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Techno-economic Analysis for the Conversion of Lignocellulosic Biomass to Gasoline via the Methanol-to-Gasoline (MTG) Process

SB Jones
Y Zhu

April 2009

Pacific Northwest
NATIONAL LABORATORY

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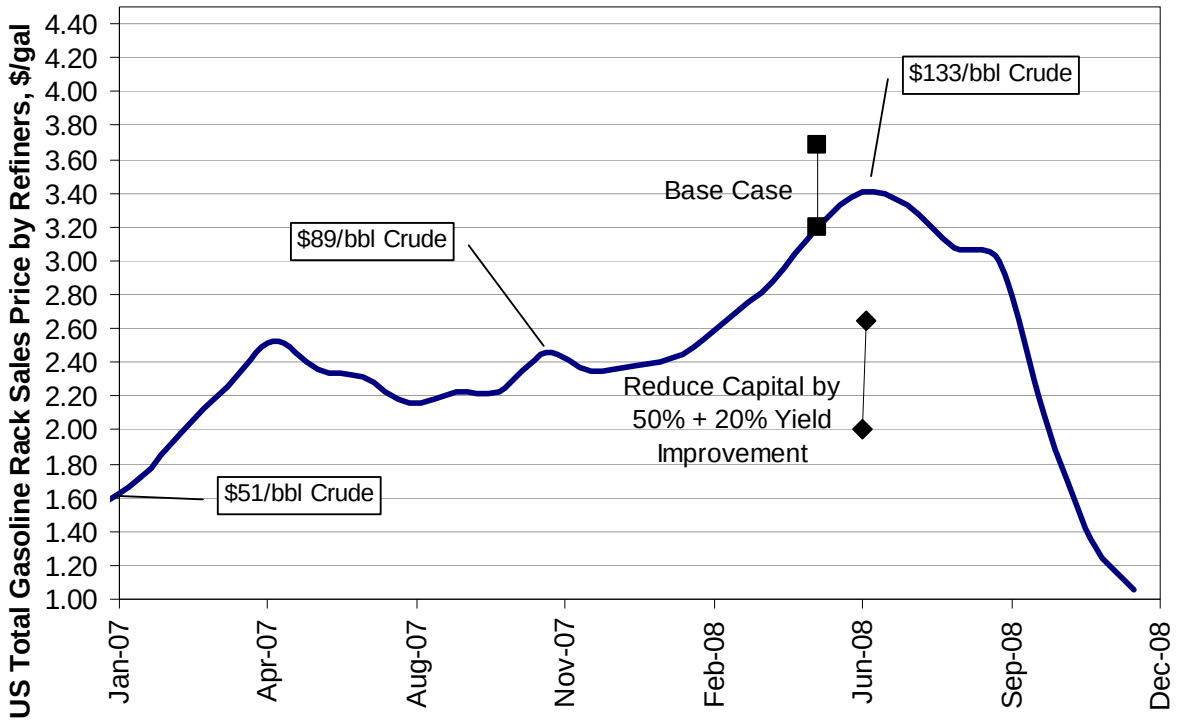
Summary

Biomass is a renewable energy resource that can be converted into liquid fuel suitable for transportation applications. As a widely available biomass form, lignocellulosic biomass can have a major impact on domestic transportation fuel supplies and thus help meet the Energy Independence and Security Act renewable energy goals (EISA 2007).

With gasification technology, biomass can be converted to gasoline via methanol synthesis and methanol-to-gasoline (MTG) technologies. Producing a gasoline product that is infrastructure ready has much potential. Although the MTG technology has been commercially demonstrated with natural gas conversion, combining MTG with biomass gasification has not been shown. Therefore, a techno-economic evaluation for a biomass MTG process based on currently available technology was developed to provide information about benefits and risks of this technology. The economic assumptions used in this report are consistent with previous U.S. Department of Energy Office of Biomass Programs techno-economic assessments.

The feedstock is assumed to be wood chips at 2000 metric ton/day (dry basis). Two kinds of gasification technologies were evaluated: an indirectly-heated gasifier and a directly-heated oxygen-blown gasifier. The gasoline selling prices (2008 USD) excluding taxes were estimated to be $3.20/gallon and $3.68/gallon for indirectly-heated gasified and directly-heated. This suggests that a process based on existing technology is economic only when crude prices are above $100/bbl. However, improvements in syngas cleanup combined with consolidated gasoline synthesis can potentially reduce the capital cost. In addition, improved synthesis catalysts and reactor design may allow increased yield. This is shown in the figure below (the ranges for the base case and the improved case reflect differences in gasifier types).



Acknowledgment

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1.0 Introduction

Biomass is an important domestic resource that has the potential to make a significant impact on domestic fuel supplies and thus help meet the Energy Independence and Security Act renewable energy goals (EISA 2007). This study is part of an ongoing effort within the Department of Energy to meet the renewable energy goals for liquid transportation fuels. In particular, this report assesses the potential for gasoline production from biomass via the methanol-to-gasoline process.

Biomass conversion to synthesis gas by gasification has been demonstrated. The syngas, rich in CO and H_2, can be further used to produce methanol, ethanol or other chemicals and liquid fuels. Among these products, methanol has been widely used as a solvent and also as the raw material for many chemicals and liquid fuels. In the 1970s, a methanol-to-gasoline (MTG) process was developed by Mobil in response to the Arab oil embargo (Chang, 1992). This technology was based on the direct conversion of methanol to hydrocarbons catalyzed by zeolite ZSM-5 (Olson, *et al.* 1981). A commercially operated gas-to-gasoline plant using Mobil's MTG technology was built in New Zealand in the 1980s. In this plant, methane was converted into syngas by steam reforming, and then syngas was used to make methanol. The methanol was then converted to gasoline by a fixed-bed MTG process. Another type of MTG process is the fluid-bed type, which has not yet been commercially demonstrated (Chang, 1992). Currently, a coal-based MTG demonstration plant is under construction in China for start-up in late 2008/mid-2009 using MTG technology from ExxonMobil (Tabak, *et al.*, 2008) and a commercial scale plant is being planned. ExxonMobil has also announced plans for two coal-to-gasoline plants in the United Stated using MTG technology (Ondry 2008, DKRW 2008). Although natural gas has been used and coal will be used for gasoline production, biomass feedstock has not yet been commercially used for MTG production.

A number of techno-economic assessments, using process design and simulation models, have been conducted for biomass gasification to fuels and chemicals such as methanol (Hamelinck and Faaij, 2001), Fischer-Tropsch liquid transportation fuels (Hamelinck, *et al*. 2003), hydrogen (Hamelinck and Faaij, 2001; Spath, *et al*. 2005), and ethanol (Aden, *et al*. 2005; Phillips, *et al*. 2007). Limited research and analysis work has been conducted for a biomass conversion to gasoline via MTG. In this study, process and economic models were developed for a biomass gasification based MTG system using existing technology. In the following sections, the design basis, simulation methods, and results are described. The sensitivity analysis results will also be discussed.

