
CAL/SEC	-1.3080+06	-1.3080+06	-1.3134+06	-1.3134+06	4.1414-11
SUBSTREAM: MIXED					
PHASE:	MISSING	VAPOR	MISSING	MIXED	VAPOR
COMPONENTS: KMOL/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	0.0	0.0	65.7017	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	0.0	0.0	0.0	7.0792
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	167.5595	0.0	0.0
167.5595				
COMPONENTS: KG/HR				
METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	0.0	0.0	0.0	1.2626+04
0.0				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	0.0	0.0	0.0	127.5347
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				

BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	4851.0000	0.0	0.0
4851.0000				
TOTAL FLOW:				
KMOL/HR	0.0	167.5595	0.0	72.7809
167.5595				
KG/HR	0.0	4851.0000	0.0	1.2753+04
4851.0000				
L/MIN	0.0	7.0562+04	0.0	31.7207
6.8322+04				
STATE VARIABLES:				
TEMP K	MISSING	307.9221	MISSING	298.1500
298.1500				
PRES ATM	MISSING	1.0000	1.0000	1.0000
1.0000				
VFRAC	MISSING	1.0000	MISSING	0.0
1.0000				
LFRAC	MISSING	0.0	MISSING	9.7268-02
0.0				
SFRAC	MISSING	0.0	MISSING	0.9027
0.0				

STREAM SECTION

PPS-31 PPS-32 PPS-33 PPS-33-2 PPS-34 (CONTINUED)

STREAM ID	PPS-31	PPS-32	PPS-33	PPS-33-2	PPS-34
ENTHALPY:					
CAL/MOL	MISSING	67.6832	MISSING	-6.4967+04	8.8977-13
CAL/GM	MISSING	2.3379	MISSING	-370.7507	3.0734-14
CAL/SEC	MISSING	3150.2687	MISSING	-1.3134+06	4.1414-11
ENTROPY:					
CAL/MOL-K	MISSING	0.2234	MISSING	-199.4212	0.0
CAL/GM-K	MISSING	7.7155-03	MISSING	-1.1380	0.0
DENSITY:					
MOL/CC	MISSING	3.9578-05	MISSING	3.8241-02	4.0875-05
GM/CC	MISSING	1.1458-03	MISSING	6.7009	1.1834-03
AVG MW	MISSING	28.9509	MISSING	175.2313	28.9509
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	MISSING	MISSING	MISSING	1.0000	MISSING
FRAC2	MISSING	MISSING	MISSING	0.0	MISSING

FRAC3	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC4	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC5	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC6	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC7	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC8	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC9	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC10	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC11	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC12	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC13	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC14	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC15	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC16	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC17	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC18	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC19	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC20	MISSING	MISSING	MISSING	0.0
MISSING				

FRAC21	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC22	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC23	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC24	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC25	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC26	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC27	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC28	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC29	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC30	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC31	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC32	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC33	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC34	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC35	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC36	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC37	MISSING	MISSING	MISSING	0.0
MISSING				
FRAC38	MISSING	MISSING	MISSING	0.0
MISSING				

FRAC39	MISSING	MISSING	MISSING	0.0	MISSING

STREAM SECTION

PPS-31 PPS-32 PPS-33 PPS-33-2 PPS-34 (CONTINUED)

STREAM ID	PPS-31	PPS-32	PPS-33	PPS-33-2	PPS-34
FRAC40	MISSING	MISSING	MISSING	0.0	MISSING
FRAC41	MISSING	MISSING	MISSING	0.0	MISSING
FRAC42	MISSING	MISSING	MISSING	0.0	MISSING
FRAC43	MISSING	MISSING	MISSING	0.0	MISSING
FRAC44	MISSING	MISSING	MISSING	0.0	MISSING
FRAC45	MISSING	MISSING	MISSING	0.0	MISSING
FRAC46	MISSING	MISSING	MISSING	0.0	MISSING
FRAC47	MISSING	MISSING	MISSING	0.0	MISSING
FRAC48	MISSING	MISSING	MISSING	0.0	MISSING
FRAC49	MISSING	MISSING	MISSING	0.0	MISSING
FRAC50	MISSING	MISSING	MISSING	0.0	MISSING

SUBSTREAM: CIPSD STRUCTURE: CONVENTIONAL

COMPONENTS: KMOL/HR

METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	65.7019	65.7019	65.7019	0.0
0.0				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	7.0793	7.0793	7.0793	0.0
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				

COMPONENTS: KG/HR

METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	1.2626+04	1.2626+04	1.2626+04	0.0
0.0				

NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	127.5354	127.5354	127.5354	0.0
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
TOTAL FLOW:				
KMOL/HR	72.7812	72.7812	72.7812	0.0
0.0				
KG/HR	1.2754+04	1.2754+04	1.2754+04	0.0
0.0				
L/MIN	31.7707	31.7414	31.7208	0.0
0.0				

STREAM SECTION

PPS-31 PPS-32 PPS-33 PPS-33-2 PPS-34 (CONTINUED)

STREAM ID		PPS-31	PPS-32	PPS-33	PPS-33-2	PPS-34
STATE VARIABLES:						
TEMP	K	321.3354	307.9221	298.1500	MISSING	MISSING
PRES	ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC		0.0	0.0	0.0	MISSING	MISSING
LFRAC		9.7268-02	9.7268-02	9.7268-02	MISSING	MISSING
SFRAC		0.9027	0.9027	0.9027	MISSING	MISSING
ENTHALPY:						
	CAL/MOL	-6.4698+04	-6.4854+04	-6.4967+04	MISSING	MISSING
	CAL/GM	-369.2149	-370.1041	-370.7508	MISSING	MISSING
	CAL/SEC	-1.3080+06	-1.3111+06	-1.3134+06	MISSING	MISSING
ENTROPY:						
	CAL/MOL-K	-198.5524	-199.0474	-199.4212	MISSING	MISSING
	CAL/GM-K	-1.1331	-1.1359	-1.1380	MISSING	MISSING
DENSITY:						

MOL/CC	3.8180-02	3.8216-02	3.8241-02	MISSING	MISSING
GM/CC	6.6904	6.6966	6.7009	MISSING	MISSING
AVG MW	175.2313	175.2313	175.2313	MISSING	MISSING

SUBSTREAM ATTRIBUTES:

PSD

FRAC1	1.0000	1.0000	1.0000	MISSING	MISSING
FRAC2	0.0	0.0	0.0	MISSING	MISSING
FRAC3	0.0	0.0	0.0	MISSING	MISSING
FRAC4	0.0	0.0	0.0	MISSING	MISSING
FRAC5	0.0	0.0	0.0	MISSING	MISSING
FRAC6	0.0	0.0	0.0	MISSING	MISSING
FRAC7	0.0	0.0	0.0	MISSING	MISSING
FRAC8	0.0	0.0	0.0	MISSING	MISSING
FRAC9	0.0	0.0	0.0	MISSING	MISSING
FRAC10	0.0	0.0	0.0	MISSING	MISSING
FRAC11	0.0	0.0	0.0	MISSING	MISSING
FRAC12	0.0	0.0	0.0	MISSING	MISSING
FRAC13	0.0	0.0	0.0	MISSING	MISSING
FRAC14	0.0	0.0	0.0	MISSING	MISSING

FRAC15	0.0	0.0	0.0	MISSING
MISSING				
FRAC16	0.0	0.0	0.0	MISSING
MISSING				
FRAC17	0.0	0.0	0.0	MISSING
MISSING				
FRAC18	0.0	0.0	0.0	MISSING
MISSING				
FRAC19	0.0	0.0	0.0	MISSING
MISSING				
FRAC20	0.0	0.0	0.0	MISSING
MISSING				
FRAC21	0.0	0.0	0.0	MISSING
MISSING				
FRAC22	0.0	0.0	0.0	MISSING
MISSING				
FRAC23	0.0	0.0	0.0	MISSING
MISSING				
FRAC24	0.0	0.0	0.0	MISSING
MISSING				
FRAC25	0.0	0.0	0.0	MISSING
MISSING				
FRAC26	0.0	0.0	0.0	MISSING
MISSING				
FRAC27	0.0	0.0	0.0	MISSING
MISSING				
FRAC28	0.0	0.0	0.0	MISSING
MISSING				
FRAC29	0.0	0.0	0.0	MISSING
MISSING				
FRAC30	0.0	0.0	0.0	MISSING
MISSING				
FRAC31	0.0	0.0	0.0	MISSING
MISSING				
FRAC32	0.0	0.0	0.0	MISSING
MISSING				

FRAC33	0.0	0.0	0.0	MISSING	MISSING

STREAM SECTION

PPS-31 PPS-32 PPS-33 PPS-33-2 PPS-34 (CONTINUED)

STREAM ID	PPS-31	PPS-32	PPS-33	PPS-33-2	PPS-34
FRAC34	0.0	0.0	0.0	MISSING	MISSING
FRAC35	0.0	0.0	0.0	MISSING	MISSING
FRAC36	0.0	0.0	0.0	MISSING	MISSING
FRAC37	0.0	0.0	0.0	MISSING	MISSING
FRAC38	0.0	0.0	0.0	MISSING	MISSING
FRAC39	0.0	0.0	0.0	MISSING	MISSING
FRAC40	0.0	0.0	0.0	MISSING	MISSING
FRAC41	0.0	0.0	0.0	MISSING	MISSING
FRAC42	0.0	0.0	0.0	MISSING	MISSING
FRAC43	0.0	0.0	0.0	MISSING	MISSING
FRAC44	0.0	0.0	0.0	MISSING	MISSING
FRAC45	0.0	0.0	0.0	MISSING	MISSING
FRAC46	0.0	0.0	0.0	MISSING	MISSING

FRAC47	0.0	0.0	0.0	MISSING	MISSING
FRAC48	0.0	0.0	0.0	MISSING	MISSING
FRAC49	0.0	0.0	0.0	MISSING	MISSING
FRAC50	0.0	0.0	0.0	MISSING	MISSING

STREAM SECTION

PPS-4 PPS-5 PPS-6 PPS-7 PPS-8

STREAM ID	PPS-4	PPS-5	PPS-6	PPS-7	PPS-8
FROM :	METALDET	METALDET	TROMMEL	TROMMEL	---
TO :	----	TROMMEL	----	B4	B4
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	70.1700	2.6374+04	140.2900	2.6234+04	4410.0000
CAL/SEC	1.2375-13	-2.3584+06	4.7451-13	-2.3584+06	-4.6417+06
SUBSTREAM: MIXED					
PHASE:	MISSING	SOLID	MISSING	SOLID	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	0.0	65.7019	0.0	65.7019	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	0.0	0.0	0.0	0.0
244.7922				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
COMPONENTS: KG/HR				
METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	0.0	1.2626+04	0.0	1.2626+04
0.0				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	0.0	0.0	0.0	0.0
4410.0000				
DEG	0.0	0.0	0.0	0.0
0.0				

BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	0.0	65.7019	0.0	65.7019	244.7922
KG/HR	0.0	1.2626+04	0.0	1.2626+04	4410.0000
L/MIN	0.0	29.5823	0.0	29.5823	73.9469
STATE VARIABLES:					
TEMP K	MISSING	298.1500	MISSING	298.1500	298.1500
PRES ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC	MISSING	0.0	MISSING	0.0	0.0
LFRAC	MISSING	0.0	MISSING	0.0	1.0000
SFRAC	MISSING	1.0000	MISSING	1.0000	0.0

STREAM SECTION

PPS-4 PPS-5 PPS-6 PPS-7 PPS-8 (CONTINUED)

STREAM ID	PPS-4	PPS-5	PPS-6	PPS-7	PPS-8
ENTHALPY:					
CAL/MOL	MISSING	-6.4612+04	MISSING	-6.4612+04	-6.8262+04
CAL/GM	MISSING	-336.2218	MISSING	-336.2218	-3789.1277
CAL/SEC	MISSING	-1.1792+06	MISSING	-1.1792+06	-4.6417+06
ENTROPY:					
CAL/MOL-K	MISSING	-216.7101	MISSING	-216.7101	-38.9652
CAL/GM-K	MISSING	-1.1277	MISSING	-1.1277	-2.1629
DENSITY:					
MOL/CC	MISSING	3.7016-02	MISSING	3.7016-02	5.5173-02
GM/CC	MISSING	7.1135	MISSING	7.1135	0.9940
AVG MW	MISSING	192.1711	MISSING	192.1711	18.0153
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	MISSING	2.2657-10	MISSING	2.2657-10	MISSING
FRAC2	MISSING	2.5960-11	MISSING	2.5960-11	MISSING

FRAC3	MISSING	3.3395-11	MISSING	3.3395-11	MISSING
FRAC4	MISSING	4.3672-11	MISSING	4.3672-11	MISSING
FRAC5	MISSING	5.8194-11	MISSING	5.8194-11	MISSING
FRAC6	MISSING	7.9221-11	MISSING	7.9221-11	MISSING
FRAC7	MISSING	1.1050-10	MISSING	1.1050-10	MISSING
FRAC8	MISSING	1.5846-10	MISSING	1.5846-10	MISSING
FRAC9	MISSING	2.3446-10	MISSING	2.3446-10	MISSING
FRAC10	MISSING	3.5946-10	MISSING	3.5946-10	MISSING
FRAC11	MISSING	5.7366-10	MISSING	5.7366-10	MISSING
FRAC12	MISSING	9.5782-10	MISSING	9.5782-10	MISSING
FRAC13	MISSING	1.6824-09	MISSING	1.6824-09	MISSING
FRAC14	MISSING	3.1274-09	MISSING	3.1274-09	MISSING
FRAC15	MISSING	6.1918-09	MISSING	6.1918-09	MISSING
FRAC16	MISSING	1.3143-08	MISSING	1.3143-08	MISSING
FRAC17	MISSING	3.0111-08	MISSING	3.0111-08	MISSING
FRAC18	MISSING	7.4948-08	MISSING	7.4948-08	MISSING
FRAC19	MISSING	2.0388-07	MISSING	2.0388-07	MISSING
FRAC20	MISSING	6.0900-07	MISSING	6.0900-07	MISSING

FRAC21	MISSING	2.0029-06	MISSING	2.0029-06	MISSING
FRAC22	MISSING	7.2483-06	MISSING	7.2483-06	MISSING
FRAC23	MISSING	2.8706-05	MISSING	2.8706-05	MISSING
FRAC24	MISSING	1.2285-04	MISSING	1.2285-04	MISSING
FRAC25	MISSING	5.5530-04	MISSING	5.5530-04	MISSING
FRAC26	MISSING	2.5548-03	MISSING	2.5548-03	MISSING
FRAC27	MISSING	1.1309-02	MISSING	1.1309-02	MISSING
FRAC28	MISSING	4.4364-02	MISSING	4.4364-02	MISSING
FRAC29	MISSING	0.1374	MISSING	0.1374	MISSING
FRAC30	MISSING	0.2875	MISSING	0.2875	MISSING
FRAC31	MISSING	0.3306	MISSING	0.3306	MISSING
FRAC32	MISSING	0.1610	MISSING	0.1610	MISSING
FRAC33	MISSING	2.3867-02	MISSING	2.3867-02	MISSING
FRAC34	MISSING	6.8541-04	MISSING	6.8541-04	MISSING
FRAC35	MISSING	1.9694-06	MISSING	1.9694-06	MISSING
FRAC36	MISSING	2.2075-10	MISSING	2.2075-10	MISSING
FRAC37	MISSING	2.2205-16	MISSING	2.2205-16	MISSING
FRAC38	MISSING	0.0	MISSING	0.0	MISSING

FRAC39	MISSING	0.0	MISSING	0.0	MISSING

STREAM SECTION

PPS-4 PPS-5 PPS-6 PPS-7 PPS-8 (CONTINUED)

STREAM ID	PPS-4	PPS-5	PPS-6	PPS-7	PPS-8
FRAC40	MISSING	0.0	MISSING	0.0	MISSING
FRAC41	MISSING	0.0	MISSING	0.0	MISSING
FRAC42	MISSING	0.0	MISSING	0.0	MISSING
FRAC43	MISSING	0.0	MISSING	0.0	MISSING
FRAC44	MISSING	0.0	MISSING	0.0	MISSING
FRAC45	MISSING	0.0	MISSING	0.0	MISSING
FRAC46	MISSING	0.0	MISSING	0.0	MISSING
FRAC47	MISSING	0.0	MISSING	0.0	MISSING
FRAC48	MISSING	0.0	MISSING	0.0	MISSING
FRAC49	MISSING	0.0	MISSING	0.0	MISSING
FRAC50	MISSING	0.0	MISSING	0.0	MISSING

SUBSTREAM: CIPSD STRUCTURE: CONVENTIONAL

COMPONENTS: KMOL/HR

METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	0.0	65.7019	0.0	65.7019
0.0				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	20.0030	0.0	20.0030
0.0				
ALUM	0.0	5.1995	5.1995	0.0
0.0				
WATER	0.0	0.0	0.0	0.0
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	1.2565	0.0	0.0	0.0
0.0				
POLY(-01	0.0	10.0015	0.0	10.0015
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
COMPONENTS: KG/HR				
METHANOL	0.0	0.0	0.0	0.0
0.0				
EG	0.0	0.0	0.0	0.0
0.0				
DMT	0.0	0.0	0.0	0.0
0.0				
PET	0.0	1.2626+04	0.0	1.2626+04
0.0				

NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	561.1600	0.0	561.1600
0.0				
ALUM	0.0	140.2900	140.2900	0.0
0.0				
WATER	0.0	0.0	0.0	0.0
0.0				
DEG	0.0	0.0	0.0	0.0
0.0				
BIS-2-01	0.0	0.0	0.0	0.0
0.0				
MPT	0.0	0.0	0.0	0.0
0.0				
IRON	70.1700	0.0	0.0	0.0
0.0				
POLY(-01	0.0	420.8700	0.0	420.8700
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
TOTAL FLOW:				
KMOL/HR	1.2565	100.9059	5.1995	95.7064
0.0				
KG/HR	70.1700	1.3748+04	140.2900	1.3608+04
0.0				
L/MIN	0.1467	43.9564	0.8646	43.0918
0.0				

STREAM SECTION

PPS-4 PPS-5 PPS-6 PPS-7 PPS-8 (CONTINUED)