2.0 Process Design Basis and Modeling Approach

A simplified block diagram for the Biomass MTG system is shown in Figure 2-1. In this system, wood chips are converted to synthesis gas in a gasifier. Raw syngas is sent to a tar reformer, a particulate scrubber, and finally a sulfur removal unit. A steam reformer is used to convert CH_4 to H_2 and CO and to adjust the H_2/CO ratio to that required by methanol synthesis. Excess CO_2 is removed in an amine unit. The syngas is then compressed and sent to the methanol synthesis section to produce feed for the MTG process. Part of the purge gas from methanol synthesis is used to produce hydrogen by a pressure swing adsorption (PSA) unit; the remainder purge gas is used as fuel. Raw methanol is converted to hydrocarbons and water in the MTG reactors. The raw gasoline product stream is separated to produce fuel gas, liquefied petroleum gas (LPG), light gasoline, and heavy gasoline. The heavy gasoline is further treated with hydrogen from the PSA to meet the final gasoline specifications. Steam generated in the processes is collected and sent to the steam cycle for power generation. Some steam is used in steam reforming and other processes.

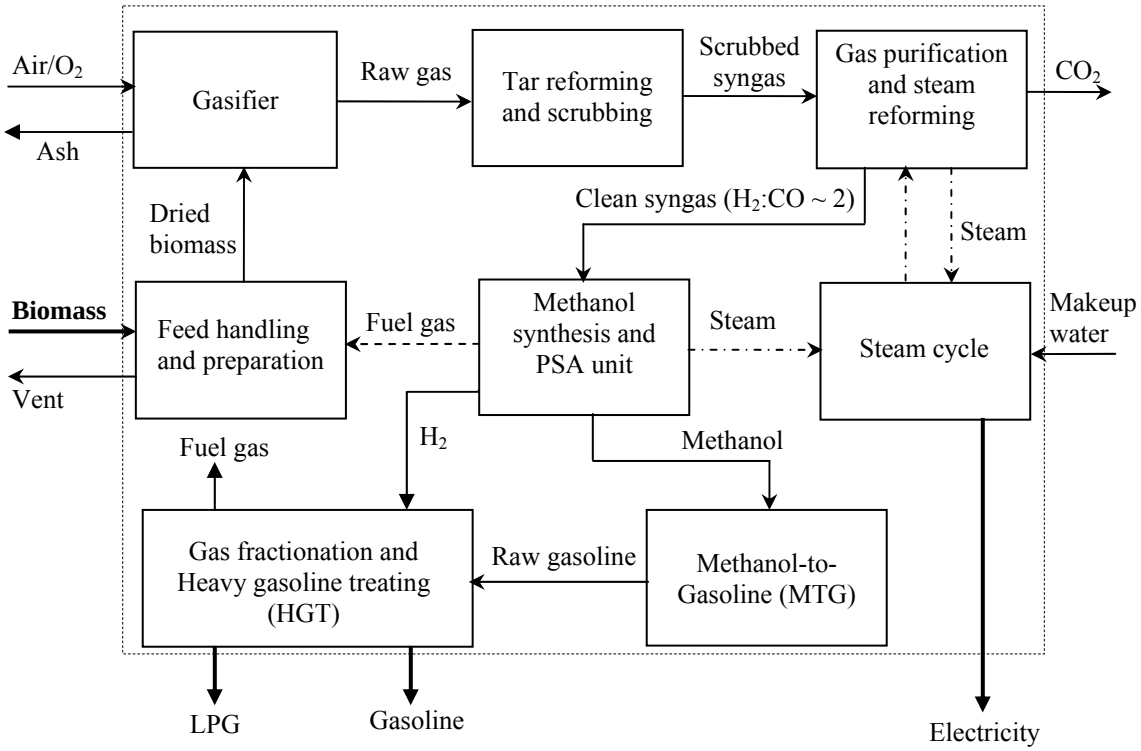

Figure 2-1 Block Diagram of Biomass-to-Gasoline via MTG System

2.1 Process Design Basis

The biomass-to-gasoline via MTG processing consists of eight main sections. Each section is briefly described in the follow paragraphs. Detailed process model diagrams and heat and material balances can be found in the Appendix.

2.1.1 Feed handling and preparation

The feedstock is assumed to be wood chips at a moisture content of 50 wt%. The wood feed rate is 2000 dry metric ton per day. The wet wood chips enter rotary dryers and are dried to a moisture content of 12 wt% (Spath, *et al.* 2005). For the indirectly-heated gasifier based system, the hot flue gas from the char combustor is used for biomass drying. For the directly-heated gasifier, the char combustor flue gas is insufficient for feed drying. The dryer used for this gasifier is assumed to have an auxiliary burner to provide additional heat. Fuel for the burner comes from the methanol and MTG syntheses purge gas. The dried biomass is then conveyed to the gasifier.

2.1.2 Gasification

Two types of gasifiers are considered in this study: a low pressure indirectly-heated gasifier and a pressurized oxygen-blown, directly-heated gasifier. The indirectly-heated gasifier consists of two vessels: a gasifier and a combustor. Dried wood is fed into a low-pressure indirectly heated entrained flow gasifier. Steam extracted from the steam cycle is sent to the gasifier at a flow rate of 0.4 lb of steam/lb of bone dry wood to fluidize the bed and to supply a portion of the heat required for the gasifier. The gasifier is assumed to be operated at 870°C (1598°F) and 23 psia. The gasifier is mainly heated by circulating olivine particles between the gasifier and the separate combustor. Olivine is synthetic sand that serves as the heat carrier in the gasifier. Char formed in the gasifier is carried out of the gasifier along with the olivine, separated in a series of cyclones and sent to the fluidized bed combustor, where air is used to burn the char, thereby reheating the olivine.

The oxygen-blown, directly-heated gasifier is a pressurized fluidized bed gasifier that also uses steam to fluidize the gasifer bed and to provide a portion of the heat. A pressurized cryogenic air separation unit provides purified oxygen at 99.5% for the gasifier at 350 psia and 15.6 °C (60°F). The mass flow rate of oxygen is varied to achieve an 870 °C (1600°F) gasifier outlet stream temperature. The dried wood is fed using a lock hopper feeder system and pressurized by compressed CO_2 recovered from the syngas purification process. The CO_2 gas used in the lock hopper is fed at a flow rate of 0.03 lb of CO_2/lb dried wood and compressed to 330 psi. A small amount of MgO is also added to the gasifier to react with potassium in the ash to prevent agglomeration in the gasifier bed.

The indirectly-heated gasifier is modeled using the correlations reported in Spath, *et al.* (2005) which in turn is based on data from a Battelle-Columbus Laboratory (BCL) process development unit gasifier. The performance of the oxygen-blown, directly-heated pressurized gasifier was predicted using correlations derived from an experimental Institute of Gas Technology (IGT) gasifier (Evans, 1988).

2.1.3 Tar reforming and gas scrubbing

During gasification, a relatively small fraction of biomass is converted into tars consisting mostly of aromatic and poly-aromatic hydrocarbons. The nitrogen in the biomass is converted to ammonia. The raw syngas from the cyclone in the gasifier section is sent to a catalytic tar cracker, which is assumed to be a bubbling fluidized bed reactor. A portion of the syngas tar, methane, and other light hydrocarbons in the raw gas are converted to CO and H_2, and some of the ammonia is converted to N_2 and H_2. The conversion percentage for each compound is reported in Spath, *et al.*, (2005). The gas enters the tar reformer at the gasifier outlet temperature and exits the reformer at 750°C (1,383°F). The syngas is further

cooled to 149°C (300°F) and sent to a wet scrubber to remove other impurities, such as particulates, residual ammonia and residual tars.

2.1.4 Gas purification and steam reforming

The scrubbed syngas is compressed to 450 psia. A liquid phase oxidation (LO-CAT) process followed by a ZnO bed is used to remove sulfur that would otherwise poison downstream catalysts. The LO-CAT process is assumed to remove the sulfur to a concentration of 10 ppm H_2S, and then the ZnO bed polishes the syngas to less than 1 ppmv (Spath, *et al.* 2005).

Syngas leaving the ZnO bed is sent to a steam reformer to convert the remaining methane and light hydrocarbons to additional syngas and to adjust the H_2:CO ratio via the water-gas shift reaction. The main steam reformer reactions are:

$$C_nH_m + nH_2O \leftrightarrow (n+m/2)H_2 + nCO \quad (1)$$

$$CO + H_2O \leftrightarrow CO_2 + H_2 \quad (2)$$

Before the syngas is sent to the steam reformer, it is mixed with high temperature steam from the steam cycle and the steam generated by the methanol synthesis reactor. Reactions take place between 800 and 900°C (1472 and 1652 °F). The steam reformer is fired with off-gas from the methanol synthesis section purge and the MTG syntheses section. The H_2: CO ratio is adjusted to ~ 2, as required by methanol synthesis reaction. The converted syngas passes through several heat exchangers to recover heat by generating saturate high pressure steam and superheated high pressure steam. The cooled syngas from the reforming process is further cooled by air cooling and cooling water. Excess CO_2 is removed in an amine unit. The clean syngas is then compressed to 1450 psia.

2.1.5 Methanol synthesis and PSA unit

The compressed clean syngas is sent to a low-pressure methanol synthesis process. The principle reactions are:

$$CO + 2H_2 \leftrightarrow CH_3OH \quad (3)$$

$$CO_2 + 3H_2 \leftrightarrow CH_3OH + H_2O \quad (4)$$

The first reaction is the primary methanol synthesis reaction, and the second one represents a small fraction of carbon dioxide in the feed that acts as a promoter for the primary reaction.

A simplified process flow diagram of methanol synthesis is shown in Figure 2-2.

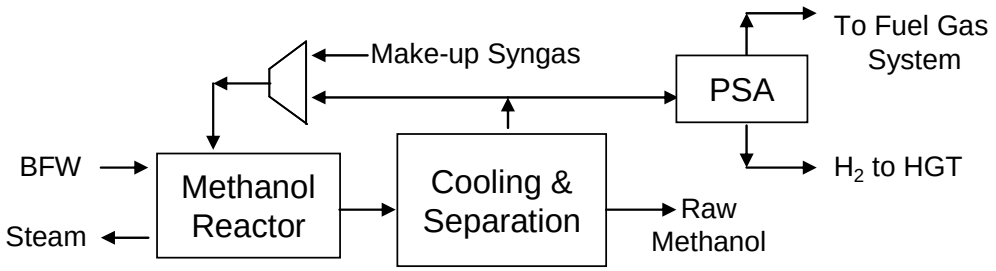

Figure 2-2 Block Diagram of Methanol Synthesis

The syngas from the steam reformer is compressed and preheated before entering the methanol reactor. Methanol synthesis temperatures and pressures typically range between 230 to 270°C (446 to 578°F) and 735 to 1470 psia, respectively (Cheng, 1994, Fiedler, *et al*., 2000). The methanol reactor is assumed to be isothermal, low-pressure (850 psia), gas-phase shell and tube type with ZnO/CuO catalyst in the tubes. The methanol synthesis reaction is highly exothermic and reaction heat is removed by generating medium pressure steam on the shell side of the reactor. The hot reactor product vapor is cooled by recycled compressed syngas and further cooled by air and then cooling water. The product stream is sent to a flash tank where liquid raw methanol is separated from the non-condensable gases. Approximately ninety-five percent of the vapor phase is compressed and recycled to the methanol reactor. The liquid product is further reduced in pressure to produce raw methanol at about 95 wt% purity. The raw methanol is sent to the MTG process. No distillation equipment is provided to produce high purity methanol.

Part of the purged gas from the methanol process is fed to a PSA unit where high purity (99.9%) hydrogen is produced for use in the heavy gasoline treating (HGT) unit. This unit hydrotreats the heavy gasoline fraction from the MTG process and is described more fully in the next sections.

2.1.6 Methanol-to-gasoline (MTG) Process

Methanol is converted to gasoline by the Mobil MTG process. The principle reactions are (Chang, 1992, Cheng, 1994):

$$\frac{n}{2}\left[2CH_3OH \Leftrightarrow CH_3OCH_3 + H_2O\right] \xrightarrow{-nH_2O} C_nH_{2n} \rightarrow n\left[CH_2\right] \qquad (5)$$

$[CH_2]$ = average formula for the paraffin-aromatic mixture

First methanol is partially dehydrated to dimethyl ether (DME) using a methanol dehydration catalyst. This reaction is followed by olefin formation and finally aromatic/paraffin formation over a zeolite catalyst (ZSM-5). The final hydrocarbon product is predominantly in the gasoline boiling range, with some LPG and fuel gas generated as well.

Mobil has developed two reactor configurations: an adiabatic fixed-bed and a circulating fluidized-bed process (Kaneko, *et al*. 2002). ZSM-5 undergoes deactivation with time. In fixed bed reactors, the catalyst ages in a "band-aging" mechanism that travels down the length of the reactor. Methanol break-through occurs when the age-band reaches the bottom of the reactor and indicates the need for catalyst regeneration. Regeneration is accomplished by burning off organic deposits with air (Cheng, 1994).

Circulating fluidized beds have the potential to simplify heat and catalyst activity management by providing continuous catalyst regeneration.

The fixed bed concept was demonstrated on a commercial scale in New Zealand using natural gas as the feed stock. This plant produced 14,500 bpd of gasoline and used one DME reactor and four MTG reactors operating in parallel, with a fifth MTG reactor off-line for regeneration. Multiple reactors minimize bed pressure drop and allow a staggered operating sequence to prevent significant methanol breaking through to the product (Cheng, 1994). The fluidized bed configuration has been demonstrated on a pilot scale only.

The simulation of the MTG process for this work is based on a study by the W.R. Grace Co. (1982 a,b,c) using the fixed bed process. A simplified flow diagram is shown in Figure 2-3.