STREAM ID		PPS-4	PPS-5	PPS-6	PPS-7	PPS-8
STATE VARIABLES:						
TEMP	K	298.1500	298.1500	298.1500	298.1500	MISSING
PRES	ATM	1.0000	1.0000	1.0000	1.0000	1.0000
VFRAC		0.0	0.0	0.0	0.0	MISSING
LFRAC		0.0	0.0	0.0	0.0	MISSING
SFRAC		1.0000	1.0000	1.0000	1.0000	MISSING
ENTHALPY:						
	CAL/MOL	3.5458-13	-4.2070+04	3.2854-13	-4.4356+04	MISSING
	CAL/GM	6.3491-15	-308.7749	1.2177-14	-311.9582	MISSING
	CAL/SEC	1.2375-13	-1.1792+06	4.7451-13	-1.1792+06	MISSING
ENTROPY:						
	CAL/MOL-K	1.3851-15	-141.1043	1.2756-15	-148.7702	MISSING
	CAL/GM-K	2.4801-17	-1.0356	4.7275-17	-1.0463	MISSING
DENSITY:						

MOL/CC	0.1428	3.8260-02	0.1002	3.7016-02
MISSING				
GM/CC	7.9735	5.2129	2.7043	5.2632
MISSING				
AVG MW	55.8470	136.2490	26.9815	142.1852
MISSING				
SUBSTREAM ATTRIBUTES:				
PSD				
FRAC1	2.2657-10	2.2657-10	2.2657-10	2.2657-10
MISSING				
FRAC2	2.5960-11	2.5960-11	2.5960-11	2.5960-11
MISSING				
FRAC3	3.3395-11	3.3395-11	3.3395-11	3.3395-11
MISSING				
FRAC4	4.3672-11	4.3672-11	4.3672-11	4.3672-11
MISSING				
FRAC5	5.8194-11	5.8194-11	5.8194-11	5.8194-11
MISSING				
FRAC6	7.9221-11	7.9221-11	7.9221-11	7.9221-11
MISSING				
FRAC7	1.1050-10	1.1050-10	1.1050-10	1.1050-10
MISSING				
FRAC8	1.5846-10	1.5846-10	1.5846-10	1.5846-10
MISSING				
FRAC9	2.3446-10	2.3446-10	2.3446-10	2.3446-10
MISSING				
FRAC10	3.5946-10	3.5946-10	3.5946-10	3.5946-10
MISSING				
FRAC11	5.7366-10	5.7366-10	5.7366-10	5.7366-10
MISSING				
FRAC12	9.5782-10	9.5782-10	9.5782-10	9.5782-10
MISSING				
FRAC13	1.6824-09	1.6824-09	1.6824-09	1.6824-09
MISSING				
FRAC14	3.1274-09	3.1274-09	3.1274-09	3.1274-09
MISSING				

FRAC15	6.1918-09	6.1918-09	6.1918-09	6.1918-09
MISSING				
FRAC16	1.3143-08	1.3143-08	1.3143-08	1.3143-08
MISSING				
FRAC17	3.0111-08	3.0111-08	3.0111-08	3.0111-08
MISSING				
FRAC18	7.4948-08	7.4948-08	7.4948-08	7.4948-08
MISSING				
FRAC19	2.0388-07	2.0388-07	2.0388-07	2.0388-07
MISSING				
FRAC20	6.0900-07	6.0900-07	6.0900-07	6.0900-07
MISSING				
FRAC21	2.0029-06	2.0029-06	2.0029-06	2.0029-06
MISSING				
FRAC22	7.2483-06	7.2483-06	7.2483-06	7.2483-06
MISSING				
FRAC23	2.8706-05	2.8706-05	2.8706-05	2.8706-05
MISSING				
FRAC24	1.2285-04	1.2285-04	1.2285-04	1.2285-04
MISSING				
FRAC25	5.5530-04	5.5530-04	5.5530-04	5.5530-04
MISSING				
FRAC26	2.5548-03	2.5548-03	2.5548-03	2.5548-03
MISSING				
FRAC27	1.1309-02	1.1309-02	1.1309-02	1.1309-02
MISSING				
FRAC28	4.4364-02	4.4364-02	4.4364-02	4.4364-02
MISSING				
FRAC29	0.1374	0.1374	0.1374	0.1374
MISSING				
FRAC30	0.2875	0.2875	0.2875	0.2875
MISSING				
FRAC31	0.3306	0.3306	0.3306	0.3306
MISSING				
FRAC32	0.1610	0.1610	0.1610	0.1610
MISSING				

FRAC33	2.3867-02	2.3867-02	2.3867-02	2.3867-02	MISSING

STREAM SECTION

PPS-4 PPS-5 PPS-6 PPS-7 PPS-8 (CONTINUED)

STREAM ID	PPS-4	PPS-5	PPS-6	PPS-7	PPS-8
FRAC34	6.8541-04	6.8541-04	6.8541-04	6.8541-04	MISSING
FRAC35	1.9694-06	1.9694-06	1.9694-06	1.9694-06	MISSING
FRAC36	2.2075-10	2.2075-10	2.2075-10	2.2075-10	MISSING
FRAC37	2.2205-16	2.2205-16	2.2205-16	2.2205-16	MISSING
FRAC38	0.0	0.0	0.0	0.0	MISSING
FRAC39	0.0	0.0	0.0	0.0	MISSING
FRAC40	0.0	0.0	0.0	0.0	MISSING
FRAC41	0.0	0.0	0.0	0.0	MISSING
FRAC42	0.0	0.0	0.0	0.0	MISSING
FRAC43	0.0	0.0	0.0	0.0	MISSING
FRAC44	0.0	0.0	0.0	0.0	MISSING
FRAC45	0.0	0.0	0.0	0.0	MISSING
FRAC46	0.0	0.0	0.0	0.0	MISSING

FRAC47	0.0	0.0	0.0	0.0
MISSING				
FRAC48	0.0	0.0	0.0	0.0
MISSING				
FRAC49	0.0	0.0	0.0	0.0
MISSING				
FRAC50	0.0	0.0	0.0	0.0
MISSING				

STREAM SECTION

PPS-9 S-1 S-10 S-11 S-12

STREAM ID	PPS-9	S-1	S-10	S-11	S-12
FROM :	B4	----	R-2	P-2	EVAP
TO :	JAWCRUSH	M-1	P-2	EVAP	COMP
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:						
KG/HR	3.0644+04	4304.0000	6.6419+04	6.6419+04	6.1310+04
CAL/SEC	-7.0001+06	-2.1608+06	-2.5721+07	-2.5728+07	-2.1799+07
SUBSTREAM: MIXED						
PHASE:	MIXED	MIXED	MIXED	MIXED	VAPOR
COMPONENTS: KMOL/HR						
METHANOL	0.0	129.0175	1171.7052	1171.7052	1171.3877
EG	0.0	0.0	125.3049	125.3049	123.4462
DMT	0.0	0.0	99.7767	99.7767	80.6374
PET	65.7019	0.0	1.1958	1.1958	0.0
NA2CO3	0.0	1.6039	1.6039	1.6039	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	244.7922	0.0	9.8117	9.8117	9.8041
DEG	0.0	0.0	2.7324	2.7324	2.6279
BIS-2-01	0.0	0.0	3.3669	3.3669	1.2451-03
MPT	0.0	0.0	1.1810-06	1.1810-06	1.1510-06
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
COMPONENTS: KG/HR					
METHANOL	0.0	4134.0000	3.7544+04	3.7544+04	3.7534+04
EG	0.0	0.0	7777.4786	7777.4786	7662.1119
DMT	0.0	0.0	1.9375+04	1.9375+04	1.5659+04
PET	1.2626+04	0.0	229.7926	229.7926	0.0
NA2CO3	0.0	170.0000	170.0000	170.0000	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	4410.0000	0.0	176.7601	176.7601	176.6231
DEG	0.0	0.0	289.9696	289.9696	278.8794

BIS-2-01	0.0	0.0	855.9935	855.9935	0.3166
MPT	0.0	0.0	1.7736-04	1.7736-04	1.7286-04
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	310.4941	130.6215	1415.4975	1415.4975	1387.9045
KG/HR	1.7036+04	4304.0000	6.6419+04	6.6419+04	6.1310+04
L/MIN	103.5291	88.0178	1445.6736	1444.5626	5.2973+06
STATE VARIABLES:					
TEMP K	298.1500	298.1500	433.1500	432.7491	413.1500
PRES ATM	1.0000	1.0000	18.0000	0.9869	0.1480
VFRAC	0.0	0.0	0.0	0.0	1.0000
LFRAC	0.7884	0.9877	0.9980	0.9980	0.0
SFRAC	0.2116	1.2279-02	1.9779-03	1.9779-03	0.0

STREAM SECTION

PPS-9 S-1 S-10 S-11 S-12 (CONTINUED)

STREAM ID	PPS-9	S-1	S-10	S-11	S-12
ENTHALPY:					
CAL/MOL	-6.7490+04	-5.9553+04	-6.5415+04	-6.5433+04	-5.6543+04
CAL/GM	-1230.0534	-1807.3760	-1394.0997	-1394.4695	-1279.9728
CAL/SEC	-5.8209+06	-2.1608+06	-2.5721+07	-2.5728+07	-2.1799+07
ENTROPY:					
CAL/MOL-K	-76.5767	-57.5099	-58.5968	-58.6331	-32.6619
CAL/GM-K	-1.3957	-1.7454	-1.2488	-1.2496	-0.7394
DENSITY:					
MOL/CC	4.9985-02	2.4734-02	1.6319-02	1.6331-02	4.3667-06
GM/CC	2.7425	0.8150	0.7657	0.7663	1.9290-04
AVG MW	54.8674	32.9502	46.9229	46.9229	44.1748
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	2.2657-10	1.0000	1.0000	1.0000	MISSING
FRAC2	2.5960-11	0.0	0.0	0.0	MISSING

FRAC3	3.3395-11	0.0	0.0	0.0
MISSING				
FRAC4	4.3672-11	0.0	0.0	0.0
MISSING				
FRAC5	5.8194-11	0.0	0.0	0.0
MISSING				
FRAC6	7.9221-11	0.0	0.0	0.0
MISSING				
FRAC7	1.1050-10	0.0	0.0	0.0
MISSING				
FRAC8	1.5846-10	0.0	0.0	0.0
MISSING				
FRAC9	2.3446-10	0.0	0.0	0.0
MISSING				
FRAC10	3.5946-10	0.0	0.0	0.0
MISSING				
FRAC11	5.7366-10	0.0	0.0	0.0
MISSING				
FRAC12	9.5782-10	0.0	0.0	0.0
MISSING				
FRAC13	1.6824-09	0.0	0.0	0.0
MISSING				
FRAC14	3.1274-09	0.0	0.0	0.0
MISSING				
FRAC15	6.1918-09	0.0	0.0	0.0
MISSING				
FRAC16	1.3143-08	0.0	0.0	0.0
MISSING				
FRAC17	3.0111-08	0.0	0.0	0.0
MISSING				
FRAC18	7.4948-08	0.0	0.0	0.0
MISSING				
FRAC19	2.0388-07	0.0	0.0	0.0
MISSING				
FRAC20	6.0900-07	0.0	0.0	0.0
MISSING				

FRAC21	2.0029-06	0.0	0.0	0.0
MISSING				
FRAC22	7.2483-06	0.0	0.0	0.0
MISSING				
FRAC23	2.8706-05	0.0	0.0	0.0
MISSING				
FRAC24	1.2285-04	0.0	0.0	0.0
MISSING				
FRAC25	5.5530-04	0.0	0.0	0.0
MISSING				
FRAC26	2.5548-03	0.0	0.0	0.0
MISSING				
FRAC27	1.1309-02	0.0	0.0	0.0
MISSING				
FRAC28	4.4364-02	0.0	0.0	0.0
MISSING				
FRAC29	0.1374	0.0	0.0	0.0
MISSING				
FRAC30	0.2875	0.0	0.0	0.0
MISSING				
FRAC31	0.3306	0.0	0.0	0.0
MISSING				
FRAC32	0.1610	0.0	0.0	0.0
MISSING				
FRAC33	2.3867-02	0.0	0.0	0.0
MISSING				
FRAC34	6.8541-04	0.0	0.0	0.0
MISSING				
FRAC35	1.9694-06	0.0	0.0	0.0
MISSING				
FRAC36	2.2075-10	0.0	0.0	0.0
MISSING				
FRAC37	2.2205-16	0.0	0.0	0.0
MISSING				
FRAC38	0.0	0.0	0.0	0.0
MISSING				

FRAC39	0.0	0.0	0.0	0.0
MISSING				

STREAM SECTION

PPS-9 S-1 S-10 S-11 S-12 (CONTINUED)

STREAM ID	PPS-9	S-1	S-10	S-11	S-12
FRAC40	0.0	0.0	0.0	0.0	MISSING
FRAC41	0.0	0.0	0.0	0.0	MISSING
FRAC42	0.0	0.0	0.0	0.0	MISSING
FRAC43	0.0	0.0	0.0	0.0	MISSING
FRAC44	0.0	0.0	0.0	0.0	MISSING
FRAC45	0.0	0.0	0.0	0.0	MISSING
FRAC46	0.0	0.0	0.0	0.0	MISSING
FRAC47	0.0	0.0	0.0	0.0	MISSING
FRAC48	0.0	0.0	0.0	0.0	MISSING
FRAC49	0.0	0.0	0.0	0.0	MISSING
FRAC50	0.0	0.0	0.0	0.0	MISSING

SUBSTREAM: CIPSD STRUCTURE: CONVENTIONAL

COMPONENTS: KMOL/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	65.7019	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	20.0030	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	10.0015	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0

COMPONENTS: KG/HR

METHANOL	0.0	0.0	0.0	0.0	0.0
EG	0.0	0.0	0.0	0.0	0.0
DMT	0.0	0.0	0.0	0.0	0.0
PET	1.2626+04	0.0	0.0	0.0	0.0

NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	561.1600	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.0	0.0	0.0	0.0	0.0
DEG	0.0	0.0	0.0	0.0	0.0
BIS-2-01	0.0	0.0	0.0	0.0	0.0
MPT	0.0	0.0	0.0	0.0	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	420.8700	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	95.7064	0.0	0.0	0.0	0.0
KG/HR	1.3608+04	0.0	0.0	0.0	0.0
L/MIN	43.0918	0.0	0.0	0.0	0.0

STREAM SECTION

PPS-9 S-1 S-10 S-11 S-12 (CONTINUED)

STREAM ID		PPS-9	S-1	S-10	S-11	S-12
STATE VARIABLES:						
TEMP	K	298.1500	MISSING	MISSING	MISSING	MISSING
PRES	ATM	1.0000	1.0000	18.0000	0.9869	0.1480
VFRAC		0.0	MISSING	MISSING	MISSING	MISSING
LFRAC		0.0	MISSING	MISSING	MISSING	MISSING
SFRAC		1.0000	MISSING	MISSING	MISSING	MISSING
ENTHALPY:						
CAL/MOL		-4.4356+04	MISSING	MISSING	MISSING	MISSING
CAL/GM		-311.9582	MISSING	MISSING	MISSING	MISSING
CAL/SEC		-1.1792+06	MISSING	MISSING	MISSING	MISSING
ENTROPY:						
CAL/MOL-K		-148.7702	MISSING	MISSING	MISSING	MISSING
CAL/GM-K		-1.0463	MISSING	MISSING	MISSING	MISSING
DENSITY:						

MOL/CC	3.7016-02	MISSING	MISSING	MISSING	MISSING
GM/CC	5.2632	MISSING	MISSING	MISSING	MISSING
AVG MW	142.1852	MISSING	MISSING	MISSING	MISSING

SUBSTREAM ATTRIBUTES:

PSD

FRAC1	2.2657-10	MISSING	MISSING	MISSING	MISSING
FRAC2	2.5960-11	MISSING	MISSING	MISSING	MISSING
FRAC3	3.3395-11	MISSING	MISSING	MISSING	MISSING
FRAC4	4.3672-11	MISSING	MISSING	MISSING	MISSING
FRAC5	5.8194-11	MISSING	MISSING	MISSING	MISSING
FRAC6	7.9221-11	MISSING	MISSING	MISSING	MISSING
FRAC7	1.1050-10	MISSING	MISSING	MISSING	MISSING
FRAC8	1.5846-10	MISSING	MISSING	MISSING	MISSING
FRAC9	2.3446-10	MISSING	MISSING	MISSING	MISSING
FRAC10	3.5946-10	MISSING	MISSING	MISSING	MISSING
FRAC11	5.7366-10	MISSING	MISSING	MISSING	MISSING
FRAC12	9.5782-10	MISSING	MISSING	MISSING	MISSING
FRAC13	1.6824-09	MISSING	MISSING	MISSING	MISSING
FRAC14	3.1274-09	MISSING	MISSING	MISSING	MISSING

FRAC15	6.1918-09	MISSING	MISSING	MISSING	MISSING
FRAC16	1.3143-08	MISSING	MISSING	MISSING	MISSING
FRAC17	3.0111-08	MISSING	MISSING	MISSING	MISSING
FRAC18	7.4948-08	MISSING	MISSING	MISSING	MISSING
FRAC19	2.0388-07	MISSING	MISSING	MISSING	MISSING
FRAC20	6.0900-07	MISSING	MISSING	MISSING	MISSING
FRAC21	2.0029-06	MISSING	MISSING	MISSING	MISSING
FRAC22	7.2483-06	MISSING	MISSING	MISSING	MISSING
FRAC23	2.8706-05	MISSING	MISSING	MISSING	MISSING
FRAC24	1.2285-04	MISSING	MISSING	MISSING	MISSING
FRAC25	5.5530-04	MISSING	MISSING	MISSING	MISSING
FRAC26	2.5548-03	MISSING	MISSING	MISSING	MISSING
FRAC27	1.1309-02	MISSING	MISSING	MISSING	MISSING
FRAC28	4.4364-02	MISSING	MISSING	MISSING	MISSING
FRAC29	0.1374	MISSING	MISSING	MISSING	MISSING
FRAC30	0.2875	MISSING	MISSING	MISSING	MISSING
FRAC31	0.3306	MISSING	MISSING	MISSING	MISSING
FRAC32	0.1610	MISSING	MISSING	MISSING	MISSING

FRAC33	2.3867-02	MISSING	MISSING	MISSING	MISSING

STREAM SECTION

PPS-9 S-1 S-10 S-11 S-12 (CONTINUED)