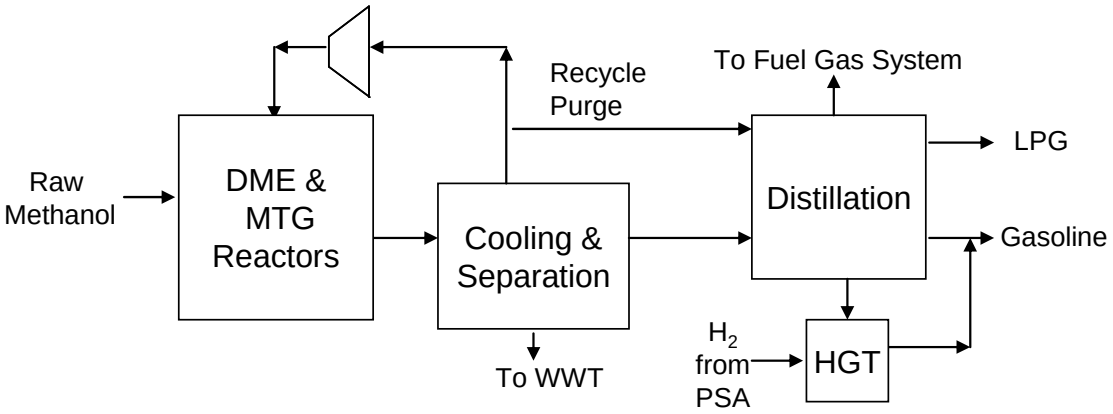

Figure 2-3 Block Diagram of Methanol-to-Gasoline Synthesis

The MTG process is highly exothermic and heat management is performed in two steps. First, raw methanol is sent to a single fixed bed dehydration reactor to convert some of the methanol to dimethyl ether (DME) and water. Pre-conversion to DME reduces the exotherm in the next set of reactors. The DME reactor effluent is combined with recycle gas and sent to two conversion reactors operating in parallel. A third reactor is offline for catalyst regeneration. The mixture is converted to hydrocarbons and water over a zeolite catalyst in the conversion reactors. The reaction is highly exothermic and is controlled by using a large recycle gas-to-DME reactor effluent ratio. Approximately ninety-nine percent of the non-condensable gas is combined with the effluent from the dehydration unit and sent to the conversion unit to achieve a recycle ratio of 9 moles of recycle gas per mole of methanol feed (Cheng, 1994). The remaining gas is combined with the hydrocarbon liquid and sent to the gas fractionation unit.

The hydrocarbon product typically yields about 85 wt% high-quality gasoline. Almost no hydrocarbons with carbon numbers greater than ten are found in the product because of the shape selective nature of the conversion catalyst (Chang, 1992). The process operates at essentially 100% conversion of methanol until the catalyst is deactivated by carbon formation. The deactivated catalyst is regenerated by burning off the coke from the catalyst using air combustion.

2.1.7 Gas fractionation and HGT

The hydrocarbons from the MTG process are separated in a gas fractionation unit to produce fuel gas, liquefied petroleum gas (LPG), light gasoline and a heavy gasoline feed stream. The gas fractionation unit consists of three fractionation towers, the de-ethanizer, the de-butanizer, and the gasoline splitter.

The product stream from the MTG process gas-liquid separator is first sent to a de-ethanizer tower to remove ethane and lighter hydrocarbons for fuel gas from the product. The de-ethanizer bottoms are then fractionated in the debutanizer to produce the feed to the gasoline splitter. The de-butanizer produces a light over head consisting of C4 and lower hydrocarbons, which is suitable for sale as liquefied petroleum gas (LPG). Most of the de-butanizer bottoms (a stream containing C5+ hydrocarbon) are sent to the gasoline splitter. A small portion of the de-butanizer column bottoms is recycled to the de-ethanizer column to act as a lean oil solvent. This assists in the separation of the light gases from the liquids in the de-ethanizer. In the gasoline splitter, light gasoline containing hydrocarbons in the C5 to C9 range are separated in the overhead flow. The light gasoline is cooled and then sent to gasoline storage as gasoline product. The bottom flow from the gasoline splitter is heavy gasoline with hydrocarbons numbering C9 and above. This heavy fraction contains durene, a low melting point component, which if not removed, can cause freeze point problems in the gasoline. The heavy gasoline is treated in the Heavy Gasoline Treater (HGT).

The HGT unit removes durene via hydrogenation. The hydrogen produced from the PSA unit is combined with the heavy gasoline feed from the gasoline splitter. The mixture is sent to the catalytic hydrotreating reactor. The effluent is cooled by process streams and air before it is sent to the gas-liquid separator. Most of the vapor is compressed and recycled to the hydrotreater, with a small purge going to fuel gas system. The liquid flow from the separator is stabilized in the product stripper. The stablilized heavy gasoline is combined with the lighter gasoline cut from the de-butanizer, cooled and sent to product storage.

In the indirectly-heated gasifier case, some of the LPG is used as fuel for the steam reformer. The remaining LPG is available for sale as a by-product. In the directly-heated gasifier case, all of the LPG is used as fuel for the steam reformer and the wood dryer.

2.1.8 Power generation

Saturated steam is generated by cooling process streams in the gasifier, steam reformer and MTG synthesis areas. It is then superheated and sent to a steam turbine to generate power for the entire plant. Excess power is sold. The steam cycle also provides medium and low pressure process steam for use in the system.

2.2 Analysis Approach

The process simulation for the gasifier based biomass-to-gasoline via MTG system was developed in CHEMCAD 6.1. The capital and operating costs were assembled in an EXCEL spreadsheet using information from the CHEMDAD simulation. A discounted cash flow method was used to estimate the product selling price.

3.0 Simulation and Economic Assumptions

This section describes the performance and cost simulation assumptions.

3.1 Simulation Assumptions

Table 3-1 shows the main assumptions for the indirectly-heated and directly-heated gasifier based cases.

Table 3-1 Operating Conditions Used in the Simulations

Gasification		
Gasifier Type	Indirectly-Heated Gasifier	Directly-Heated Gasifier
Gasifier Pressure, psia	23	330
Gasifier Temperature, °C (°F)	870 (1598)	871 (1600)
Biomass Feed, metric ton/d, dry basis	2000	2000
Oxidant	Air	Oxygen
Dried Biomass, moisture fraction %	12	12
Tar Reformer, °C (^{o}F)/P, psia	717 (1323) / 20	717 (1323) / 327
Steam Reforming		
Reformer outlet temperature, °C (^{o}F)	900 (1652)	900 (1652)
Reformer outlet pressure, psia	423	430
Reformed gas H_2/CO	2.1	2.1
Methanol Synthesis and Purification		
Reactor outlet temperature, °C (^{o}F)	260 (500)	260 (500)
Reactor outlet pressure, psia	840	840
kg/h methanol/L catalyst	0.9	0.9
Methanol-to-Gasoline		
Dehydration unit (DME reactor)		
Outlet temperature, °C (^{o}F)	400 (752)	400 (752)
Outlet pressure, psia	385	385
kg/h hydrocarbon/L catalyst	0.96	0.96
Conversion unit (MTG reactor)		
Outlet temperature, °C (^{o}F)	390 (733)	390 (733)
Outlet pressure, psia	300	300
Recycle ratio: moles recycle gas /mole methanol	9	9
kg/h hydrocarbon/L catalyst	0.25	0.25
Heavy Gasoline Treating		
Reactor outlet temperature, °C (^{o}F)	282 (540)	282 (540)
Reactor outlet pressure, psia	470	470
H_2 partial pressure at reactor inlet, psia	423	423

3.2 Economic Assumptions

Most of the base equipment costs for gas purification and conditioning and steam cycle and power generation sections of the plant were obtained from Spath, *et al.* (2005). The estimation of the equipment cost for the two types of gasifiers is based on Hamelinck and Faaij (2002). Capital costs for methanol synthesis and methanol-to-gasoline synthesis were estimated using ASPEN ICARUS 2006.5 and the W.R. Grace Report (Grace, 1982 a,b,c).