STREAM ID	PPS-9	S-1	S-10	S-11	S-12
FRAC34	6.8541-04	MISSING	MISSING	MISSING	MISSING
FRAC35	1.9694-06	MISSING	MISSING	MISSING	MISSING
FRAC36	2.2075-10	MISSING	MISSING	MISSING	MISSING
FRAC37	2.2205-16	MISSING	MISSING	MISSING	MISSING
FRAC38	0.0	MISSING	MISSING	MISSING	MISSING
FRAC39	0.0	MISSING	MISSING	MISSING	MISSING
FRAC40	0.0	MISSING	MISSING	MISSING	MISSING
FRAC41	0.0	MISSING	MISSING	MISSING	MISSING
FRAC42	0.0	MISSING	MISSING	MISSING	MISSING
FRAC43	0.0	MISSING	MISSING	MISSING	MISSING
FRAC44	0.0	MISSING	MISSING	MISSING	MISSING
FRAC45	0.0	MISSING	MISSING	MISSING	MISSING
FRAC46	0.0	MISSING	MISSING	MISSING	MISSING

FRAC47	0.0	MISSING	MISSING	MISSING	MISSING
FRAC48	0.0	MISSING	MISSING	MISSING	MISSING
FRAC49	0.0	MISSING	MISSING	MISSING	MISSING
FRAC50	0.0	MISSING	MISSING	MISSING	MISSING

STREAM SECTION

S-13 S-14 S-15 S-16 S-17

STREAM ID	S-13	S-14	S-15	S-16	S-17
FROM :	COMP	----	HX-1	HX-1	DC-1
TO :	HX-1	HX-1	----	DC-1	HX-2
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	6.1310+04	3.7361+06	3.7361+06	6.1310+04	3.7723+04
CAL/SEC	-2.0300+07	-3.9249+09	-3.9193+09	-2.5909+07	-1.8236+07
SUBSTREAM: MIXED					
PHASE:	VAPOR	LIQUID	LIQUID	LIQUID	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	1171.3877	0.0	0.0	1171.3877	1171.0637
EG	123.4462	0.0	0.0	123.4462	0.6241
DMT	80.6374	0.0	0.0	80.6374	5.2320-06
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	9.8041	2.0738+05	2.0738+05	9.8041
8.9286				
DEG	2.6279	0.0	0.0	2.6279
1.1340-08				
BIS-2-01	1.2451-03	0.0	0.0	1.2451-03
6.3099-22				
MPT	1.1510-06	0.0	0.0	1.1510-06
1.3801-11				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
COMPONENTS: KG/HR				
METHANOL	3.7534+04	0.0	0.0	3.7534+04
3.7523+04				
EG	7662.1119	0.0	0.0	7662.1119
38.7382				
DMT	1.5659+04	0.0	0.0	1.5659+04
1.0160-03				
PET	0.0	0.0	0.0	0.0
0.0				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	176.6231	3.7361+06	3.7361+06	176.6231
160.8508				
DEG	278.8794	0.0	0.0	278.8794
1.2034-06				

BIS-2-01	0.3166	0.0	0.0	0.3166	1.6042-19
MPT	1.7286-04	0.0	0.0	1.7286-04	2.0726-09
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	1387.9045	2.0738+05	2.0738+05	1387.9045	1180.6164
KG/HR	6.1310+04	3.7361+06	3.7361+06	6.1310+04	3.7723+04
L/MIN	4.7727+05	6.3090+04	6.3431+04	1195.2730	872.5651
STATE VARIABLES:					
TEMP K	620.3938	305.3722	310.8140	349.2585	356.1653
PRES ATM	2.4673	1.0000	0.2909	2.2613	1.9738
VFRAC	1.0000	0.0	0.0	0.0	0.0
LFRAC	0.0	1.0000	1.0000	1.0000	1.0000
SFRAC	0.0	0.0	0.0	0.0	0.0

STREAM SECTION

S-13 S-14 S-15 S-16 S-17 (CONTINUED)

STREAM ID	S-13	S-14	S-15	S-16	S-17
ENTHALPY:					
CAL/MOL	-5.2655+04	-6.8134+04	-6.8036+04	-6.7204+04	-5.5606+04
CAL/GM	-1191.9576	-3781.9979	-3776.5930	-1521.3116	-1740.3030
CAL/SEC	-2.0300+07	-3.9249+09	-3.9193+09	-2.5909+07	-1.8236+07
ENTROPY:					
CAL/MOL-K	-30.6910	-38.5412	-38.2264	-65.9096	-52.9904
CAL/GM-K	-0.6948	-2.1394	-2.1219	-1.4920	-1.6584
DENSITY:					
MOL/CC	4.8467-05	5.4785-02	5.4490-02	1.9353-02	2.2551-02
GM/CC	2.1410-03	0.9870	0.9817	0.8549	0.7205
AVG MW	44.1748	18.0153	18.0153	44.1748	31.9520
SUBSTREAM ATTRIBUTES:					
PSD					

STREAM SECTION

S-18 S-19 S-2 S-20 S-20-2

STREAM ID	S-18	S-19	S-2	S-20	S-20-2
FROM :	----	HX-2	M-1	HX-2	---
TO :	HX-2	----	SLURMIX	----	M-1
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	3.7173+04	3.7173+04	4.1967+04	3.7723+04	3.7663+04
CAL/SEC	-3.9052+07	-3.8865+07	-2.0493+07	-1.8424+07	-1.8332+07
SUBSTREAM: MIXED					
PHASE:	LIQUID	LIQUID	MIXED	LIQUID	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	0.0	0.0	1300.3805	1171.0637	1171.3630
EG	0.0	0.0	2.0945	0.6241	2.0945
DMT	0.0	0.0	0.0	5.2320-06	0.0
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	1.6039	0.0	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	2063.4192	2063.4192	0.0	8.9286	0.0
DEG	0.0	0.0	0.0	1.1340-08	0.0
BIS-2-01	0.0	0.0	0.0	6.3099-22	0.0
MPT	0.0	0.0	0.0	1.3801-11	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
COMPONENTS: KG/HR					
METHANOL	0.0	0.0	4.1667+04	3.7523+04	3.7533+04
EG	0.0	0.0	130.0000	38.7382	130.0000
DMT	0.0	0.0	0.0	1.0160-03	0.0
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	170.0000	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	3.7173+04	3.7173+04	0.0	160.8508	0.0
DEG	0.0	0.0	0.0	1.2034-06	0.0

BIS-2-01	0.0	0.0	0.0	1.6042-19	0.0
MPT	0.0	0.0	0.0	2.0726-09	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	2063.4192	2063.4192	1304.0789	1180.6164	1173.4574
KG/HR	3.7173+04	3.7173+04	4.1967+04	3.7723+04	3.7663+04
L/MIN	627.7351	639.3017	923.9531	840.7299	835.9944
STATE VARIABLES:					
TEMP K	305.3722	323.5507	329.9173	335.4153	333.1500
PRES ATM	2.0000	1.9287	1.0000	1.9116	1.9738
VFRAC	0.0	0.0	0.0	0.0	0.0
LFRAC	1.0000	1.0000	0.9988	1.0000	1.0000
SFRAC	0.0	0.0	1.2299-03	0.0	0.0

STREAM SECTION

S-18 S-19 S-2 S-20 S-20-2 (CONTINUED)

STREAM ID	S-18	S-19	S-2	S-20	S-20-2
ENTHALPY:					
CAL/MOL	-6.8134+04	-6.7806+04	-5.6572+04	-5.6178+04	-5.6240+04
CAL/GM	-3781.9979	-3763.8198	-1757.9079	-1758.2162	-1752.2548
CAL/SEC	-3.9052+07	-3.8865+07	-2.0493+07	-1.8424+07	-1.8332+07
ENTROPY:					
CAL/MOL-K	-38.5412	-37.5039	-55.2843	-54.5494	-55.0512
CAL/GM-K	-2.1394	-2.0818	-1.7179	-1.7072	-1.7152
DENSITY:					
MOL/CC	5.4785-02	5.3794-02	2.3524-02	2.3405-02	2.3394-02
GM/CC	0.9870	0.9691	0.7570	0.7478	0.7509
AVG MW	18.0153	18.0153	32.1813	31.9520	32.0958
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	MISSING	MISSING	1.0000	MISSING	MISSING
FRAC2	MISSING	MISSING	0.0	MISSING	MISSING

FRAC3	MISSING	MISSING	0.0	MISSING	MISSING
FRAC4	MISSING	MISSING	0.0	MISSING	MISSING
FRAC5	MISSING	MISSING	0.0	MISSING	MISSING
FRAC6	MISSING	MISSING	0.0	MISSING	MISSING
FRAC7	MISSING	MISSING	0.0	MISSING	MISSING
FRAC8	MISSING	MISSING	0.0	MISSING	MISSING
FRAC9	MISSING	MISSING	0.0	MISSING	MISSING
FRAC10	MISSING	MISSING	0.0	MISSING	MISSING
FRAC11	MISSING	MISSING	0.0	MISSING	MISSING
FRAC12	MISSING	MISSING	0.0	MISSING	MISSING
FRAC13	MISSING	MISSING	0.0	MISSING	MISSING
FRAC14	MISSING	MISSING	0.0	MISSING	MISSING
FRAC15	MISSING	MISSING	0.0	MISSING	MISSING
FRAC16	MISSING	MISSING	0.0	MISSING	MISSING
FRAC17	MISSING	MISSING	0.0	MISSING	MISSING
FRAC18	MISSING	MISSING	0.0	MISSING	MISSING
FRAC19	MISSING	MISSING	0.0	MISSING	MISSING
FRAC20	MISSING	MISSING	0.0	MISSING	MISSING

FRAC21	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC22	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC23	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC24	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC25	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC26	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC27	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC28	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC29	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC30	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC31	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC32	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC33	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC34	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC35	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC36	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC37	MISSING	MISSING	0.0	MISSING
MISSING				
FRAC38	MISSING	MISSING	0.0	MISSING
MISSING				

FRAC39	MISSING	MISSING	0.0	MISSING
MISSING				

STREAM SECTION

S-18 S-19 S-2 S-20 S-20-2 (CONTINUED)

STREAM ID	S-18	S-19	S-2	S-20	S-20-2
FRAC40	MISSING	MISSING	0.0	MISSING	MISSING
FRAC41	MISSING	MISSING	0.0	MISSING	MISSING
FRAC42	MISSING	MISSING	0.0	MISSING	MISSING
FRAC43	MISSING	MISSING	0.0	MISSING	MISSING
FRAC44	MISSING	MISSING	0.0	MISSING	MISSING
FRAC45	MISSING	MISSING	0.0	MISSING	MISSING
FRAC46	MISSING	MISSING	0.0	MISSING	MISSING
FRAC47	MISSING	MISSING	0.0	MISSING	MISSING
FRAC48	MISSING	MISSING	0.0	MISSING	MISSING
FRAC49	MISSING	MISSING	0.0	MISSING	MISSING
FRAC50	MISSING	MISSING	0.0	MISSING	MISSING

STREAM SECTION

S-21 S-22 S-23 S-24 S-25

STREAM ID	S-21	S-22	S-23	S-24	S-25
FROM :	DC-1	EVAP	P-3	SLSEP	SLSEP
TO :	DC-2	P-3	SLSEP	----	DC-2
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	2.3587+04	5108.8417	5108.8417	592.4612	4516.3806
CAL/SEC	-6.9689+06	-1.3028+06	-1.3026+06	-1.8521+05	-1.1174+06
SUBSTREAM: MIXED					
PHASE:	MIXED	MIXED	MIXED	MIXED	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	0.3240	0.3175	0.3175	1.5877-02	0.3017
EG	122.8221	1.8587	1.8587	9.2935-02	1.7658
DMT	80.6374	19.1393	19.1393	0.9570	18.1823
PET	0.0	1.1958	1.1958	1.1958	0.0
NA2CO3	0.0	1.6039	1.6039	1.6039	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	0.8755	7.6005-03	7.6005-03	3.8002-04	7.2205-03
DEG	2.6279	0.1045	0.1045	5.2252-03	9.9279-02
BIS-2-01	1.2451-03	3.3656	3.3656	0.0	3.3656
MPT	1.1510-06	3.0014-08	3.0014-08	0.0	3.0014-08
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0

COMPONENTS: KG/HR

METHANOL	10.3815	10.1749	10.1749	0.5087	9.6662
EG	7623.3736	115.3667	115.3667	5.7683	109.5984
DMT	1.5659+04	3716.6034	3716.6034	185.8302	3530.7733
PET	0.0	229.7926	229.7926	229.7926	0.0
NA2CO3	0.0	170.0000	170.0000	170.0000	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	15.7724	0.1369	0.1369	6.8462-03	0.1301
DEG	278.8794	11.0902	11.0902	0.5545	10.5357

BIS-2-01	0.3166	855.6770	855.6770	0.0	855.6770
MPT	1.7285-04	4.5074-06	4.5074-06	0.0	4.5074-06
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	207.2881	27.5930	27.5930	3.8711	23.7219
KG/HR	2.3587+04	5108.8417	5108.8417	592.4612	4516.3806
L/MIN	418.7090	71.5202	71.5392	4.6040	66.9343
STATE VARIABLES:					
TEMP K	505.1183	413.1500	413.4534	413.4533	413.4533
PRES ATM	2.0310	0.1480	3.9477	3.9477	3.9477
VFRAC	2.7242-07	0.0	0.0	0.0	0.0
LFRAC	1.0000	0.8985	0.8985	0.2768	1.0000
SFRAC	0.0	0.1015	0.1015	0.7232	0.0

STREAM SECTION

S-21 S-22 S-23 S-24 S-25 (CONTINUED)

STREAM ID	S-21	S-22	S-23	S-24	S-25
ENTHALPY:					
CAL/MOL	-1.2103+05	-1.6997+05	-1.6995+05	-1.7224+05	-1.6958+05
CAL/GM	-1063.6226	-918.0363	-917.9260	-1125.3777	-890.7123
CAL/SEC	-6.9689+06	-1.3028+06	-1.3026+06	-1.8521+05	-1.1174+06
ENTROPY:					
CAL/MOL-K	-113.1223	-171.1827	-171.1334	-136.4523	-176.8063
CAL/GM-K	-0.9941	-0.9246	-0.9243	-0.8916	-0.9287
DENSITY:					
MOL/CC	8.2511-03	6.4301-03	6.4284-03	1.4013-02	5.9068-03
GM/CC	0.9389	1.1905	1.1902	2.1447	1.1246
AVG MW	113.7907	185.1499	185.1499	153.0473	190.3886
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	MISSING	1.0000	1.0000	1.0000	1.0000
FRAC2	MISSING	0.0	0.0	0.0	0.0

FRAC3	MISSING	0.0	0.0	0.0
0.0				
FRAC4	MISSING	0.0	0.0	0.0
0.0				
FRAC5	MISSING	0.0	0.0	0.0
0.0				
FRAC6	MISSING	0.0	0.0	0.0
0.0				
FRAC7	MISSING	0.0	0.0	0.0
0.0				
FRAC8	MISSING	0.0	0.0	0.0
0.0				
FRAC9	MISSING	0.0	0.0	0.0
0.0				
FRAC10	MISSING	0.0	0.0	0.0
0.0				
FRAC11	MISSING	0.0	0.0	0.0
0.0				
FRAC12	MISSING	0.0	0.0	0.0
0.0				
FRAC13	MISSING	0.0	0.0	0.0
0.0				
FRAC14	MISSING	0.0	0.0	0.0
0.0				
FRAC15	MISSING	0.0	0.0	0.0
0.0				
FRAC16	MISSING	0.0	0.0	0.0
0.0				
FRAC17	MISSING	0.0	0.0	0.0
0.0				
FRAC18	MISSING	0.0	0.0	0.0
0.0				
FRAC19	MISSING	0.0	0.0	0.0
0.0				
FRAC20	MISSING	0.0	0.0	0.0
0.0				

FRAC21	MISSING	0.0	0.0	0.0
0.0				
FRAC22	MISSING	0.0	0.0	0.0
0.0				
FRAC23	MISSING	0.0	0.0	0.0
0.0				
FRAC24	MISSING	0.0	0.0	0.0
0.0				
FRAC25	MISSING	0.0	0.0	0.0
0.0				
FRAC26	MISSING	0.0	0.0	0.0
0.0				
FRAC27	MISSING	0.0	0.0	0.0
0.0				
FRAC28	MISSING	0.0	0.0	0.0
0.0				
FRAC29	MISSING	0.0	0.0	0.0
0.0				
FRAC30	MISSING	0.0	0.0	0.0
0.0				
FRAC31	MISSING	0.0	0.0	0.0
0.0				
FRAC32	MISSING	0.0	0.0	0.0
0.0				
FRAC33	MISSING	0.0	0.0	0.0
0.0				
FRAC34	MISSING	0.0	0.0	0.0
0.0				
FRAC35	MISSING	0.0	0.0	0.0
0.0				
FRAC36	MISSING	0.0	0.0	0.0
0.0				
FRAC37	MISSING	0.0	0.0	0.0
0.0				
FRAC38	MISSING	0.0	0.0	0.0
0.0				

FRAC39	MISSING	0.0	0.0	0.0	0.0

STREAM SECTION

S-21 S-22 S-23 S-24 S-25 (CONTINUED)

STREAM ID	S-21	S-22	S-23	S-24	S-25
FRAC40	MISSING	0.0	0.0	0.0	0.0
FRAC41	MISSING	0.0	0.0	0.0	0.0
FRAC42	MISSING	0.0	0.0	0.0	0.0
FRAC43	MISSING	0.0	0.0	0.0	0.0
FRAC44	MISSING	0.0	0.0	0.0	0.0
FRAC45	MISSING	0.0	0.0	0.0	0.0
FRAC46	MISSING	0.0	0.0	0.0	0.0
FRAC47	MISSING	0.0	0.0	0.0	0.0
FRAC48	MISSING	0.0	0.0	0.0	0.0
FRAC49	MISSING	0.0	0.0	0.0	0.0
FRAC50	MISSING	0.0	0.0	0.0	0.0

STREAM SECTION

S-26 S-27 S-28 S-29 S-3

STREAM ID	S-26	S-27	S-28	S-29	S-3
FROM :	----	DC-2	P-4	----	SLURMIX
TO :	DC-2	P-4	HX-4	HX-4	P-1
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
CONV. MAX. REL. ERR:	0.0	4.1363-05	0.0	0.0	0.0
TOTAL STREAM:					
KG/HR	1500.0000	2.3115+04	2.3115+04	8.8182+04	6.2416+04
CAL/SEC	-2.4639+05	-1.0320+07	-1.0320+07	-9.3306+07	-2.3687+07
SUBSTREAM: MIXED					
PHASE:	LIQUID	LIQUID	LIQUID	LIQUID	MIXED
COMPONENTS: KMOL/HR					
METHANOL	0.0	1.2887	1.2887	0.0	1300.3805
EG	0.0	330.8998	330.8998	0.0	2.0945
DMT	0.0	1.8833	1.8833	0.0	35.4391

PET	0.0	0.0	0.0	0.0
65.7017				
NA2CO3	0.0	0.0	0.0	0.0
1.6039				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	0.0	3.2605	3.2605	4894.8516
7.0792				
DEG	0.0	5.7608	5.7608	0.0
2.6040-06				
BIS-2-01	0.0	6.4902-11	6.4902-11	0.0
3.1985				
MPT	9.9882	9.9827	9.9827	0.0
1.1810-06				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				

COMPONENTS: KG/HR

METHANOL	0.0	41.2920	41.2920	0.0
4.1667+04				
EG	0.0	2.0538+04	2.0538+04	0.0
130.0000				
DMT	0.0	365.7038	365.7038	0.0
6881.8109				
PET	0.0	0.0	0.0	0.0
1.2626+04				
NA2CO3	0.0	0.0	0.0	0.0
170.0000				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				

WATER	0.0	58.7391	58.7391	8.8182+04
127.5347				
DEG	0.0	611.3435	611.3435	0.0
2.7634-04				
BIS-2-01	0.0	1.6501-08	1.6501-08	0.0
813.1887				
MPT	1500.0000	1499.1768	1499.1768	0.0
1.7736-04				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
TOTAL FLOW:				
KMOL/HR	9.9882	353.0758	353.0758	4894.8516
1415.4974				
KG/HR	1500.0000	2.3115+04	2.3115+04	8.8182+04
6.2416+04				
L/MIN	25.1276	381.9040	381.9482	1450.0214
1058.1168				
STATE VARIABLES:				
TEMP K	298.1500	404.9174	405.0321	277.5944
327.6559				
PRES ATM	1.0000	0.1480	1.9738	1.0000
1.0000				
VFRAC	0.0	0.0	0.0	0.0
0.0				
LFRAC	1.0000	1.0000	1.0000	1.0000
0.9525				
SFRAC	0.0	0.0	0.0	0.0
4.7549-02				

STREAM SECTION

S-26 S-27 S-28 S-29 S-3 (CONTINUED)

STREAM ID	S-26	S-27	S-28	S-29	S-3
ENTHALPY:					
CAL/MOL	-8.8806+04	-1.0523+05	-1.0522+05	-6.8624+04	-6.0241+04
CAL/GM	-591.3415	-1607.3344	-1607.2527	-3809.1884	-1366.1900
CAL/SEC	-2.4639+05	-1.0320+07	-1.0320+07	-9.3306+07	-2.3687+07
ENTROPY:					
CAL/MOL-K	-147.6139	-94.3744	-94.3616	-40.2136	-66.3662
CAL/GM-K	-0.9829	-1.4416	-1.4414	-2.2322	-1.5051
DENSITY:					
MOL/CC	6.6250-03	1.5409-02	1.5407-02	5.6262-02	2.2296-02
GM/CC	0.9949	1.0087	1.0086	1.0136	0.9831
AVG MW	150.1772	65.4667	65.4667	18.0153	44.0944
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	MISSING	MISSING	MISSING	MISSING	1.0000
FRAC2	MISSING	MISSING	MISSING	MISSING	0.0

FRAC3	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC4	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC5	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC6	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC7	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC8	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC9	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC10	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC11	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC12	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC13	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC14	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC15	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC16	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC17	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC18	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC19	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC20	MISSING	MISSING	MISSING	MISSING
0.0				

FRAC21	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC22	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC23	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC24	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC25	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC26	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC27	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC28	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC29	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC30	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC31	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC32	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC33	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC34	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC35	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC36	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC37	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC38	MISSING	MISSING	MISSING	MISSING
0.0				

FRAC39	MISSING	MISSING	MISSING	MISSING
0.0				

STREAM SECTION

S-26 S-27 S-28 S-29 S-3 (CONTINUED)

STREAM ID	S-26	S-27	S-28	S-29	S-3
FRAC40	MISSING	MISSING	MISSING	MISSING	0.0
FRAC41	MISSING	MISSING	MISSING	MISSING	0.0
FRAC42	MISSING	MISSING	MISSING	MISSING	0.0
FRAC43	MISSING	MISSING	MISSING	MISSING	0.0
FRAC44	MISSING	MISSING	MISSING	MISSING	0.0
FRAC45	MISSING	MISSING	MISSING	MISSING	0.0
FRAC46	MISSING	MISSING	MISSING	MISSING	0.0
FRAC47	MISSING	MISSING	MISSING	MISSING	0.0
FRAC48	MISSING	MISSING	MISSING	MISSING	0.0
FRAC49	MISSING	MISSING	MISSING	MISSING	0.0
FRAC50	MISSING	MISSING	MISSING	MISSING	0.0

STREAM SECTION

S-30 S-31 S-32 S-33 S-34

STREAM ID	S-30	S-31	S-32	S-33	S-34
FROM :	HX-4	HX-4	DEC-1	DC-3	DC-3
TO :	----	DEC-1	DC-3	----	---
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	8.8182+04	2.3115+04	8267.0554	1267.0554	7000.0000
CAL/SEC	-9.2843+07	-1.0783+07	-3.9922+06	-5.6007+05	-3.2299+06
SUBSTREAM: MIXED					
PHASE:	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	0.0	1.2887	0.6257	0.6257	5.3053-19
EG	0.0	330.8998	124.5212	16.7408	107.7805
DMT	0.0	1.8833	0.3109	9.7792-04	0.3099
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	4894.8516	3.2605	0.8827	0.8827	1.7503-13
DEG	0.0	5.7608	2.6338	0.2775	2.3563
BIS-2-01	0.0	6.4902-11	0.0	0.0	0.0
MPT	0.0	9.9827	1.0814	1.0814	8.4760-07
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
COMPONENTS: KG/HR					
METHANOL	0.0	41.2920	20.0476	20.0476	1.6999-17
EG	0.0	2.0538+04	7728.8392	1039.0741	6689.7651
DMT	0.0	365.7038	60.3726	0.1899	60.1827
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	8.8182+04	58.7391	15.9025	15.9025	3.1533-12
DEG	0.0	611.3435	279.4989	29.4468	250.0521

BIS-2-01	0.0	1.6501-08	0.0	0.0	0.0
MPT	0.0	1499.1768	162.3946	162.3945	1.2729-04
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	4894.8516	353.0758	130.0556	19.6090	110.4467
KG/HR	8.8182+04	2.3115+04	8267.0554	1267.0554	7000.0000
L/MIN	1476.9869	346.0989	123.2559	20.5160	117.8556
STATE VARIABLES:					
TEMP K	296.9978	295.6236	295.6236	371.5333	431.0822
PRES ATM	0.6262	1.9251	1.9251	0.1480	0.2719
VFRAC	0.0	0.0	0.0	0.0	0.0
LFRAC	1.0000	1.0000	1.0000	1.0000	1.0000
SFRAC	0.0	0.0	0.0	0.0	0.0

STREAM SECTION

S-30 S-31 S-32 S-33 S-34 (CONTINUED)

STREAM ID	S-30	S-31	S-32	S-33	S-34
ENTHALPY:					
CAL/MOL	-6.8283+04	-1.0995+05	-1.1050+05	-1.0282+05	-1.0528+05
CAL/GM	-3790.2608	-1679.4607	-1738.4400	-1591.2817	-1661.1136
CAL/SEC	-9.2843+07	-1.0783+07	-3.9922+06	-5.6007+05	-3.2299+06
ENTROPY:					
CAL/MOL-K	-39.0335	-108.0128	-107.6916	-94.5978	-91.5641
CAL/GM-K	-2.1667	-1.6499	-1.6942	-1.4640	-1.4447
DENSITY:					
MOL/CC	5.5235-02	1.7003-02	1.7586-02	1.5930-02	1.5619-02
GM/CC	0.9951	1.1131	1.1179	1.0293	0.9899
AVG MW	18.0153	65.4667	63.5655	64.6161	63.3790
SUBSTREAM ATTRIBUTES:					
PSD					

STREAM SECTION

S-35 S-36 S-37 S-38 S-39

STREAM ID	S-35	S-36	S-37	S-38	S-39
FROM :	DEC-1	DEC-2	DEC-2	DC-2	P-5
TO :	DEC-2	----	DC-2	P-5	DC-4
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	1.4848+04	1336.7823	1.3511+04	2.0000+04	2.0000+04
CAL/SEC	-6.7914+06	-2.1990+05	-6.5750+06	-4.4348+06	-4.4347+06
SUBSTREAM: MIXED					
PHASE:	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	0.6630	0.0	0.6630	8.7353-12	8.7353-12
EG	206.3786	0.0	206.3786	6.6622-02	6.6622-02
DMT	1.5724	0.0	1.5724	98.5088	98.5088
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	2.3778	0.0	2.3778	1.8833-09	1.8833-09
DEG	3.1270	0.0	3.1270	9.3513-02	9.3513-02
BIS-2-01	6.4902-11	0.0	6.4902-11	3.3669	3.3669
MPT	8.9014	8.9014	0.0	5.4805-03	5.4805-03
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
COMPONENTS: KG/HR					
METHANOL	21.2444	0.0	21.2444	2.7990-10	2.7990-10
EG	1.2810+04	0.0	1.2810+04	4.1351	4.1351
DMT	305.3312	0.0	305.3312	1.9129+04	1.9129+04
PET	0.0	0.0	0.0	0.0	0.0
NA2CO3	0.0	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	42.8367	0.0	42.8367	3.3928-08	3.3928-08
DEG	331.8446	0.0	331.8446	9.9237	9.9237

BIS-2-01	1.6501-08	0.0	1.6501-08	855.9935
855.9935				
MPT	1336.7823	1336.7823	0.0	0.8230
0.8230				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
TOTAL FLOW:				
KMOL/HR	223.0201	8.9014	214.1188	102.0413
102.0413				
KG/HR	1.4848+04	1336.7823	1.3511+04	2.0000+04
2.0000+04				
L/MIN	222.8413	22.3488	200.9048	325.7882
325.8104				
STATE VARIABLES:				
TEMP K	295.6236	295.6236	295.6236	496.1278
496.1908				
PRES ATM	1.9251	1.9251	1.9251	0.2052
0.9869				
VFRAC	0.0	0.0	0.0	0.0
0.0				
LFRAC	1.0000	1.0000	1.0000	1.0000
1.0000				
SFRAC	0.0	0.0	0.0	0.0
0.0				

STREAM SECTION

S-35 S-36 S-37 S-38 S-39 (CONTINUED)

STREAM ID	S-35	S-36	S-37	S-38	S-39
ENTHALPY:					
CAL/MOL	-1.0963+05	-8.8935+04	-1.1055+05	-1.5646+05	-1.5646+05
CAL/GM	-1646.6663	-592.2024	-1751.9265	-798.2727	-798.2463
CAL/SEC	-6.7914+06	-2.1990+05	-6.5750+06	-4.4348+06	-4.4347+06
ENTROPY:					
CAL/MOL-K	-108.2288	-148.0526	-106.9296	-165.4904	-165.4800
CAL/GM-K	-1.6257	-0.9859	-1.6946	-0.8443	-0.8443
DENSITY:					
MOL/CC	1.6680-02	6.6382-03	1.7763-02	5.2202-03	5.2199-03
GM/CC	1.1105	0.9969	1.1208	1.0232	1.0231
AVG MW	66.5753	150.1772	63.0998	195.9991	195.9991
SUBSTREAM ATTRIBUTES:					
PSD					

STREAM SECTION

S-4 S-40 S-41 S-42 S-43

STREAM ID	S-4	S-40	S-41	S-42	S-43
FROM :	P-1	DC-4	DC-4	P-6	---
TO :	SEP-1	----	P-6	HX-3	HX-3
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:					
KG/HR	6.2416+04	1.1900+04	8099.9999	8099.9999	1.8680+06
CAL/SEC	-2.3675+07	-2.6228+06	-1.8268+06	-1.8267+06	-1.9625+09
SUBSTREAM: MIXED					
PHASE:	MIXED	LIQUID	MIXED	LIQUID	LIQUID
COMPONENTS: KMOL/HR					
METHANOL	1300.3805	8.7353-12	3.8446-25	3.8446-25	0.0
EG	2.0945	6.6622-02	1.1420-07	1.1420-07	0.0
DMT	35.4391	61.2045	37.3043	37.3043	0.0
PET	65.7017	0.0	0.0	0.0	0.0
NA2CO3	1.6039	0.0	0.0	0.0	0.0

HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	7.0792	1.8833-09	1.9383-20	1.9383-20	1.0369+05
DEG	2.6040-06	9.3510-02	2.7419-06	2.7419-06	0.0
BIS-2-01	3.1985	2.1496-05	3.3669	3.3669	0.0
MPT	1.1810-06	5.4792-03	1.2427-06	1.2427-06	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
COMPONENTS: KG/HR					
METHANOL	4.1667+04	2.7990-10	1.2319-23	1.2319-23	0.0
EG	130.0000	4.1351	7.0880-06	7.0880-06	0.0
DMT	6881.8109	1.1885+04	7244.0121	7244.0121	0.0
PET	1.2626+04	0.0	0.0	0.0	0.0
NA2CO3	170.0000	0.0	0.0	0.0	0.0
HDPE	0.0	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0	0.0
WATER	127.5347	3.3928-08	3.4920-19	3.4920-19	1.8680+06
DEG	2.7634-04	9.9234	2.9097-04	2.9097-04	0.0

BIS-2-01	813.1887	5.4651-03	855.9872	855.9872	0.0
MPT	1.7736-04	0.8229	1.8663-04	1.8663-04	0.0
IRON	0.0	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0	0.0
TOTAL FLOW:					
KMOL/HR	1415.4974	61.3701	40.6712	40.6712	1.0369+05
KG/HR	6.2416+04	1.1900+04	8099.9999	8099.9999	1.8680+06
L/MIN	1059.8525	192.5861	130.9445	130.9387	3.1545+04
STATE VARIABLES:					
TEMP K	328.7462	483.5297	498.5423	498.6816	305.3722
PRES ATM	18.0000	0.1480	0.2052	1.9738	1.0000
VFRAC	0.0	0.0	1.8905-07	0.0	0.0
LFRAC	0.9525	1.0000	1.0000	1.0000	1.0000
SFRAC	4.7549-02	0.0	0.0	0.0	0.0

STREAM SECTION

S-4 S-40 S-41 S-42 S-43 (CONTINUED)

STREAM ID	S-4	S-40	S-41	S-42	S-43
ENTHALPY:					
CAL/MOL	-6.0213+04	-1.5386+05	-1.6170+05	-1.6169+05	-6.8134+04
CAL/GM	-1365.5522	-793.4562	-811.9181	-811.8588	-3781.9979
CAL/SEC	-2.3675+07	-2.6228+06	-1.8268+06	-1.8267+06	-1.9625+09
ENTROPY:					
CAL/MOL-K	-66.2841	-166.0093	-167.5337	-167.5101	-38.5412
CAL/GM-K	-1.5032	-0.8561	-0.8412	-0.8411	-2.1394
DENSITY:					
MOL/CC	2.2259-02	5.3111-03	5.1766-03	5.1769-03	5.4785-02
GM/CC	0.9815	1.0298	1.0310	1.0310	0.9870
AVG MW	44.0944	193.9055	199.1583	199.1583	18.0153
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	1.0000	MISSING	MISSING	MISSING	MISSING
FRAC2	0.0	MISSING	MISSING	MISSING	MISSING

FRAC3	0.0	MISSING	MISSING	MISSING	MISSING
FRAC4	0.0	MISSING	MISSING	MISSING	MISSING
FRAC5	0.0	MISSING	MISSING	MISSING	MISSING
FRAC6	0.0	MISSING	MISSING	MISSING	MISSING
FRAC7	0.0	MISSING	MISSING	MISSING	MISSING
FRAC8	0.0	MISSING	MISSING	MISSING	MISSING
FRAC9	0.0	MISSING	MISSING	MISSING	MISSING
FRAC10	0.0	MISSING	MISSING	MISSING	MISSING
FRAC11	0.0	MISSING	MISSING	MISSING	MISSING
FRAC12	0.0	MISSING	MISSING	MISSING	MISSING
FRAC13	0.0	MISSING	MISSING	MISSING	MISSING
FRAC14	0.0	MISSING	MISSING	MISSING	MISSING
FRAC15	0.0	MISSING	MISSING	MISSING	MISSING
FRAC16	0.0	MISSING	MISSING	MISSING	MISSING
FRAC17	0.0	MISSING	MISSING	MISSING	MISSING
FRAC18	0.0	MISSING	MISSING	MISSING	MISSING
FRAC19	0.0	MISSING	MISSING	MISSING	MISSING
FRAC20	0.0	MISSING	MISSING	MISSING	MISSING

FRAC21	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC22	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC23	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC24	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC25	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC26	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC27	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC28	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC29	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC30	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC31	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC32	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC33	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC34	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC35	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC36	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC37	0.0	MISSING	MISSING	MISSING
MISSING				
FRAC38	0.0	MISSING	MISSING	MISSING
MISSING				

FRAC39	0.0	MISSING	MISSING	MISSING	MISSING

STREAM SECTION

S-4 S-40 S-41 S-42 S-43 (CONTINUED)

STREAM ID	S-4	S-40	S-41	S-42	S-43
FRAC40	0.0	MISSING	MISSING	MISSING	MISSING
FRAC41	0.0	MISSING	MISSING	MISSING	MISSING
FRAC42	0.0	MISSING	MISSING	MISSING	MISSING
FRAC43	0.0	MISSING	MISSING	MISSING	MISSING
FRAC44	0.0	MISSING	MISSING	MISSING	MISSING
FRAC45	0.0	MISSING	MISSING	MISSING	MISSING
FRAC46	0.0	MISSING	MISSING	MISSING	MISSING
FRAC47	0.0	MISSING	MISSING	MISSING	MISSING
FRAC48	0.0	MISSING	MISSING	MISSING	MISSING
FRAC49	0.0	MISSING	MISSING	MISSING	MISSING
FRAC50	0.0	MISSING	MISSING	MISSING	MISSING

STREAM SECTION

S-44 S-45 S-46 S-47 S-5

STREAM ID	S-44	S-45	S-46	S-47	S-5
FROM :	HX-3	HX-3	M-3	M-3	SEP-1
TO :	----	M-3	----	SLURMIX	---
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
CONV. MAX. REL. ERR:	0.0	0.0	0.0	7.8650-05	0.0
TOTAL STREAM:					
KG/HR	1.8680+06	8099.9999	405.0000	7695.0001	1.2396+04
CAL/SEC	-1.9623+09	-1.9792+06	-9.8961+04	-1.8803+06	-1.1517+06
SUBSTREAM: MIXED					
PHASE:	LIQUID	LIQUID	LIQUID	LIQUID	SOLID
COMPONENTS: KMOL/HR					
METHANOL	0.0	3.8446-25	1.9223-26	3.6521-25	0.0
EG	0.0	1.1420-07	5.7098-09	1.0848-07	0.0
DMT	0.0	37.3043	1.8652	35.4391	0.0