All capital costs are reported in 2008 dollars. Equipment cost escalation is calculated by using the Chemical Engineering Plant Cost Index (CEPCI). The total capital investment is factored from installed equipment costs as shown in Table 3-2. Table 3-3 lists the assumptions used to estimate the production costs.

Table 3-2 Project Investment Factors

	% of TPEC
Total Purchased Equipment Cost (TPEC)	100%
Purchased Equipment Installation	39%
Instrumentation and Controls	26%
Piping	31%
Electrical Systems	10%
Buildings (including services)	29%
Yard Improvements	12%
Total Installed Cost (TIC)	247%
Indirect Costs	
Engineering	32%
Construction	34%
Legal and Contractors Fees	23%
Project Contingency	37%
Total Indirect	126%
Total Project Investment	373%

Table 3-3 Operating Cost Assumptions

	Value used in model, 2008 basis	Units or Basis	Reference
Raw Materials			
Hybrid poplar chips	60	$/dry short ton	Aden, 2008
Olivine makeup	258	$/short ton	Phillips, *et al.* 2007*
Ash disposal	44	$/short ton	Phillips, *et al.* 2007*
Tar cracker catalyst	8.06	$/lb	Phillips, *et al.*, 2007*
Reformer catalyst	25.4	$/lb	SRI PEP 2007*
Methanol catalyst	9.69	$/lb catalyst	SRI PEP 2007
MTG zeolite catalyst	60	$/lb catalyst	SRI PEP 2007
DME catalyst	11.6	$/lb catalyst	SRI PEP 2007
Utilities			
Waste water treatment	2.4	$/100 ft^3	Phillips, *et al.* 2007
Cooling tower makeup	245	¢/1000 gal	Phillips, *et al.* 2007
Electricity	6.68	¢/kWh	EIA, 2008b
Economic Assumptions			
Stream Factor	90%		estimated
MACRS Depreciation, yrs	7		Phillips, *et al.* 2007
Plant life, yrs	20		Phillips, *et al.* 2007
Construction Period 1st 6 months expenditure Next 12 months expenditure Last 12 months expenditure	2.5 years 8% 60% 32%		Phillips, *et al.* 2007
Start-up time Revenues Variable Costs Fixed Costs	6 months 50% 75% 100%		Phillips, *et al.* 2007
Working Capital	5% of Total Capital Investment		Phillips, *et al.* 2007
Land	6% of Total Purchased Equipment Cost (taken as 1st year construction expense)		Phillips, *et al.* 2007
Internal Rate of Return	10%		Phillips, *et al.* 2007
* Reference value escalated to 2008 dollars using the producer price index			

4.0 Results and Analysis

This section describes the main performance and cost simulation results for the biomass-to-gasoline via MTG systems. The results of the sensitivity analysis are also discussed.

4.1 Performance Results and Discussion

Table 4-1 shows the main performance results for the biomass-to-gasoline via MTG systems.

Table 4-1 Performance Analysis Results

Case	Indirectly-Heated Gasifier	Directly-Heated Gasifier
Gasifier pressure, psi	23	330
Gasifier temperature, °C (°F)	870 (1598)	871 (1600)
H_2:CO ratio in scrubbed syngas, molar	0.9	1.4
Char production, lb/hr	33970	7510
Feed		
Wood chips, metric ton/d, dry basis	2000	2000
Natural Gas, lb/hr	--	--
Feed Preparation		
Directly-heated dryer	Heat from char burner exhaust only	Heat from char burner exhaust plus auxiliary fuel gas burner
Products		
Gasoline, mmgal/y	40	40
LPG, mmgal/y	7.2	--
Methanol Synthesis		
Recycle ratio: moles recycle gas /moles makeup gas	5.6	2.0
Power Consumption, MW		
Air separation unit	--	-8.6
Lock hopper gas compressor	--	-0.2
Dryer air blower	--	-0.1
Char burner air compressor	-4.8	-0.5
Syngas compressor	-16.0	-1.9
Reformer air compressor	-1.1	-1.8
Reformer flue gas blower	-0.5	-0.6
Clean syngas compressor	-3.8	-4.6
Methanol syn. recycle compressor	-2.7	-2.4
MTG recycle & hydrogen compressor	-3.0	-3.7
Steam turbines	24.4	56.0
Net power, MW	**-7.5**	**32**
Carbon Efficiency, %	**32%**	**29%**
Thermal Efficiency, %, higher heating value (HHV) basis	**47%**	**41%**

In general, one would expect that the directly-heated gasifier would produce more final product than an indirectly-heated gasifier due to the former's lower char production and thus higher syngas rate. However, the biomass dryer for the directly-heated gasifier needs an external burner to supply the dryer heat load. Fuel to the auxiliary burner is supplied by using all of the LPG plus a higher purge rate in the methanol synthesis step. The higher methanol off-gas purge rate reduces the yield of methanol and hence reduces the final gasoline yield. This effect could be mitigated by 1) using natural gas in the dryer burner, or 2) by using an indirectly-heated dryer using steam as the heat source. Analysis of these options is beyond the scope of this work. Lack of LPG product in the directly-heated gasifier case reduces the carbon and the thermal efficiency as compared to the indirectly-heated gasifier case. However, the larger volumes of gas through the syngas generation and cleanup steps greatly increase the amount of steam recuperated, and thus results in a net export of power.

4.2 Cost Results and Discussion

Table 4-2 shows the capital and operating cost breakdown for each section of the plant.