PET	0.0	0.0	0.0	0.0
64.5059				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				
WATER	1.0369+05	1.9383-20	9.6917-22	1.8411-20
0.0				
DEG	0.0	2.7419-06	1.3709-07	2.6040-06
0.0				
BIS-2-01	0.0	3.3669	0.1683	3.1985
0.0				
MPT	0.0	1.2427-06	6.2137-08	1.1810-06
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				
COMPONENTS: KG/HR				
METHANOL	0.0	1.2319-23	6.1595-25	1.1702-23
0.0				
EG	0.0	7.0880-06	3.5440-07	6.7333-06
0.0				
DMT	0.0	7244.0121	362.2006	6881.8109
0.0				
PET	0.0	0.0	0.0	0.0
1.2396+04				
NA2CO3	0.0	0.0	0.0	0.0
0.0				
HDPE	0.0	0.0	0.0	0.0
0.0				
ALUM	0.0	0.0	0.0	0.0
0.0				

WATER	1.8680+06	3.4920-19	1.7460-20	3.3168-19
0.0				
DEG	0.0	2.9097-04	1.4549-05	2.7634-04
0.0				
BIS-2-01	0.0	855.9872	42.7994	813.1887
0.0				
MPT	0.0	1.8663-04	9.3316-06	1.7736-04
0.0				
IRON	0.0	0.0	0.0	0.0
0.0				
POLY(-01	0.0	0.0	0.0	0.0
0.0				
AIR	0.0	0.0	0.0	0.0
0.0				

TOTAL FLOW:

KMOL/HR	1.0369+05	40.6712	2.0336	38.6376
64.5059				
KG/HR	1.8680+06	8099.9999	405.0000	7695.0001
1.2396+04				
L/MIN	3.1554+04	110.4722	5.5236	104.9486
29.0438				

STATE VARIABLES:

TEMP K	305.6690	307.4055	307.4055	307.4055
328.7462				
PRES ATM	0.8121	1.9629	1.9629	1.9629
18.0000				
VFRAC	0.0	0.0	0.0	0.0
0.0				
LFRAC	1.0000	1.0000	1.0000	1.0000
0.0				
SFRAC	0.0	0.0	0.0	0.0
1.0000				

STREAM SECTION

S-44 S-45 S-46 S-47 S-5 (CONTINUED)

STREAM ID	S-44	S-45	S-46	S-47	S-5
ENTHALPY:					
CAL/MOL	-6.8128+04	-1.7519+05	-1.7519+05	-1.7519+05	-6.4278+04
CAL/GM	-3781.7039	-879.6550	-879.6550	-879.6550	-334.4820
CAL/SEC	-1.9623+09	-1.9792+06	-9.8961+04	-1.8803+06	-1.1517+06
ENTROPY:					
CAL/MOL-K	-38.5240	-201.6594	-201.6594	-201.6594	-215.6426
CAL/GM-K	-2.1384	-1.0126	-1.0126	-1.0126	-1.1221
DENSITY:					
MOL/CC	5.4769-02	6.1360-03	6.1360-03	6.1360-03	3.7016-02
GM/CC	0.9867	1.2220	1.2220	1.2220	7.1135
AVG MW	18.0153	199.1583	199.1583	199.1583	192.1711
SUBSTREAM ATTRIBUTES:					
PSD					
FRAC1	MISSING	MISSING	MISSING	MISSING	1.0000
FRAC2	MISSING	MISSING	MISSING	MISSING	0.0

FRAC3	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC4	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC5	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC6	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC7	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC8	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC9	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC10	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC11	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC12	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC13	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC14	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC15	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC16	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC17	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC18	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC19	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC20	MISSING	MISSING	MISSING	MISSING
0.0				

FRAC21	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC22	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC23	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC24	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC25	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC26	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC27	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC28	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC29	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC30	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC31	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC32	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC33	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC34	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC35	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC36	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC37	MISSING	MISSING	MISSING	MISSING
0.0				
FRAC38	MISSING	MISSING	MISSING	MISSING
0.0				

FRAC39	MISSING	MISSING	MISSING	MISSING
0.0				

STREAM SECTION

S-44 S-45 S-46 S-47 S-5 (CONTINUED)

STREAM ID	S-44	S-45	S-46	S-47	S-5
FRAC40	MISSING	MISSING	MISSING	MISSING	0.0
FRAC41	MISSING	MISSING	MISSING	MISSING	0.0
FRAC42	MISSING	MISSING	MISSING	MISSING	0.0
FRAC43	MISSING	MISSING	MISSING	MISSING	0.0
FRAC44	MISSING	MISSING	MISSING	MISSING	0.0
FRAC45	MISSING	MISSING	MISSING	MISSING	0.0
FRAC46	MISSING	MISSING	MISSING	MISSING	0.0
FRAC47	MISSING	MISSING	MISSING	MISSING	0.0
FRAC48	MISSING	MISSING	MISSING	MISSING	0.0
FRAC49	MISSING	MISSING	MISSING	MISSING	0.0
FRAC50	MISSING	MISSING	MISSING	MISSING	0.0

STREAM SECTION

S-6 S-7 S-8 S-9

STREAM ID	S-6	S-7	S-8	S-9
FROM :	SEP-1	----	M-2	R-1
TO :	M-2	M-2	R-1	R-2
CLASS:	MIXCIPSD	MIXCIPSD	MIXCIPSD	MIXCIPSD
TOTAL STREAM:				
KG/HR	5.0019+04	1.6400+04	6.6419+04	6.6419+04
CAL/SEC	-2.2524+07	-4.8204+06	-2.7344+07	-2.5759+07
SUBSTREAM: MIXED				
PHASE:	MIXED	LIQUID	MIXED	MIXED
COMPONENTS: KMOL/HR				
METHANOL	1300.3805	0.0	1300.3805	1195.1677
EG	2.0945	0.0	2.0945	107.2026
DMT	35.4391	0.0	35.4391	88.0455
PET	1.1958	0.0	1.1958	1.1958
NA2CO3	1.6039	0.0	1.6039	1.6039
HDPE	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0
WATER	7.0792	0.0	7.0792	7.1316
DEG	2.6040-06	0.0	2.6040-06	5.2364-02
BIS-2-01	3.1985	64.5060	67.7045	15.0981
MPT	1.1810-06	0.0	1.1810-06	1.1810-06
IRON	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0

AIR	0.0	0.0	0.0	0.0
COMPONENTS: KG/HR				
METHANOL	4.1667+04	0.0	4.1667+04	3.8296+04
EG	130.0000	0.0	130.0000	6653.8952
DMT	6881.8109	0.0	6881.8109	1.7097+04
PET	229.7926	0.0	229.7926	229.7926
NA2CO3	170.0000	0.0	170.0000	170.0000
HDPE	0.0	0.0	0.0	0.0
ALUM	0.0	0.0	0.0	0.0
WATER	127.5347	0.0	127.5347	128.4780
DEG	2.7634-04	0.0	2.7634-04	5.5570
BIS-2-01	813.1887	1.6400+04	1.7213+04	3838.5360
MPT	1.7736-04	0.0	1.7736-04	1.7736-04
IRON	0.0	0.0	0.0	0.0
POLY(-01	0.0	0.0	0.0	0.0
AIR	0.0	0.0	0.0	0.0
TOTAL FLOW:				
KMOL/HR	1350.9915	64.5060	1415.4975	1415.4975
KG/HR	5.0019+04	1.6400+04	6.6419+04	6.6419+04
L/MIN	1030.8087	212.6171	1259.2452	1447.6391
STATE VARIABLES:				
TEMP K	328.7462	433.1500	345.8889	433.1500
PRES ATM	18.0000	18.0000	18.0000	18.0000
VFRAC	0.0	0.0	0.0	0.0
LFRAC	0.9979	1.0000	0.9980	0.9980
SFRAC	2.0723-03	0.0	1.9779-03	1.9779-03

STREAM SECTION

S-6 S-7 S-8 S-9 (CONTINUED)

STREAM ID	S-6	S-7	S-8	S-9
ENTHALPY:				
CAL/MOL	-6.0019+04	-2.6902+05	-6.9544+04	-6.5513+04
CAL/GM	-1621.0799	-1058.1411	-1482.0814	-1396.1742
CAL/SEC	-2.2524+07	-4.8204+06	-2.7344+07	-2.5759+07
ENTROPY:				
CAL/MOL-K	-59.1527	-233.7189	-66.6536	-58.5043
CAL/GM-K	-1.5977	-0.9193	-1.4205	-1.2468
DENSITY:				
MOL/CC	2.1844-02	5.0565-03	1.8735-02	1.6297-02
GM/CC	0.8087	1.2856	0.8791	0.7647
AVG MW	37.0242	254.2396	46.9229	46.9229
SUBSTREAM ATTRIBUTES:				
PSD				
FRAC1	1.0000	MISSING	1.0000	1.0000
FRAC2	0.0	MISSING	0.0	0.0
FRAC3	0.0	MISSING	0.0	0.0
FRAC4	0.0	MISSING	0.0	0.0
FRAC5	0.0	MISSING	0.0	0.0
FRAC6	0.0	MISSING	0.0	0.0
FRAC7	0.0	MISSING	0.0	0.0
FRAC8	0.0	MISSING	0.0	0.0
FRAC9	0.0	MISSING	0.0	0.0

FRAC10	0.0	MISSING	0.0	0.0
FRAC11	0.0	MISSING	0.0	0.0
FRAC12	0.0	MISSING	0.0	0.0
FRAC13	0.0	MISSING	0.0	0.0
FRAC14	0.0	MISSING	0.0	0.0
FRAC15	0.0	MISSING	0.0	0.0
FRAC16	0.0	MISSING	0.0	0.0
FRAC17	0.0	MISSING	0.0	0.0
FRAC18	0.0	MISSING	0.0	0.0
FRAC19	0.0	MISSING	0.0	0.0
FRAC20	0.0	MISSING	0.0	0.0
FRAC21	0.0	MISSING	0.0	0.0
FRAC22	0.0	MISSING	0.0	0.0
FRAC23	0.0	MISSING	0.0	0.0
FRAC24	0.0	MISSING	0.0	0.0
FRAC25	0.0	MISSING	0.0	0.0
FRAC26	0.0	MISSING	0.0	0.0
FRAC27	0.0	MISSING	0.0	0.0
FRAC28	0.0	MISSING	0.0	0.0
FRAC29	0.0	MISSING	0.0	0.0
FRAC30	0.0	MISSING	0.0	0.0
FRAC31	0.0	MISSING	0.0	0.0
FRAC32	0.0	MISSING	0.0	0.0
FRAC33	0.0	MISSING	0.0	0.0
FRAC34	0.0	MISSING	0.0	0.0
FRAC35	0.0	MISSING	0.0	0.0
FRAC36	0.0	MISSING	0.0	0.0
FRAC37	0.0	MISSING	0.0	0.0
FRAC38	0.0	MISSING	0.0	0.0
FRAC39	0.0	MISSING	0.0	0.0

STREAM SECTION

S-6 S-7 S-8 S-9 (CONTINUED)

STREAM ID	S-6	S-7	S-8	S-9
FRAC40	0.0	MISSING	0.0	0.0
FRAC41	0.0	MISSING	0.0	0.0
FRAC42	0.0	MISSING	0.0	0.0
FRAC43	0.0	MISSING	0.0	0.0
FRAC44	0.0	MISSING	0.0	0.0
FRAC45	0.0	MISSING	0.0	0.0
FRAC46	0.0	MISSING	0.0	0.0
FRAC47	0.0	MISSING	0.0	0.0
FRAC48	0.0	MISSING	0.0	0.0
FRAC49	0.0	MISSING	0.0	0.0
FRAC50	0.0	MISSING	0.0	0.0

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-1

PROPERTIES ALONG A FLASH CURVE FOR THE MIXTURE: (KMOL/HR)

EG 1.000 , DMT 1.000 ,

STATE SPECIFICATIONS:

VAPOR FRACTION: 0.000

VARIED VARIABLE(S): PRES MOLEFRAC

PROPERTY SET(S): $PS-TXY

3 PHASE PV FLASHES WERE PERFORMED.

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-1 (CONTINUED)

PRES	MOLEFRAC	TEMP	KVL	KVL	GAMMA
		TOTAL	TOTAL	TOTAL	LIQUID 1
	DMT		EG	DMT	EG
ATM					

1.0000	0.0	470.4027	1.0000	0.2501	1.0000
1.0000	2.0000-02	470.9016	1.0156	0.2349	1.0008
1.0000	4.0000-02	471.3839	1.0324	0.2218	1.0030
1.0000	6.0000-02	471.8521	1.0504	0.2105	1.0065
1.0000	8.0000-02	472.3095	1.0695	0.2007	1.0112

```
 !     1.0000 !     0.1000 !   472.7589 !     1.0898 !     0.1922 !
1.0169 !

 !     1.0000 !     0.1200 !   473.2032 !     1.1112 !     0.1849 !
1.0236 !

 !     1.0000 !     0.1400 !   473.6453 !     1.1337 !     0.1785 !
1.0310 !

 !     1.0000 !     0.1600 !   474.0882 !     1.1575 !     0.1730 !
1.0392 !

 !     1.0000 !     0.1800 !   474.5349 !     1.1826 !     0.1683 !
1.0481 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.2000 !   474.9882 !     1.2089 !     0.1643 !
1.0575 !

 !     1.0000 !     0.2200 !   475.4510 !     1.2367 !     0.1609 !
1.0675 !

 !     1.0000 !     0.2400 !   475.9260 !     1.2659 !     0.1580 !
1.0779 !

 !     1.0000 !     0.2600 !   476.4160 !     1.2966 !     0.1557 !
1.0887 !

 !     1.0000 !     0.2800 !   476.9238 !     1.3291 !     0.1539 !
1.0999 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.3000 !   477.4519 !     1.3632 !     0.1525 !
1.1113 !

 !     1.0000 !     0.3200 !   478.0032 !     1.3993 !     0.1515 !
1.1230 !

 !     1.0000 !     0.3400 !   478.5804 !     1.4374 !     0.1510 !
1.1349 !

 !     1.0000 !     0.3600 !   479.1861 !     1.4777 !     0.1508 !
1.1469 !

 !     1.0000 !     0.3800 !   479.8233 !     1.5203 !     0.1511 !
1.1591 !

 !------------+------------+------------+------------+------------+---
---------!
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```
 !     1.0000 !     0.4000 !   480.4947 !     1.5655 !     0.1517 !
1.1713 !

 !     1.0000 !     0.4200 !   481.2034 !     1.6136 !     0.1527 !
1.1836 !

 !     1.0000 !     0.4400 !   481.9525 !     1.6646 !     0.1541 !
1.1959 !

 !     1.0000 !     0.4600 !   482.7453 !     1.7191 !     0.1559 !
1.2081 !

 !     1.0000 !     0.4800 !   483.5853 !     1.7772 !     0.1581 !
1.2204 !

 !-----------+-----------+-----------+-----------+-----------+---
---------!

 !     1.0000 !     0.5000 !   484.4760 !     1.8393 !     0.1607 !
1.2325 !

 !     1.0000 !     0.5200 !   485.4214 !     1.9059 !     0.1638 !
1.2446 !

 !     1.0000 !     0.5400 !   486.4259 !     1.9774 !     0.1674 !
1.2565 !

 !     1.0000 !     0.5600 !   487.4943 !     2.0545 !     0.1715 !
1.2683 !

 !     1.0000 !     0.5800 !   488.6318 !     2.1377 !     0.1761 !
1.2800 !

 !-----------+-----------+-----------+-----------+-----------+---
---------!

 !     1.0000 !     0.6000 !   489.8442 !     2.2279 !     0.1814 !
1.2915 !

 !     1.0000 !     0.6200 !   491.1380 !     2.3259 !     0.1874 !
1.3028 !

 !     1.0000 !     0.6400 !   492.5205 !     2.4327 !     0.1941 !
1.3139 !

 !     1.0000 !     0.6600 !   494.0000 !     2.5496 !     0.2017 !
1.3248 !

 !     1.0000 !     0.6800 !   495.5861 !     2.6782 !     0.2103 !
1.3355 !

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PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-1 (CONTINUED)

PRES	MOLEFRAC	TEMP	KVL	KVL	GAMMA
		TOTAL	TOTAL	TOTAL	LIQUID 1
	DMT		EG	DMT	EG
ATM					
K					
1.0000	0.7000	497.2898	2.8201	0.2200	1.3460
1.0000	0.7200	499.1237	2.9775	0.2310	1.3562
1.0000	0.7400	501.1030	3.1531	0.2435	1.3663
1.0000	0.7600	503.2456	3.3503	0.2578	1.3761
1.0000	0.7800	505.5722	3.5731	0.2742	1.3857

```
 !     1.0000 !     0.8000 !   508.1085 !     3.8268 !     0.2933 !
1.3951 !

 !     1.0000 !     0.8200 !   510.8860 !     4.1183 !     0.3155 !
1.4044 !

 !     1.0000 !     0.8400 !   513.9432 !     4.4562 !     0.3417 !
1.4134 !

 !     1.0000 !     0.8600 !   517.3288 !     4.8526 !     0.3728 !
1.4223 !

 !     1.0000 !     0.8800 !   521.1046 !     5.3237 !     0.4104 !
1.4310 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.9000 !   525.3511 !     5.8919 !     0.4565 !
1.4397 !

 !     1.0000 !     0.9200 !   530.1750 !     6.5896 !     0.5139 !
1.4483 !

 !     1.0000 !     0.9400 !   535.7209 !     7.4650 !     0.5873 !
1.4568 !

 !     1.0000 !     0.9600 !   542.1906 !     8.5920 !     0.6837 !
1.4654 !

 !     1.0000 !     0.9800 !   549.8734 !    10.0896 !     0.8145 !
1.4741 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     1.0000 !   559.2015 !    12.1607 !     1.0000 !
1.4830 !

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----------

 !  PRES      !  MOLEFRAC  !  GAMMA     !  GAMMA     !  GAMMA     !
KVL2      !

 !            !            !  LIQUID 1  !  LIQUID 2  !  LIQUID 2  !
TOTAL     !

 !            !  DMT       !  DMT       !  EG        !  DMT       !
EG        !
```

```
 !            !            !            !            !            !
!