Table 4-2 Capital and Operating Cost Summary

Case	Indirectly-Heated Gasifier		Directly-Heated Gasifier	
CAPITAL COSTS	Million $	% of Total	Million $	% of Total
Air separation unit	--	--	$10	8%
Feed prep and drying	$11	11%	$12	9%
Gasification with tar reforming, heat recovery, scrubbing	$17	16%	$41	31%
Syngas cleanup & compression	$33	32%	$27	20%
Methanol synthesis	$10	10%	$8	6%
MTG, gas fractionation, and HGT	$24	23%	$24	16%
Steam system and power generation	$7	7%	$11	8%
Remainder off-site battery limits (OSBL)	$2	2%	$2	1%
Total Purchased Equipment Cost (TPEC)	$104	100%	$136	100%
Total Installed Cost (TIC), mm$	$258		$335	
Total Indirect Cost, mm$	$132		$272	
Total Project Investment, mm$	$383		$499	
OPERATING COSTS	$/gal	% of total	$/gal	% of total
Biomass	1.07	34%	1.07	29%
Natural Gas	0.00	0%	0.00	0%
Catalysts & Chemicals	0.29	9%	0.38	10%
Waste Disposal	0.04	1%	0.05	1%
Electricity and other utilities	0.13	4%	-0.38	-10%
LPG credit	-0.30	-9%	0.00	0%
Fixed Costs	0.50	16%	0.61	17%
Capital Depreciation	0.47	15%	0.62	17%
Average Income Tax	0.33	10%	0.43	12%
Average Return on Investment	0.65	20%	0.91	25%
Estimated Selling Price at 10% ROI, $/gal gasoline	3.20	100%	3.68	100%

Methanol and MTG synthesis, gas fractionation, and HGT represents about one-third of the total equipment cost. The total capital cost of the directly-heated gasifier based system is about 30% higher than that of the indirectly-heated gasifier based system. The directly-heated gasifier is pressurized and requires an Air Separation Unit (ASU) whereas the indirectly-heated gasifier is at atmospheric pressure.

For both gasifier cases, approximately 30% of the production cost is feedstock related. The indirectly-heated gasifier based system has by-products credit of LPG and no export electricity. The directly-heated gasifier has credits from electricity production, and no LPG credit. Therefore, the selling price of gasoline for the indirectly-heated gasifier based system is lower than that of the directly-heated gasifier based system.

As shown in Figure 4-1, the gasoline refiners rack sales prices from January 2007 to December 2008 ranged from a low in December 2008 of $1.05/gallon to a high of $3.41/gallon in June 2008. The June 2008 gasoline price corresponds to the EIA reported peak of over $130/barrel (bbl) crude oil. Superimposed on this plot is the estimated selling price for the indirectly-heated gasifier case (horizontal line at $3.20/gallon). The estimated gasoline selling prices for the two gasifier models are at or above the high end of the rack market price as shown in Figure 4-1. Thus, the base case gasification and MTG technology investigated in this study appears to be economically viable only at crude prices above $100/bbl. To give this another perspective, if taxes are assumed to be an additional 25% on top of the rack price, then the pump price for the base case indirectly-heated gasifier is over $4.25/gallon.

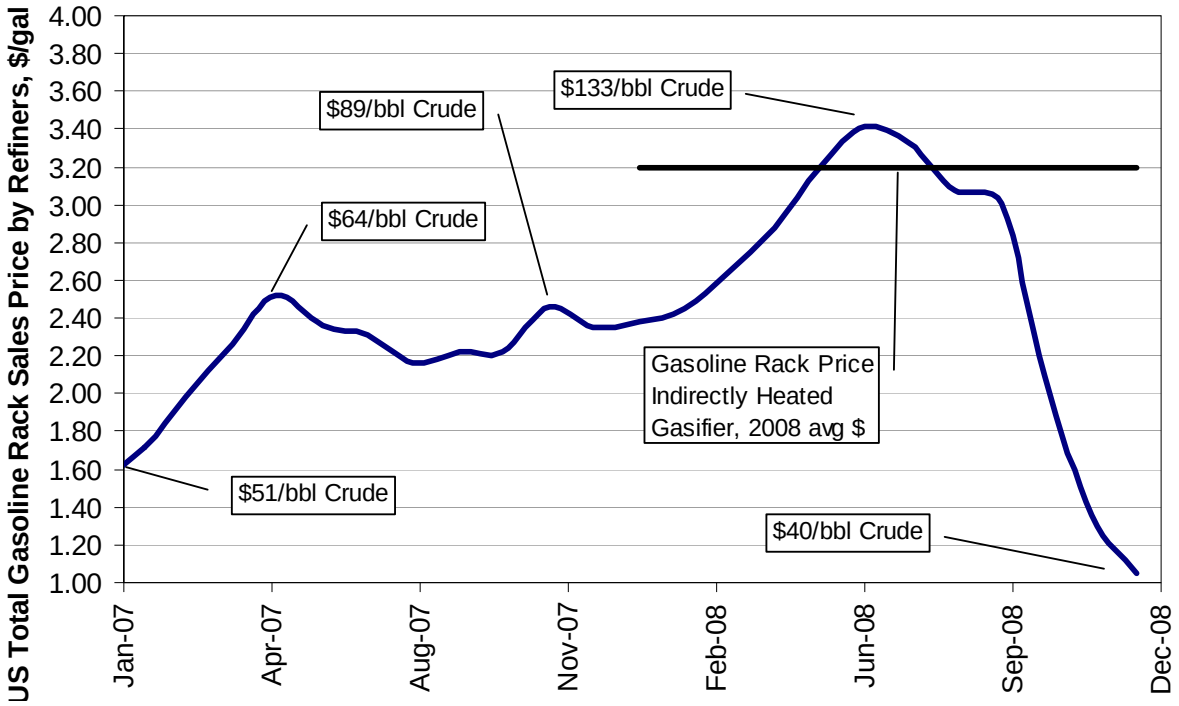

Figure 4-1 US Refiners Gasoline Rack Sales Price and World Average Crude Prices (EIA, 2009)

4.3 Sensitivity Analysis

A sensitivity analysis was conducted to investigate the effects of different cost assumptions. The feedstock cost, total capital cost and yield were varied to determine their economic impact. The feedstock cost was chosen because it represents between 30% of the total production cost as shown in Table 4-2. The capital cost was chosen because it has potential for cost reductions.

4.3.1 Feedstock Cost

Figure 4-2 shows a range of feedstock prices superimposed on the rack gasoline sale price. For each price range, the upper point corresponds to the directly heated gasifier. Very low feedstock costs (below $20/dry ton) are required to approach the medium gasoline rack price for this time frame. As little or no feedstock is available at this price, this effect alone suggests that producing gasoline with current technology will never be viable unless crude prices are extremely high.