 !
ATM       !            !            !            !            !
!

 !            !            !            !            !            !
!

 !============!============!============!============!============!===
=========!

 !     1.0000 !     0.0    !     2.6188 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  2.0000-02 !     2.4199 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  4.0000-02 !     2.2496 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  6.0000-02 !     2.1029 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  8.0000-02 !     1.9759 !    MISSING !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.1000 !     1.8654 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1200 !     1.7688 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1400 !     1.6841 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1600 !     1.6094 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1800 !     1.5435 !    MISSING !    MISSING !
MISSING !

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PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-1 (CONTINUED)

PRES ATM	MOLEFRAC DMT	GAMMA LIQUID 1 DMT	GAMMA LIQUID 2 DMT	GAMMA LIQUID 2 EG	KVL2 TOTAL DMT EG
1.0000	0.2000	1.4850	MISSING	MISSING	MISSING
1.0000	0.2200	1.4331	MISSING	MISSING	MISSING
1.0000	0.2400	1.3869	MISSING	MISSING	MISSING
1.0000	0.2600	1.3456	MISSING	MISSING	MISSING
1.0000	0.2800	1.3087	MISSING	MISSING	MISSING

```
 !     1.0000 !     0.3000 !     1.2756 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3200 !     1.2460 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3400 !     1.2194 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3600 !     1.1955 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3800 !     1.1740 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.4000 !     1.1547 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4200 !     1.1374 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4400 !     1.1217 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4600 !     1.1077 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4800 !     1.0950 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.5000 !     1.0837 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5200 !     1.0735 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5400 !     1.0644 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5600 !     1.0562 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5800 !     1.0488 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.6000 !     1.0423 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.6200 !     1.0365 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.6400 !     1.0313 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.6600 !     1.0267 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.6800 !     1.0226 !    MISSING !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.7000 !     1.0190 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.7200 !     1.0159 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.7400 !     1.0131 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.7600 !     1.0108 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.7800 !     1.0087 !    MISSING !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.8000 !     1.0069 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.8200 !     1.0054 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.8400 !     1.0041 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.8600 !     1.0030 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.8800 !     1.0022 !    MISSING !    MISSING !
MISSING !

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PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-1 (CONTINUED)

PRES ATM	MOLEFRAC DMT	GAMMA LIQUID 1 DMT	GAMMA LIQUID 2 DMT	GAMMA LIQUID 2 EG	KVL2 TOTAL DMT EG
1.0000	0.9000	1.0015	MISSING	MISSING	MISSING
1.0000	0.9200	1.0009	MISSING	MISSING	MISSING
1.0000	0.9400	1.0005	MISSING	MISSING	MISSING
1.0000	0.9600	1.0002	MISSING	MISSING	MISSING
1.0000	0.9800	1.0001	MISSING	MISSING	MISSING

```
 !     1.0000 !     1.0000 !     1.0000 !    MISSING !    MISSING !
MISSING !

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 !  PRES      !  MOLEFRAC  !  KVL2      !  BETA      !  MOLEFRAC  !
MOLEFRAC  !

 !            !            !  TOTAL     !  TOTAL     !  VAPOR     !
VAPOR     !

 !            !  DMT       !  DMT       !            !  EG        !
DMT       !

 !            !            !            !            !            !
!

 !
ATM       !            !            !            !            !
!

 !            !            !            !            !            !
!

 !============!============!============!============!============!===
=========!

 !     1.0000 !     0.0    !    MISSING !     1.0000 !     1.0000 !
0.0    !

 !     1.0000 !  2.0000-02 !    MISSING !     1.0000 !     0.9953 !
4.6980-03 !

 !     1.0000 !  4.0000-02 !    MISSING !     1.0000 !     0.9911 !
8.8716-03 !

 !     1.0000 !  6.0000-02 !    MISSING !     1.0000 !     0.9874 !
1.2629-02 !

 !     1.0000 !  8.0000-02 !    MISSING !     1.0000 !     0.9839 !
1.6055-02 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.1000 !    MISSING !     1.0000 !     0.9808 !
1.9221-02 !
```

```
 !     1.0000 !     0.1200 !    MISSING !     1.0000 !     0.9778 !
2.2184-02 !

 !     1.0000 !     0.1400 !    MISSING !     1.0000 !     0.9750 !
2.4991-02 !

 !     1.0000 !     0.1600 !    MISSING !     1.0000 !     0.9723 !
2.7683-02 !

 !     1.0000 !     0.1800 !    MISSING !     1.0000 !     0.9697 !
3.0293-02 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.2000 !    MISSING !     1.0000 !     0.9671 !
3.2853-02 !

 !     1.0000 !     0.2200 !    MISSING !     1.0000 !     0.9646 !
3.5388-02 !

 !     1.0000 !     0.2400 !    MISSING !     1.0000 !     0.9621 !
3.7923-02 !

 !     1.0000 !     0.2600 !    MISSING !     1.0000 !     0.9595 !
4.0480-02 !

 !     1.0000 !     0.2800 !    MISSING !     1.0000 !     0.9569 !
4.3079-02 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.3000 !    MISSING !     1.0000 !     0.9543 !
4.5740-02 !

 !     1.0000 !     0.3200 !    MISSING !     1.0000 !     0.9515 !
4.8483-02 !

 !     1.0000 !     0.3400 !    MISSING !     1.0000 !     0.9487 !
5.1328-02 !

 !     1.0000 !     0.3600 !    MISSING !     1.0000 !     0.9457 !
5.4294-02 !

 !     1.0000 !     0.3800 !    MISSING !     1.0000 !     0.9426 !
5.7401-02 !

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PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-1 (CONTINUED)

PRES ATM	MOLEFRAC DMT	KVL2 TOTAL DMT	BETA TOTAL VAPOR	MOLEFRAC VAPOR EG	MOLEFRAC VAPOR DMT
1.0000	0.4000	MISSING	1.0000	0.9393	6.0672-02
1.0000	0.4200	MISSING	1.0000	0.9359	6.4129-02
1.0000	0.4400	MISSING	1.0000	0.9322	6.7797-02
1.0000	0.4600	MISSING	1.0000	0.9283	7.1704-02
1.0000	0.4800	MISSING	1.0000	0.9241	7.5880-02

```
 !     1.0000 !     0.5000 !    MISSING !     1.0000 !     0.9196 !
8.0360-02 !
 !     1.0000 !     0.5200 !    MISSING !     1.0000 !     0.9148 !
8.5181-02 !
 !     1.0000 !     0.5400 !    MISSING !     1.0000 !     0.9096 !
9.0386-02 !
 !     1.0000 !     0.5600 !    MISSING !     1.0000 !     0.9040 !
9.6026-02 !
 !     1.0000 !     0.5800 !    MISSING !     1.0000 !     0.8978 !
0.1022 !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.6000 !    MISSING !     1.0000 !     0.8912 !
0.1088 !
 !     1.0000 !     0.6200 !    MISSING !     1.0000 !     0.8838 !
0.1162 !
 !     1.0000 !     0.6400 !    MISSING !     1.0000 !     0.8758 !
0.1242 !
 !     1.0000 !     0.6600 !    MISSING !     1.0000 !     0.8669 !
0.1331 !
 !     1.0000 !     0.6800 !    MISSING !     1.0000 !     0.8570 !
0.1430 !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.7000 !    MISSING !     1.0000 !     0.8460 !
0.1540 !
 !     1.0000 !     0.7200 !    MISSING !     1.0000 !     0.8337 !
0.1663 !
 !     1.0000 !     0.7400 !    MISSING !     1.0000 !     0.8198 !
0.1802 !
 !     1.0000 !     0.7600 !    MISSING !     1.0000 !     0.8041 !
0.1959 !
 !     1.0000 !     0.7800 !    MISSING !     1.0000 !     0.7861 !
0.2139 !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.8000 !    MISSING !     1.0000 !     0.7654 !
0.2346 !

 !     1.0000 !     0.8200 !    MISSING !     1.0000 !     0.7413 !
0.2587 !

 !     1.0000 !     0.8400 !    MISSING !     1.0000 !     0.7130 !
0.2870 !

 !     1.0000 !     0.8600 !    MISSING !     1.0000 !     0.6794 !
0.3206 !

 !     1.0000 !     0.8800 !    MISSING !     1.0000 !     0.6388 !
0.3612 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.9000 !    MISSING !     1.0000 !     0.5892 !
0.4108 !

 !     1.0000 !     0.9200 !    MISSING !     1.0000 !     0.5272 !
0.4728 !

 !     1.0000 !     0.9400 !    MISSING !     1.0000 !     0.4479 !
0.5521 !

 !     1.0000 !     0.9600 !    MISSING !     1.0000 !     0.3437 !
0.6563 !

 !     1.0000 !     0.9800 !    MISSING !     1.0000 !     0.2018 !
0.7982 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     1.0000 !    MISSING !     1.0000 !     0.0    !
1.0000 !

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```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-1 (CONTINUED)

PRES ATM	MOLEFRAC DMT LIQUID 1	MOLEFRAC EG LIQUID 1	MOLEFRAC DMT LIQUID 2	MOLEFRAC EG LIQUID 2
1.0000	0.0	1.0000	0.0	MISSING
1.0000	2.0000-02	0.9800	2.0000-02	MISSING
1.0000	4.0000-02	0.9600	4.0000-02	MISSING
1.0000	6.0000-02	0.9400	6.0000-02	MISSING
1.0000	8.0000-02	0.9200	8.0000-02	MISSING

```
 !     1.0000 !     0.1000 !     0.9000 !     0.1000 !    MISSING !
MISSING !
 !     1.0000 !     0.1200 !     0.8800 !     0.1200 !    MISSING !
MISSING !
 !     1.0000 !     0.1400 !     0.8600 !     0.1400 !    MISSING !
MISSING !
 !     1.0000 !     0.1600 !     0.8400 !     0.1600 !    MISSING !
MISSING !
 !     1.0000 !     0.1800 !     0.8200 !     0.1800 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.2000 !     0.8000 !     0.2000 !    MISSING !
MISSING !
 !     1.0000 !     0.2200 !     0.7800 !     0.2200 !    MISSING !
MISSING !
 !     1.0000 !     0.2400 !     0.7600 !     0.2400 !    MISSING !
MISSING !
 !     1.0000 !     0.2600 !     0.7400 !     0.2600 !    MISSING !
MISSING !
 !     1.0000 !     0.2800 !     0.7200 !     0.2800 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.3000 !     0.7000 !     0.3000 !    MISSING !
MISSING !
 !     1.0000 !     0.3200 !     0.6800 !     0.3200 !    MISSING !
MISSING !
 !     1.0000 !     0.3400 !     0.6600 !     0.3400 !    MISSING !
MISSING !
 !     1.0000 !     0.3600 !     0.6400 !     0.3600 !    MISSING !
MISSING !
 !     1.0000 !     0.3800 !     0.6200 !     0.3800 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.4000 !     0.6000 !     0.4000 !    MISSING !
MISSING !

 !     1.0000 !     0.4200 !     0.5800 !     0.4200 !    MISSING !
MISSING !

 !     1.0000 !     0.4400 !     0.5600 !     0.4400 !    MISSING !
MISSING !

 !     1.0000 !     0.4600 !     0.5400 !     0.4600 !    MISSING !
MISSING !

 !     1.0000 !     0.4800 !     0.5200 !     0.4800 !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.5000 !     0.5000 !     0.5000 !    MISSING !
MISSING !

 !     1.0000 !     0.5200 !     0.4800 !     0.5200 !    MISSING !
MISSING !

 !     1.0000 !     0.5400 !     0.4600 !     0.5400 !    MISSING !
MISSING !

 !     1.0000 !     0.5600 !     0.4400 !     0.5600 !    MISSING !
MISSING !

 !     1.0000 !     0.5800 !     0.4200 !     0.5800 !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.6000 !     0.4000 !     0.6000 !    MISSING !
MISSING !

 !     1.0000 !     0.6200 !     0.3800 !     0.6200 !    MISSING !
MISSING !

 !     1.0000 !     0.6400 !     0.3600 !     0.6400 !    MISSING !
MISSING !

 !     1.0000 !     0.6600 !     0.3400 !     0.6600 !    MISSING !
MISSING !

 !     1.0000 !     0.6800 !     0.3200 !     0.6800 !    MISSING !
MISSING !

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PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-1 (CONTINUED)

PRES ATM	MOLEFRAC DMT LIQUID 1	MOLEFRAC EG LIQUID 1	MOLEFRAC DMT LIQUID 2	MOLEFRAC EG LIQUID 2
1.0000	0.7000	0.3000	0.7000	MISSING
1.0000	0.7200	0.2800	0.7200	MISSING
1.0000	0.7400	0.2600	0.7400	MISSING
1.0000	0.7600	0.2400	0.7600	MISSING
1.0000	0.7800	0.2200	0.7800	MISSING

```
 !     1.0000 !     0.8000 !     0.2000 !     0.8000 !    MISSING !
MISSING !

 !     1.0000 !     0.8200 !     0.1800 !     0.8200 !    MISSING !
MISSING !

 !     1.0000 !     0.8400 !     0.1600 !     0.8400 !    MISSING !
MISSING !

 !     1.0000 !     0.8600 !     0.1400 !     0.8600 !    MISSING !
MISSING !

 !     1.0000 !     0.8800 !     0.1200 !     0.8800 !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.9000 !     0.1000 !     0.9000 !    MISSING !
MISSING !

 !     1.0000 !     0.9200 !  8.0000-02 !     0.9200 !    MISSING !
MISSING !

 !     1.0000 !     0.9400 !  6.0000-02 !     0.9400 !    MISSING !
MISSING !

 !     1.0000 !     0.9600 !  4.0000-02 !     0.9600 !    MISSING !
MISSING !

 !     1.0000 !     0.9800 !  2.0000-02 !     0.9800 !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     1.0000 !     0.0    !     1.0000 !    MISSING !
MISSING !

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```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-2

PROPERTIES ALONG A FLASH CURVE FOR THE MIXTURE: (KMOL/HR)

EG 1.000 , DEG 1.000 ,

STATE SPECIFICATIONS:

VAPOR FRACTION: 0.000

VARIED VARIABLE(S): PRES MOLEFRAC

PROPERTY SET(S): $PS-TXY

3 PHASE PV FLASHES WERE PERFORMED.

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-2 (CONTINUED)

PRES	MOLEFRAC	TEMP	KVL	KVL	GAMMA
		TOTAL	TOTAL	TOTAL	LIQUID 1
	DEG		EG	DEG	EG
ATM		K			
1.0000	0.0	470.4027	1.0000	0.5083	1.0000
1.0000	2.0000-02	470.7392	1.0111	0.4579	1.0011
1.0000	4.0000-02	471.0806	1.0242	0.4189	1.0039
1.0000	6.0000-02	471.4260	1.0390	0.3886	1.0082
1.0000	8.0000-02	471.7772	1.0552	0.3647	1.0134

```
 !     1.0000 !     0.1000 !   472.1372 !     1.0727 !     0.3460 !
1.0193 !

 !     1.0000 !     0.1200 !   472.5100 !     1.0912 !     0.3312 !
1.0257 !

 !     1.0000 !     0.1400 !   472.8990 !     1.1107 !     0.3198 !
1.0323 !

 !     1.0000 !     0.1600 !   473.3075 !     1.1312 !     0.3111 !
1.0389 !

 !     1.0000 !     0.1800 !   473.7393 !     1.1526 !     0.3046 !
1.0454 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.2000 !   474.1971 !     1.1750 !     0.3001 !
1.0516 !

 !     1.0000 !     0.2200 !   474.6836 !     1.1982 !     0.2973 !
1.0574 !

 !     1.0000 !     0.2400 !   475.2011 !     1.2223 !     0.2960 !
1.0627 !

 !     1.0000 !     0.2600 !   475.7516 !     1.2473 !     0.2961 !
1.0674 !

 !     1.0000 !     0.2800 !   476.3366 !     1.2732 !     0.2974 !
1.0715 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.3000 !   476.9574 !     1.3000 !     0.2999 !
1.0748 !

 !     1.0000 !     0.3200 !   477.6151 !     1.3278 !     0.3035 !
1.0774 !

 !     1.0000 !     0.3400 !   478.3104 !     1.3565 !     0.3080 !
1.0792 !

 !     1.0000 !     0.3600 !   479.0438 !     1.3861 !     0.3136 !
1.0802 !

 !     1.0000 !     0.3800 !   479.8156 !     1.4167 !     0.3201 !
1.0803 !

 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.4000 !   480.6259 !     1.4483 !     0.3275 !
1.0796 !

 !     1.0000 !     0.4200 !   481.4748 !     1.4809 !     0.3359 !
1.0781 !

 !     1.0000 !     0.4400 !   482.3620 !     1.5145 !     0.3451 !
1.0757 !

 !     1.0000 !     0.4600 !   483.2872 !     1.5492 !     0.3553 !
1.0726 !

 !     1.0000 !     0.4800 !   484.2501 !     1.5849 !     0.3664 !
1.0686 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.5000 !   485.2501 !     1.6216 !     0.3784 !
1.0639 !

 !     1.0000 !     0.5200 !   486.2867 !     1.6594 !     0.3913 !
1.0585 !

 !     1.0000 !     0.5400 !   487.3591 !     1.6983 !     0.4052 !
1.0523 !

 !     1.0000 !     0.5600 !   488.4667 !     1.7382 !     0.4200 !
1.0454 !

 !     1.0000 !     0.5800 !   489.6085 !     1.7791 !     0.4358 !
1.0379 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.6000 !   490.7835 !     1.8211 !     0.4526 !
1.0297 !

 !     1.0000 !     0.6200 !   491.9908 !     1.8640 !     0.4704 !
1.0209 !

 !     1.0000 !     0.6400 !   493.2291 !     1.9079 !     0.4893 !
1.0115 !

 !     1.0000 !     0.6600 !   494.4970 !     1.9527 !     0.5092 !
1.0016 !

 !     1.0000 !     0.6800 !   495.7931 !     1.9982 !     0.5303 !
0.9911 !