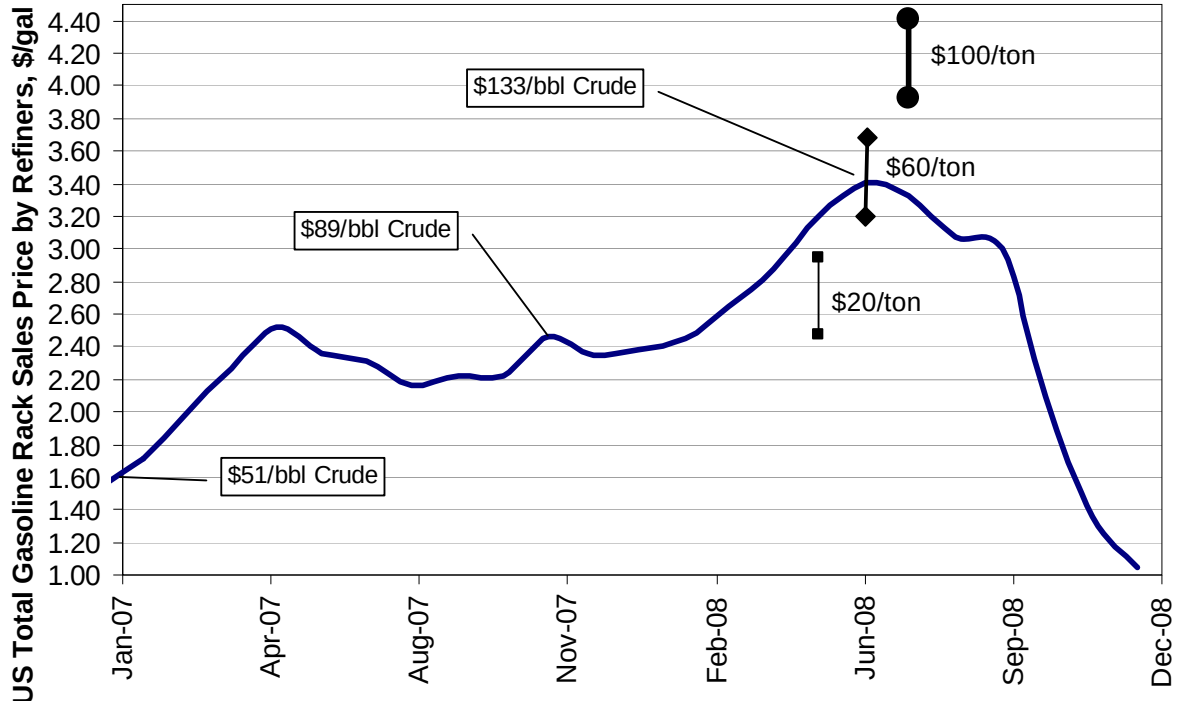

Figure 4-2 Effect of Feedstock Cost on Gasoline Price

4.3.2 Sensitivity to Capital Cost and Yield

There is scope for reducing the capital costs for the syngas cleanup and for the entire MTG synthesis process. The base case assumes that the gas cleanup step includes a tar reformer and a separate steam reformer. Additionally, the MTG process uses six fixed bed reactors:

- one for syngas to methanol synthesis,
- one for methanol to dimethyl ether (DME) conversion,
- three for methanol/DME conversion to gasoline and

- one for hydrogenating the heavy gasoline fraction to remove durene.

Research into improved syngas cleanup is ongoing (Phillips, 2007). Pilot scale tests have shown that a continuous fluidized bed reactor can achieve nearly the same conversion to gasoline as the multi-fixed bed process (Cheng, 1994). MTG reactor design that avoid large recycle streams for temperature control, such as fluid bed MTG or shell and tube reactors, can reduce capital costs in the synthesis area. Additionally, combined synthesis steps, such as once through methanol/DME production could potentially reduce capital costs and product losses. This sensitivity explores the effect of capital cost reductions.

Figure 4-3 shows the producers selling price for three capital costs levels superimposed on the historic rack price data. The 100% bars are the base case, with the indirectly-heated gasifier the lower point and the directly-heated gasifier the upper. Reducing the capital to 75% of the base case brings the estimated rack price down by $0.40/gallon. This corresponds to a crude price just above $100/bbl. Further reducing the capital cost for the MTG synthesis step to 50% of the base case reduces the gasoline producers selling price by nearly $1/gallon, but high crude costs are still needed. It appears that capital costs reduction alone may be insufficient to make this process viable.

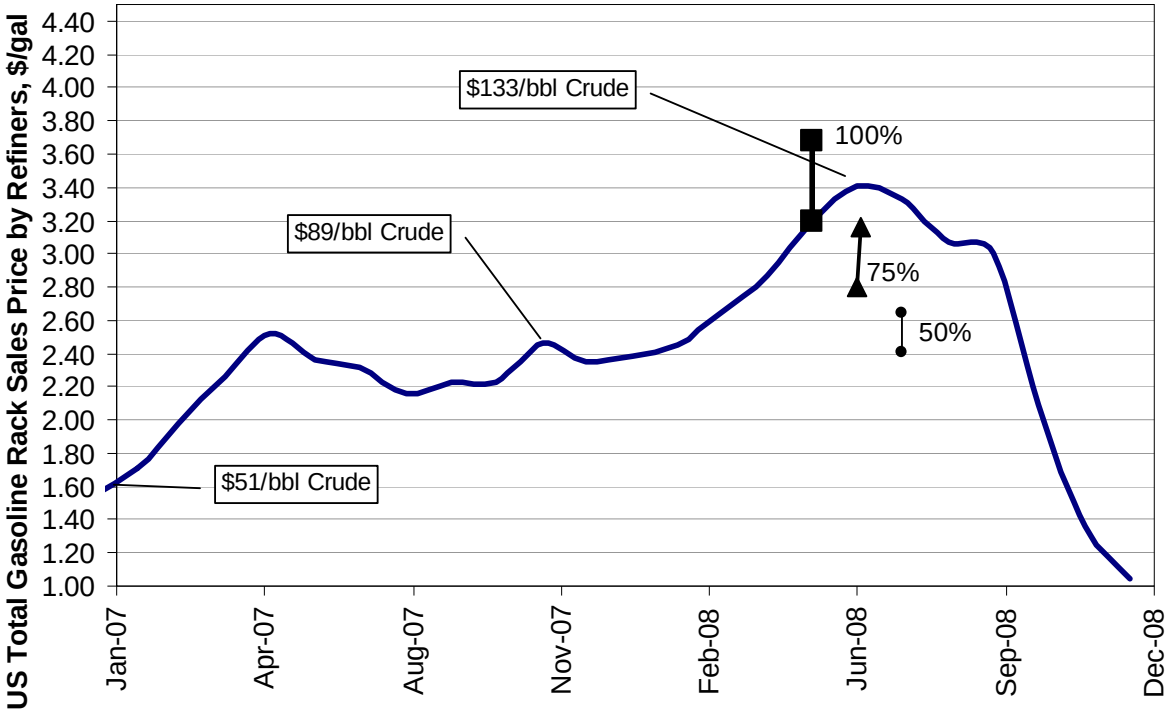

Figure 4-3 Effect of Capital Cost on Gasoline Price

Figure 4-4 shows the effect of reduced capital and improved yield. If all of the potential capital improvements are realized, and yield losses in the synthesis step are minimized, then the methanol-to-gasoline process estimated rack selling price can be lowered to approximately $2.00/gallon and thus becomes economically attractive.