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```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-2 (CONTINUED)

PRES	MOLEFRAC	TEMP	KVL	KVL	GAMMA
		TOTAL	TOTAL	TOTAL	LIQUID 1
	DEG		EG	DEG	EG
ATM		K			
1.0000	0.7000	497.1155	2.0445	0.5524	0.9802
1.0000	0.7200	498.4624	2.0913	0.5756	0.9687
1.0000	0.7400	499.8315	2.1386	0.6000	0.9568
1.0000	0.7600	501.2205	2.1862	0.6254	0.9445
1.0000	0.7800	502.6263	2.2339	0.6520	0.9318

```
 !     1.0000 !     0.8000 !   504.0460 !     2.2814 !     0.6796 !
0.9187 !

 !     1.0000 !     0.8200 !   505.4760 !     2.3286 !     0.7084 !
0.9052 !

 !     1.0000 !     0.8400 !   506.9126 !     2.3752 !     0.7381 !
0.8914 !

 !     1.0000 !     0.8600 !   508.3514 !     2.4208 !     0.7687 !
0.8774 !

 !     1.0000 !     0.8800 !   509.7881 !     2.4652 !     0.8002 !
0.8631 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.9000 !   511.2179 !     2.5081 !     0.8324 !
0.8485 !

 !     1.0000 !     0.9200 !   512.6358 !     2.5490 !     0.8653 !
0.8338 !

 !     1.0000 !     0.9400 !   514.0368 !     2.5878 !     0.8987 !
0.8190 !

 !     1.0000 !     0.9600 !   515.4157 !     2.6240 !     0.9323 !
0.8040 !

 !     1.0000 !     0.9800 !   516.7677 !     2.6574 !     0.9662 !
0.7890 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     1.0000 !   518.0880 !     2.6877 !     1.0000 !
0.7741 !

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----------

 !  PRES      !  MOLEFRAC  !  GAMMA     !  GAMMA     !  GAMMA     !
KVL2      !

 !            !            !  LIQUID 1  !  LIQUID 2  !  LIQUID 2  !
TOTAL     !

 !            !  DEG       !  DEG       !  EG        !  DEG       !
EG        !
```

```
 !            !            !            !            !            !
!

 !
ATM       !            !            !            !            !
!

 !            !            !            !            !            !
!

 !============!============!============!============!============!===
=========!

 !     1.0000 !     0.0    !     2.1024 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  2.0000-02 !     1.8721 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  4.0000-02 !     1.6931 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  6.0000-02 !     1.5521 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  8.0000-02 !     1.4396 !    MISSING !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.1000 !     1.3490 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1200 !     1.2755 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1400 !     1.2154 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1600 !     1.1661 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1800 !     1.1255 !    MISSING !    MISSING !
MISSING !

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PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-2 (CONTINUED)

PRES	MOLEFRAC	GAMMA	GAMMA	GAMMA	KVL2
		LIQUID 1	LIQUID 2	LIQUID 2	TOTAL
	DEG	DEG	EG	DEG	EG
ATM					
1.0000	0.2000	1.0920	MISSING	MISSING	MISSING
1.0000	0.2200	1.0645	MISSING	MISSING	MISSING
1.0000	0.2400	1.0418	MISSING	MISSING	MISSING
1.0000	0.2600	1.0233	MISSING	MISSING	MISSING
1.0000	0.2800	1.0082	MISSING	MISSING	MISSING

```
 !     1.0000 !     0.3000 !     0.9960 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3200 !     0.9863 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3400 !     0.9787 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3600 !     0.9729 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3800 !     0.9686 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.4000 !     0.9656 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4200 !     0.9637 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4400 !     0.9626 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4600 !     0.9623 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4800 !     0.9626 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.5000 !     0.9635 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5200 !     0.9647 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5400 !     0.9663 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5600 !     0.9681 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5800 !     0.9701 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.6000 !     0.9722 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.6200 !     0.9744 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.6400 !     0.9766 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.6600 !     0.9788 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.6800 !     0.9810 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.7000 !     0.9831 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.7200 !     0.9852 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.7400 !     0.9871 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.7600 !     0.9889 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.7800 !     0.9906 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.8000 !     0.9922 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.8200 !     0.9937 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.8400 !     0.9950 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.8600 !     0.9961 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.8800 !     0.9971 !    MISSING !    MISSING !
MISSING !
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----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-2 (CONTINUED)

PRES ATM	MOLEFRAC	GAMMA LIQUID 1 DEG	GAMMA LIQUID 2 DEG	GAMMA LIQUID 2 EG	KVL2 TOTAL EG
1.0000	0.9000	0.9980	MISSING	MISSING	MISSING
1.0000	0.9200	0.9987	MISSING	MISSING	MISSING
1.0000	0.9400	0.9993	MISSING	MISSING	MISSING
1.0000	0.9600	0.9997	MISSING	MISSING	MISSING
1.0000	0.9800	0.9999	MISSING	MISSING	MISSING

```
 !     1.0000 !     1.0000 !     1.0000 !    MISSING !    MISSING !
MISSING !
 ------------------------------------------------------------------
----------


 ------------------------------------------------------------------
----------
 !  PRES      !  MOLEFRAC  !  KVL2      !  BETA      !  MOLEFRAC  !
MOLEFRAC  !
 !            !            !  TOTAL     !  TOTAL     !  VAPOR     !
VAPOR     !
 !            !  DEG       !  DEG       !            !  EG        !
DEG       !
 !            !            !            !            !            !
!
 !
ATM       !            !            !            !            !
!
 !            !            !            !            !            !
!
 !============!============!============!============!============!===
=========!
 !     1.0000 !     0.0    !    MISSING !     1.0000 !     1.0000 !
0.0    !
 !     1.0000 !  2.0000-02 !    MISSING !     1.0000 !     0.9908 !
9.1572-03 !
 !     1.0000 !  4.0000-02 !    MISSING !     1.0000 !     0.9832 !
1.6757-02 !
 !     1.0000 !  6.0000-02 !    MISSING !     1.0000 !     0.9767 !
2.3313-02 !
 !     1.0000 !  8.0000-02 !    MISSING !     1.0000 !     0.9708 !
2.9177-02 !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.1000 !    MISSING !     1.0000 !     0.9654 !
3.4596-02 !
```

```
 !     1.0000 !     0.1200 !    MISSING !     1.0000 !     0.9603 !
3.9749-02 !

 !     1.0000 !     0.1400 !    MISSING !     1.0000 !     0.9552 !
4.4771-02 !

 !     1.0000 !     0.1600 !    MISSING !     1.0000 !     0.9502 !
4.9770-02 !

 !     1.0000 !     0.1800 !    MISSING !     1.0000 !     0.9452 !
5.4829-02 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.2000 !    MISSING !     1.0000 !     0.9400 !
6.0022-02 !

 !     1.0000 !     0.2200 !    MISSING !     1.0000 !     0.9346 !
6.5410-02 !

 !     1.0000 !     0.2400 !    MISSING !     1.0000 !     0.9290 !
7.1049-02 !

 !     1.0000 !     0.2600 !    MISSING !     1.0000 !     0.9230 !
7.6990-02 !

 !     1.0000 !     0.2800 !    MISSING !     1.0000 !     0.9167 !
8.3282-02 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.3000 !    MISSING !     1.0000 !     0.9100 !
8.9973-02 !

 !     1.0000 !     0.3200 !    MISSING !     1.0000 !     0.9029 !
9.7107-02 !

 !     1.0000 !     0.3400 !    MISSING !     1.0000 !     0.8953 !
0.1047 !

 !     1.0000 !     0.3600 !    MISSING !     1.0000 !     0.8871 !
0.1129 !

 !     1.0000 !     0.3800 !    MISSING !     1.0000 !     0.8784 !
0.1216 !

 ------------------------------------------------------------------------
----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-2 (CONTINUED)

PRES ATM	MOLEFRAC	KVL2 TOTAL DEG	BETA TOTAL DEG	MOLEFRAC VAPOR EG	MOLEFRAC VAPOR DEG
1.0000	0.4000	MISSING	1.0000	0.8690	0.1310
1.0000	0.4200	MISSING	1.0000	0.8589	0.1411
1.0000	0.4400	MISSING	1.0000	0.8481	0.1519
1.0000	0.4600	MISSING	1.0000	0.8366	0.1634
1.0000	0.4800	MISSING	1.0000	0.8241	0.1759

```
 !     1.0000 !     0.5000 !    MISSING !     1.0000 !     0.8108 !
0.1892 !

 !     1.0000 !     0.5200 !    MISSING !     1.0000 !     0.7965 !
0.2035 !

 !     1.0000 !     0.5400 !    MISSING !     1.0000 !     0.7812 !
0.2188 !

 !     1.0000 !     0.5600 !    MISSING !     1.0000 !     0.7648 !
0.2352 !

 !     1.0000 !     0.5800 !    MISSING !     1.0000 !     0.7472 !
0.2528 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.6000 !    MISSING !     1.0000 !     0.7284 !
0.2716 !

 !     1.0000 !     0.6200 !    MISSING !     1.0000 !     0.7083 !
0.2917 !

 !     1.0000 !     0.6400 !    MISSING !     1.0000 !     0.6868 !
0.3132 !

 !     1.0000 !     0.6600 !    MISSING !     1.0000 !     0.6639 !
0.3361 !

 !     1.0000 !     0.6800 !    MISSING !     1.0000 !     0.6394 !
0.3606 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.7000 !    MISSING !     1.0000 !     0.6133 !
0.3867 !

 !     1.0000 !     0.7200 !    MISSING !     1.0000 !     0.5856 !
0.4144 !

 !     1.0000 !     0.7400 !    MISSING !     1.0000 !     0.5560 !
0.4440 !

 !     1.0000 !     0.7600 !    MISSING !     1.0000 !     0.5247 !
0.4753 !

 !     1.0000 !     0.7800 !    MISSING !     1.0000 !     0.4914 !
0.5086 !

 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.8000 !    MISSING !     1.0000 !     0.4563 !
0.5437 !

 !     1.0000 !     0.8200 !    MISSING !     1.0000 !     0.4192 !
0.5808 !

 !     1.0000 !     0.8400 !    MISSING !     1.0000 !     0.3800 !
0.6200 !

 !     1.0000 !     0.8600 !    MISSING !     1.0000 !     0.3389 !
0.6611 !

 !     1.0000 !     0.8800 !    MISSING !     1.0000 !     0.2958 !
0.7042 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.9000 !    MISSING !     1.0000 !     0.2508 !
0.7492 !

 !     1.0000 !     0.9200 !    MISSING !     1.0000 !     0.2039 !
0.7961 !

 !     1.0000 !     0.9400 !    MISSING !     1.0000 !     0.1553 !
0.8447 !

 !     1.0000 !     0.9600 !    MISSING !     1.0000 !     0.1050 !
0.8950 !

 !     1.0000 !     0.9800 !    MISSING !     1.0000 !  5.3148-02 !
0.9469 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     1.0000 !    MISSING !     1.0000 !     0.0    !
1.0000 !

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----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-2 (CONTINUED)

PRES ATM	MOLEFRAC LIQUID 1 DEG	MOLEFRAC LIQUID 1 EG	MOLEFRAC LIQUID 2 DEG	MOLEFRAC LIQUID 2 EG	MOLEFRAC LIQUID 2
1.0000	0.0	1.0000	0.0	MISSING	MISSING
1.0000	2.0000-02	0.9800	2.0000-02	MISSING	MISSING
1.0000	4.0000-02	0.9600	4.0000-02	MISSING	MISSING
1.0000	6.0000-02	0.9400	6.0000-02	MISSING	MISSING
1.0000	8.0000-02	0.9200	8.0000-02	MISSING	MISSING

```
 !     1.0000 !     0.1000 !     0.9000 !     0.1000 !    MISSING !
MISSING !
 !     1.0000 !     0.1200 !     0.8800 !     0.1200 !    MISSING !
MISSING !
 !     1.0000 !     0.1400 !     0.8600 !     0.1400 !    MISSING !
MISSING !
 !     1.0000 !     0.1600 !     0.8400 !     0.1600 !    MISSING !
MISSING !
 !     1.0000 !     0.1800 !     0.8200 !     0.1800 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.2000 !     0.8000 !     0.2000 !    MISSING !
MISSING !
 !     1.0000 !     0.2200 !     0.7800 !     0.2200 !    MISSING !
MISSING !
 !     1.0000 !     0.2400 !     0.7600 !     0.2400 !    MISSING !
MISSING !
 !     1.0000 !     0.2600 !     0.7400 !     0.2600 !    MISSING !
MISSING !
 !     1.0000 !     0.2800 !     0.7200 !     0.2800 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.3000 !     0.7000 !     0.3000 !    MISSING !
MISSING !
 !     1.0000 !     0.3200 !     0.6800 !     0.3200 !    MISSING !
MISSING !
 !     1.0000 !     0.3400 !     0.6600 !     0.3400 !    MISSING !
MISSING !
 !     1.0000 !     0.3600 !     0.6400 !     0.3600 !    MISSING !
MISSING !
 !     1.0000 !     0.3800 !     0.6200 !     0.3800 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.4000 !     0.6000 !     0.4000 !    MISSING !
MISSING !

 !     1.0000 !     0.4200 !     0.5800 !     0.4200 !    MISSING !
MISSING !

 !     1.0000 !     0.4400 !     0.5600 !     0.4400 !    MISSING !
MISSING !

 !     1.0000 !     0.4600 !     0.5400 !     0.4600 !    MISSING !
MISSING !

 !     1.0000 !     0.4800 !     0.5200 !     0.4800 !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.5000 !     0.5000 !     0.5000 !    MISSING !
MISSING !

 !     1.0000 !     0.5200 !     0.4800 !     0.5200 !    MISSING !
MISSING !

 !     1.0000 !     0.5400 !     0.4600 !     0.5400 !    MISSING !
MISSING !

 !     1.0000 !     0.5600 !     0.4400 !     0.5600 !    MISSING !
MISSING !

 !     1.0000 !     0.5800 !     0.4200 !     0.5800 !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.6000 !     0.4000 !     0.6000 !    MISSING !
MISSING !

 !     1.0000 !     0.6200 !     0.3800 !     0.6200 !    MISSING !
MISSING !

 !     1.0000 !     0.6400 !     0.3600 !     0.6400 !    MISSING !
MISSING !

 !     1.0000 !     0.6600 !     0.3400 !     0.6600 !    MISSING !
MISSING !

 !     1.0000 !     0.6800 !     0.3200 !     0.6800 !    MISSING !
MISSING !

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```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-2 (CONTINUED)

PRES ATM	MOLEFRAC LIQUID 1 DEG	MOLEFRAC LIQUID 1 EG	MOLEFRAC LIQUID 2 DEG	MOLEFRAC LIQUID 2 EG	MOLEFRAC LIQUID 2
1.0000	0.7000	0.3000	0.7000	MISSING	MISSING
1.0000	0.7200	0.2800	0.7200	MISSING	MISSING
1.0000	0.7400	0.2600	0.7400	MISSING	MISSING
1.0000	0.7600	0.2400	0.7600	MISSING	MISSING
1.0000	0.7800	0.2200	0.7800	MISSING	MISSING

```
 !     1.0000 !     0.8000 !     0.2000 !     0.8000 !    MISSING !
MISSING !
 !     1.0000 !     0.8200 !     0.1800 !     0.8200 !    MISSING !
MISSING !
 !     1.0000 !     0.8400 !     0.1600 !     0.8400 !    MISSING !
MISSING !
 !     1.0000 !     0.8600 !     0.1400 !     0.8600 !    MISSING !
MISSING !
 !     1.0000 !     0.8800 !     0.1200 !     0.8800 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.9000 !     0.1000 !     0.9000 !    MISSING !
MISSING !
 !     1.0000 !     0.9200 !  8.0000-02 !     0.9200 !    MISSING !
MISSING !
 !     1.0000 !     0.9400 !  6.0000-02 !     0.9400 !    MISSING !
MISSING !
 !     1.0000 !     0.9600 !  4.0000-02 !     0.9600 !    MISSING !
MISSING !
 !     1.0000 !     0.9800 !  2.0000-02 !     0.9800 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     1.0000 !     0.0    !     1.0000 !    MISSING !
MISSING !
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----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-3

PROPERTIES ALONG A FLASH CURVE FOR THE MIXTURE: (KMOL/HR)

DMT 1.000 , BIS-2-01 1.000 ,

STATE SPECIFICATIONS:

VAPOR FRACTION: 0.000

VARIED VARIABLE(S): PRES MOLEFRAC

PROPERTY SET(S): $PS-TXY

3 PHASE PV FLASHES WERE PERFORMED.

PROPERTY OPTION SET: NRTL RENON (NRTL) / IDEAL GAS

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-3 (CONTINUED)

PRES	MOLEFRAC	TEMP	KVL	KVL	GAMMA
		TOTAL	TOTAL	TOTAL	LIQUID 1
	DMT		DMT	BIS-2-01	DMT
ATM					

1.0000	0.0	683.2302	8.4640	1.0000	1.0000
1.0000	2.0000-02	677.3832	7.7985	0.8613	1.0000
1.0000	4.0000-02	671.6845	7.1904	0.7421	1.0000
1.0000	6.0000-02	666.1601	6.6374	0.6402	1.0000
1.0000	8.0000-02	660.8304	6.1362	0.5534	1.0000

```
 !     1.0000 !     0.1000 !   655.7106 !     5.6833 !     0.4796 !
1.0000 !
 !     1.0000 !     0.1200 !   650.8098 !     5.2749 !     0.4171 !
1.0000 !
 !     1.0000 !     0.1400 !   646.1323 !     4.9071 !     0.3640 !
1.0000 !
 !     1.0000 !     0.1600 !   641.6779 !     4.5758 !     0.3189 !
1.0000 !
 !     1.0000 !     0.1800 !   637.4427 !     4.2775 !     0.2805 !
1.0000 !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.2000 !   633.4201 !     4.0085 !     0.2479 !
1.0000 !
 !     1.0000 !     0.2200 !   629.6016 !     3.7657 !     0.2199 !
1.0000 !
 !     1.0000 !     0.2400 !   625.9774 !     3.5461 !     0.1960 !
1.0000 !
 !     1.0000 !     0.2600 !   622.5371 !     3.3472 !     0.1753 !
1.0000 !
 !     1.0000 !     0.2800 !   619.2698 !     3.1665 !     0.1575 !
1.0000 !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.3000 !   616.1649 !     3.0020 !     0.1420 !
1.0000 !
 !     1.0000 !     0.3200 !   613.2119 !     2.8518 !     0.1285 !
1.0000 !
 !     1.0000 !     0.3400 !   610.4008 !     2.7145 !     0.1168 !
1.0000 !
 !     1.0000 !     0.3600 !   607.7222 !     2.5886 !     0.1064 !
1.0000 !
 !     1.0000 !     0.3800 !   605.1671 !     2.4728 !  9.7297-02 !
1.0000 !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.4000 !   602.7271 !     2.3662 !  8.9233-02 !
1.0000 !

 !     1.0000 !     0.4200 !   600.3946 !     2.2676 !  8.2075-02 !
1.0000 !

 !     1.0000 !     0.4400 !   598.1623 !     2.1764 !  7.5699-02 !
1.0000 !

 !     1.0000 !     0.4600 !   596.0237 !     2.0917 !  7.0000-02 !
1.0000 !

 !     1.0000 !     0.4800 !   593.9725 !     2.0130 !  6.4889-02 !
1.0000 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.5000 !   592.0031 !     1.9397 !  6.0293-02 !
1.0000 !

 !     1.0000 !     0.5200 !   590.1103 !     1.8712 !  5.6146-02 !
1.0000 !

 !     1.0000 !     0.5400 !   588.2894 !     1.8072 !  5.2395-02 !
1.0000 !

 !     1.0000 !     0.5600 !   586.5358 !     1.7472 !  4.8992-02 !
1.0000 !

 !     1.0000 !     0.5800 !   584.8456 !     1.6909 !  4.5897-02 !
1.0000 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.6000 !   583.2149 !     1.6380 !  4.3074-02 !
1.0000 !

 !     1.0000 !     0.6200 !   581.6402 !     1.5881 !  4.0495-02 !
1.0000 !

 !     1.0000 !     0.6400 !   580.1184 !     1.5411 !  3.8133-02 !
1.0000 !

 !     1.0000 !     0.6600 !   578.6465 !     1.4966 !  3.5964-02 !
1.0000 !

 !     1.0000 !     0.6800 !   577.2217 !     1.4546 !  3.3968-02 !
1.0000 !

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----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-3 (CONTINUED)

PRES	MOLEFRAC	TEMP	KVL	KVL	GAMMA
		TOTAL	TOTAL	TOTAL	LIQUID 1
	DMT		DMT	BIS-2-01	DMT
ATM					
1.0000	0.7000	575.8414	1.4148	3.2129-02	1.0000
1.0000	0.7200	574.5034	1.3771	3.0430-02	1.0000
1.0000	0.7400	573.2054	1.3412	2.8859-02	1.0000
1.0000	0.7600	571.9453	1.3071	2.7402-02	1.0000
1.0000	0.7800	570.7212	1.2747	2.6049-02	1.0000

```
 !     1.0000 !     0.8000 !   569.5315 !     1.2438 !  2.4792-02 !
1.0000 !

 !     1.0000 !     0.8200 !   568.3743 !     1.2143 !  2.3620-02 !
1.0000 !

 !     1.0000 !     0.8400 !   567.2482 !     1.1862 !  2.2527-02 !
1.0000 !

 !     1.0000 !     0.8600 !   566.1518 !     1.1593 !  2.1507-02 !
1.0000 !

 !     1.0000 !     0.8800 !   565.0836 !     1.1336 !  2.0552-02 !
1.0000 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.9000 !   564.0424 !     1.1089 !  1.9657-02 !
1.0000 !

 !     1.0000 !     0.9200 !   563.0270 !     1.0853 !  1.8818-02 !
1.0000 !

 !     1.0000 !     0.9400 !   562.0362 !     1.0627 !  1.8031-02 !
1.0000 !

 !     1.0000 !     0.9600 !   561.0691 !     1.0409 !  1.7290-02 !
1.0000 !

 !     1.0000 !     0.9800 !   560.1247 !     1.0201 !  1.6593-02 !
1.0000 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     1.0000 !   559.2015 !     1.0000 !  1.5936-02 !
1.0000 !

 ------------------------------------------------------------------------
----------


 ------------------------------------------------------------------------
----------

 !  PRES      !  MOLEFRAC  !  GAMMA     !  GAMMA     !  GAMMA     !
KVL2      !

 !            !            !  LIQUID 1  !  LIQUID 2  !  LIQUID 2  !
TOTAL     !

 !            !  DMT       !  BIS-2-01  !  DMT       !  BIS-2-01  !
DMT       !
```

```
 !            !            !            !            !            !
!

 !
ATM       !            !            !            !            !
!

 !            !            !            !            !            !
!

 !============!============!============!============!============!===
=========!

 !     1.0000 !     0.0    !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  2.0000-02 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  4.0000-02 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  6.0000-02 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !  8.0000-02 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.1000 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1200 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1400 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1600 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.1800 !     1.0000 !    MISSING !    MISSING !
MISSING !

 ------------------------------------------------------------------
----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-3 (CONTINUED)

PRES ATM	MOLEFRAC DMT	GAMMA LIQUID 1 BIS-2-01	GAMMA LIQUID 2 DMT	GAMMA LIQUID 2 BIS-2-01	KVL2 TOTAL DMT
1.0000	0.2000	1.0000	MISSING	MISSING	MISSING
1.0000	0.2200	1.0000	MISSING	MISSING	MISSING
1.0000	0.2400	1.0000	MISSING	MISSING	MISSING
1.0000	0.2600	1.0000	MISSING	MISSING	MISSING
1.0000	0.2800	1.0000	MISSING	MISSING	MISSING

```
 !     1.0000 !     0.3000 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3200 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3400 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3600 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.3800 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.4000 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4200 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4400 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4600 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.4800 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.5000 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5200 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5400 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5600 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !     1.0000 !     0.5800 !     1.0000 !    MISSING !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.6000 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.6200 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.6400 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.6600 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.6800 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.7000 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.7200 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.7400 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.7600 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.7800 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.8000 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.8200 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.8400 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.8600 !     1.0000 !    MISSING !    MISSING !
MISSING !

 !     1.0000 !     0.8800 !     1.0000 !    MISSING !    MISSING !
MISSING !

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----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-3 (CONTINUED)

PRES	MOLEFRAC	GAMMA	GAMMA	GAMMA	KVL2
		LIQUID 1	LIQUID 2	LIQUID 2	TOTAL
	DMT	BIS-2-01	DMT	BIS-2-01	DMT
ATM					
1.0000	0.9000	1.0000	MISSING	MISSING	MISSING
1.0000	0.9200	1.0000	MISSING	MISSING	MISSING
1.0000	0.9400	1.0000	MISSING	MISSING	MISSING
1.0000	0.9600	1.0000	MISSING	MISSING	MISSING
1.0000	0.9800	1.0000	MISSING	MISSING	MISSING

```
 !     1.0000 !     1.0000 !     1.0000 !    MISSING !    MISSING !
MISSING !
 ------------------------------------------------------------------
----------


 ------------------------------------------------------------------
----------
 !  PRES      !  MOLEFRAC  !  KVL2      !  BETA      !  MOLEFRAC  !
MOLEFRAC  !
 !            !            !  TOTAL     !  TOTAL     !  VAPOR     !
VAPOR     !
 !            !  DMT       !  BIS-2-01  !            !  DMT       !
BIS-2-01  !
 !            !            !            !            !            !
!
 !
ATM       !            !            !            !            !
!
 !            !            !            !            !            !
!
 !============!============!============!============!============!===
=========!
 !     1.0000 !     0.0    !    MISSING !     1.0000 !     0.0    !
1.0000 !
 !     1.0000 !  2.0000-02 !    MISSING !     1.0000 !     0.1560 !
0.8440 !
 !     1.0000 !  4.0000-02 !    MISSING !     1.0000 !     0.2876 !
0.7124 !
 !     1.0000 !  6.0000-02 !    MISSING !     1.0000 !     0.3982 !
0.6018 !
 !     1.0000 !  8.0000-02 !    MISSING !     1.0000 !     0.4909 !
0.5091 !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.1000 !    MISSING !     1.0000 !     0.5683 !
0.4317 !
```

```
 !     1.0000 !     0.1200 !    MISSING !     1.0000 !     0.6330 !
0.3670 !

 !     1.0000 !     0.1400 !    MISSING !     1.0000 !     0.6870 !
0.3130 !

 !     1.0000 !     0.1600 !    MISSING !     1.0000 !     0.7321 !
0.2679 !

 !     1.0000 !     0.1800 !    MISSING !     1.0000 !     0.7699 !
0.2301 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.2000 !    MISSING !     1.0000 !     0.8017 !
0.1983 !

 !     1.0000 !     0.2200 !    MISSING !     1.0000 !     0.8285 !
0.1715 !

 !     1.0000 !     0.2400 !    MISSING !     1.0000 !     0.8511 !
0.1489 !

 !     1.0000 !     0.2600 !    MISSING !     1.0000 !     0.8703 !
0.1297 !

 !     1.0000 !     0.2800 !    MISSING !     1.0000 !     0.8866 !
0.1134 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.3000 !    MISSING !     1.0000 !     0.9006 !
9.9412-02 !

 !     1.0000 !     0.3200 !    MISSING !     1.0000 !     0.9126 !
8.7409-02 !

 !     1.0000 !     0.3400 !    MISSING !     1.0000 !     0.9229 !
7.7060-02 !

 !     1.0000 !     0.3600 !    MISSING !     1.0000 !     0.9319 !
6.8104-02 !

 !     1.0000 !     0.3800 !    MISSING !     1.0000 !     0.9397 !
6.0324-02 !

 ------------------------------------------------------------------------
----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-3 (CONTINUED)

PRES ATM	MOLEFRAC DMT	KVL2 TOTAL BIS-2-01	BETA TOTAL	MOLEFRAC VAPOR DMT	MOLEFRAC VAPOR BIS-2-01
1.0000	0.4000	MISSING	1.0000	0.9465	5.3540-02
1.0000	0.4200	MISSING	1.0000	0.9524	4.7604-02
1.0000	0.4400	MISSING	1.0000	0.9576	4.2391-02
1.0000	0.4600	MISSING	1.0000	0.9622	3.7800-02
1.0000	0.4800	MISSING	1.0000	0.9663	3.3742-02

```
 !     1.0000 !     0.5000 !    MISSING !     1.0000 !     0.9699 !
3.0146-02 !
 !     1.0000 !     0.5200 !    MISSING !     1.0000 !     0.9730 !
2.6950-02 !
 !     1.0000 !     0.5400 !    MISSING !     1.0000 !     0.9759 !
2.4102-02 !
 !     1.0000 !     0.5600 !    MISSING !     1.0000 !     0.9784 !
2.1556-02 !
 !     1.0000 !     0.5800 !    MISSING !     1.0000 !     0.9807 !
1.9277-02 !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.6000 !    MISSING !     1.0000 !     0.9828 !
1.7230-02 !
 !     1.0000 !     0.6200 !    MISSING !     1.0000 !     0.9846 !
1.5388-02 !
 !     1.0000 !     0.6400 !    MISSING !     1.0000 !     0.9863 !
1.3728-02 !
 !     1.0000 !     0.6600 !    MISSING !     1.0000 !     0.9878 !
1.2228-02 !
 !     1.0000 !     0.6800 !    MISSING !     1.0000 !     0.9891 !
1.0870-02 !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.7000 !    MISSING !     1.0000 !     0.9904 !
9.6387-03 !
 !     1.0000 !     0.7200 !    MISSING !     1.0000 !     0.9915 !
8.5205-03 !
 !     1.0000 !     0.7400 !    MISSING !     1.0000 !     0.9925 !
7.5033-03 !
 !     1.0000 !     0.7600 !    MISSING !     1.0000 !     0.9934 !
6.5765-03 !
 !     1.0000 !     0.7800 !    MISSING !     1.0000 !     0.9943 !
5.7309-03 !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.8000 !    MISSING !     1.0000 !     0.9950 !
4.9583-03 !

 !     1.0000 !     0.8200 !    MISSING !     1.0000 !     0.9957 !
4.2516-03 !

 !     1.0000 !     0.8400 !    MISSING !     1.0000 !     0.9964 !
3.6044-03 !

 !     1.0000 !     0.8600 !    MISSING !     1.0000 !     0.9970 !
3.0109-03 !

 !     1.0000 !     0.8800 !    MISSING !     1.0000 !     0.9975 !
2.4662-03 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.9000 !    MISSING !     1.0000 !     0.9980 !
1.9657-03 !

 !     1.0000 !     0.9200 !    MISSING !     1.0000 !     0.9985 !
1.5055-03 !

 !     1.0000 !     0.9400 !    MISSING !     1.0000 !     0.9989 !
1.0818-03 !

 !     1.0000 !     0.9600 !    MISSING !     1.0000 !     0.9993 !
6.9160-04 !

 !     1.0000 !     0.9800 !    MISSING !     1.0000 !     0.9997 !
3.3185-04 !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     1.0000 !    MISSING !     1.0000 !     1.0000 !
0.0    !

 ---------------------------------------------------------------------
----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-3 (CONTINUED)

PRES ATM	MOLEFRAC LIQUID 1 DMT	MOLEFRAC LIQUID 1 DMT	MOLEFRAC LIQUID 2 BIS-2-01	MOLEFRAC LIQUID 2 DMT	MOLEFRAC LIQUID 2 BIS-2-01
1.0000	0.0	0.0	1.0000	MISSING	MISSING
1.0000	2.0000-02	2.0000-02	0.9800	MISSING	MISSING
1.0000	4.0000-02	4.0000-02	0.9600	MISSING	MISSING
1.0000	6.0000-02	6.0000-02	0.9400	MISSING	MISSING
1.0000	8.0000-02	8.0000-02	0.9200	MISSING	MISSING

```
 !     1.0000 !     0.1000 !     0.1000 !     0.9000 !    MISSING !
MISSING !
 !     1.0000 !     0.1200 !     0.1200 !     0.8800 !    MISSING !
MISSING !
 !     1.0000 !     0.1400 !     0.1400 !     0.8600 !    MISSING !
MISSING !
 !     1.0000 !     0.1600 !     0.1600 !     0.8400 !    MISSING !
MISSING !
 !     1.0000 !     0.1800 !     0.1800 !     0.8200 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.2000 !     0.2000 !     0.8000 !    MISSING !
MISSING !
 !     1.0000 !     0.2200 !     0.2200 !     0.7800 !    MISSING !
MISSING !
 !     1.0000 !     0.2400 !     0.2400 !     0.7600 !    MISSING !
MISSING !
 !     1.0000 !     0.2600 !     0.2600 !     0.7400 !    MISSING !
MISSING !
 !     1.0000 !     0.2800 !     0.2800 !     0.7200 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.3000 !     0.3000 !     0.7000 !    MISSING !
MISSING !
 !     1.0000 !     0.3200 !     0.3200 !     0.6800 !    MISSING !
MISSING !
 !     1.0000 !     0.3400 !     0.3400 !     0.6600 !    MISSING !
MISSING !
 !     1.0000 !     0.3600 !     0.3600 !     0.6400 !    MISSING !
MISSING !
 !     1.0000 !     0.3800 !     0.3800 !     0.6200 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
```

```
 !     1.0000 !     0.4000 !     0.4000 !     0.6000 !    MISSING !
MISSING !

 !     1.0000 !     0.4200 !     0.4200 !     0.5800 !    MISSING !
MISSING !

 !     1.0000 !     0.4400 !     0.4400 !     0.5600 !    MISSING !
MISSING !

 !     1.0000 !     0.4600 !     0.4600 !     0.5400 !    MISSING !
MISSING !

 !     1.0000 !     0.4800 !     0.4800 !     0.5200 !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.5000 !     0.5000 !     0.5000 !    MISSING !
MISSING !

 !     1.0000 !     0.5200 !     0.5200 !     0.4800 !    MISSING !
MISSING !

 !     1.0000 !     0.5400 !     0.5400 !     0.4600 !    MISSING !
MISSING !

 !     1.0000 !     0.5600 !     0.5600 !     0.4400 !    MISSING !
MISSING !

 !     1.0000 !     0.5800 !     0.5800 !     0.4200 !    MISSING !
MISSING !

 !------------+------------+------------+------------+------------+---
---------!

 !     1.0000 !     0.6000 !     0.6000 !     0.4000 !    MISSING !
MISSING !

 !     1.0000 !     0.6200 !     0.6200 !     0.3800 !    MISSING !
MISSING !

 !     1.0000 !     0.6400 !     0.6400 !     0.3600 !    MISSING !
MISSING !

 !     1.0000 !     0.6600 !     0.6600 !     0.3400 !    MISSING !
MISSING !

 !     1.0000 !     0.6800 !     0.6800 !     0.3200 !    MISSING !
MISSING !

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----------
```

PHYSICAL PROPERTY TABLES SECTION

FLASH CURVE TABLE: BINRY-3 (CONTINUED)

PRES ATM	MOLEFRAC DMT LIQUID 1	MOLEFRAC DMT LIQUID 1	MOLEFRAC BIS-2-01 LIQUID 2	MOLEFRAC DMT LIQUID 2	MOLEFRAC BIS-2-01 LIQUID 2
1.0000	0.7000	0.7000	0.3000	MISSING	MISSING
1.0000	0.7200	0.7200	0.2800	MISSING	MISSING
1.0000	0.7400	0.7400	0.2600	MISSING	MISSING
1.0000	0.7600	0.7600	0.2400	MISSING	MISSING
1.0000	0.7800	0.7800	0.2200	MISSING	MISSING

```
 !     1.0000 !     0.8000 !     0.8000 !     0.2000 !    MISSING !
MISSING !
 !     1.0000 !     0.8200 !     0.8200 !     0.1800 !    MISSING !
MISSING !
 !     1.0000 !     0.8400 !     0.8400 !     0.1600 !    MISSING !
MISSING !
 !     1.0000 !     0.8600 !     0.8600 !     0.1400 !    MISSING !
MISSING !
 !     1.0000 !     0.8800 !     0.8800 !     0.1200 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     0.9000 !     0.9000 !     0.1000 !    MISSING !
MISSING !
 !     1.0000 !     0.9200 !     0.9200 !  8.0000-02 !    MISSING !
MISSING !
 !     1.0000 !     0.9400 !     0.9400 !  6.0000-02 !    MISSING !
MISSING !
 !     1.0000 !     0.9600 !     0.9600 !  4.0000-02 !    MISSING !
MISSING !
 !     1.0000 !     0.9800 !     0.9800 !  2.0000-02 !    MISSING !
MISSING !
 !------------+------------+------------+------------+------------+---
---------!
 !     1.0000 !     1.0000 !     1.0000 !     0.0    !    MISSING !
MISSING !
 ------------------------------------------------------------------------
----------
```

PROBLEM STATUS SECTION

BLOCK STATUS

```
*****************************************************************
******
 *
*
 * Calculations were completed with warnings
*
 *
*
 * The following Unit Operation blocks were
*
 * completed with warnings:
*
 *   HX-1      BALLMILL  THERMDRY
*
 *
*
 * All streams were flashed normally
*
 *
*
 * All Convergence blocks were completed normally
*
 *
*
 * All Property Tables were completed normally
*
```

```
 *
*
 * Properties estimation was completed normally
*
 *
*


**********************************************************************
******
```