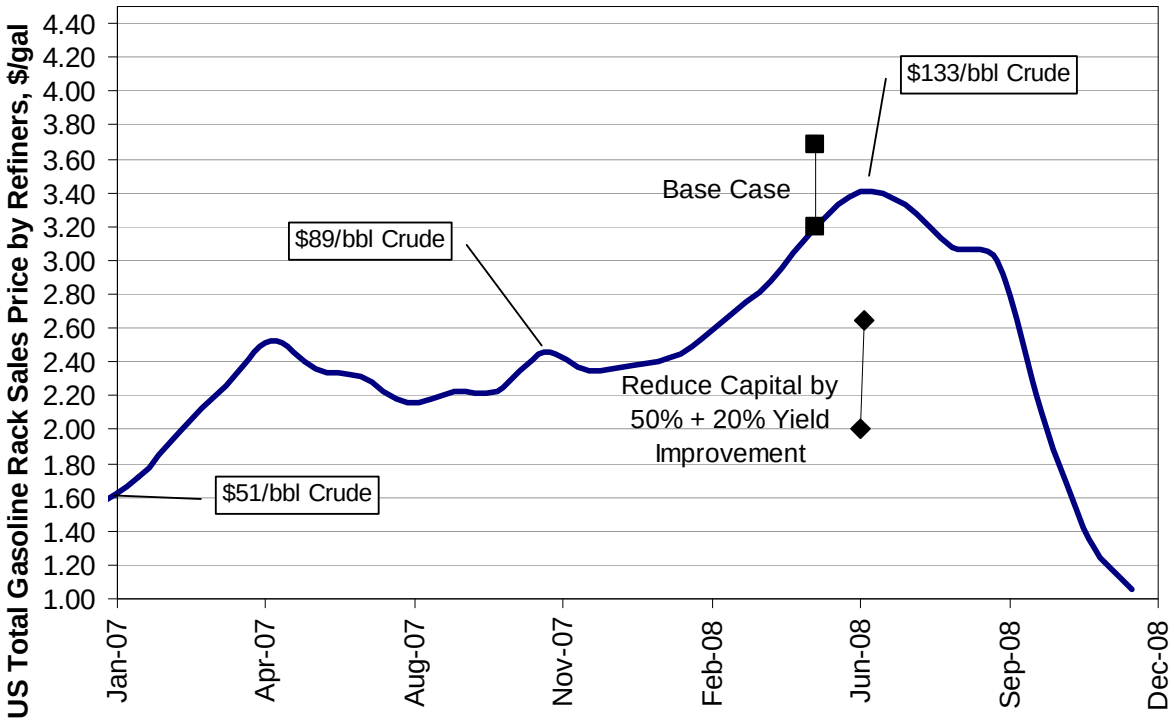

Figure 4-4 Effect of Capital Cost Reduction and Yield Improvement

5.0 Conclusions and Recommendations

A techno-economic analysis (TEA) of a conventional biomass to gasoline process was conducted, based on existing technology. This process produces an infrastructure ready fuel, with a vast available market. The simulation results showed that the estimated gasoline selling prices for the indirectly-and directly-heated gasifier based systems result in rack selling prices higher than the average of the gasoline refiners rack price in the past year. The specific conclusions are:

1. The conventional MTG process is not commercially competitive at this scale unless crude prices are well above $100/bbl.
2. The main capital costs areas are 1) gas cleanup steps (tar cracking, sulfur and other impurities removal and methane reduction by steam reforming) and 2) the MTG process, including methanol production, gas fractionation and HGT.
3. Sensitivity analysis indicated that:
    a. Very low feedstock costs are required to make the fixed-bed MTG process economic.
    b. Reducing the capital costs through consolidated gas cleanup and improved synthesis steps may significantly reduce the costs
    c. Economic viability will likely require reduced capital and improved yield.

It is recommended that other processing alternatives should be simulated to identify the extent of process improvements. Such options should include:

- Consolidated gas cleanup,
- Alternative MTG reactor designs such as fluid-bed or shell & tube,
- Consolidated synthesis with once through DME/Methanol reactors.

6.0 References

Aden, A. 2008. *Biochemical Production of Ethanol from corn Stover: 2007 State of Technology Model.* NREL/TP-510-43205. National Renewable Energy Laboratory, Golden, CO. May 2008. http://www.nrel.gov/docs/fy08osti/43205.pdf

Aden, A., P. Spath, and A. Atherton. 2005. *The Potential of Thermochemical Ethanol Via Mixed Alcohols Production*. Milestone Completion Report, FY05-684. National Renewable Energy Laboratory, Golden, CO. October 2005.

Chang, C.D., 1992. The New Zealand Gas-to-Gasoline Plant: An Engineering Tour de force. *Catalysis Today*, 13(1992):103-111.

Cheng, W., Kung, H. 1994. *Methanol Production and Use*. Marcel-Dekker. 1994.

DKRW website 2008. http://www.dkrwenergy.com/fw/main/Home-140.html.

Evans, R.J., R.A. Knight, M. Onischak, S.P. Babu, 1998. *Development of Biomass Gasification to Produce Substitute Fuels*. Institute of Gas Technology for Pacific Northwest Laboratory, PNL-6518, Richland, WA.

EIA, 2008a. *Natural Gas Monthly*. Energy Information Administration, Office of Oil and Gas, U.S. Department of energy, Washington, DC. http://www.eia.doe.gov/oil_gas/natural_gas/data_publications/natural_gas_monthly/ngm.html

EIA, 2008b. *Electric Power Monthly – August 2008*. DOE/EIA-0226. Energy Information Administration, Office of Coal, Nuclear, Electric and Alternative Fuels, U.S. Department of Energy, Washington, DC. http://www.eia.doe.gov/cneaf/electricity/epm/epm.pdf

EIA, 2009. *Topics for Petroleum Prices.* Energy Information Administration, Office of Oil and Gas, U.S. Department of energy, Washington, DC. http://tonto.eia.doe.gov/dnav/pet/pet_pri_top.asp

EISA 2007. "U.S. Energy Independence and Security Act of 2007," Public Law Number 110-140, signed 19 December, 2007; Title II. 2007. *frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h6enr.txt.pdf*

Fiedler, E., G. Grossmann, D. B. Kersebohm, G. Weiss, and C. Witte. 2000. *Methanol.* Ullmann's Encyclopedia of Industrial Chemistry, Electronic Release, 7th ed., Wiley-VCH, Weinheim, 2007.

Grace & Co. 1982a. *Preliminary Design and Assessment of a 50,000 BPD Coal-to-Gasoline-to-Methanol Plant. Process Engineering and Mechanical Design Reports Volume II of V*. DOE/ET/14759-T1-Vol.2-14B, Prepared by W.R. Grace &Co. for the U.S. Department of Energy, August 1982

Grace & Co. 1982b. *Preliminary Design and Assessment of a 12,500 BPD Coal-to-Gasoline-to-Methanol Plant. Process Engineering and Mechanical Design Reports Volume II of IV*. DOE/ET/14759-T3-Vol.2-14B, Prepared by W.R. Grace &Co. for the U.S. Department of Energy, August 1982

Grace & Co. 1982c. *Preliminary Design and Assessment of a 12,500 BPD Coal-to-Gasoline-to-Methanol Plant. Capital and Operating Costs Estimates Volume I of IV.* DOE/ET/14759-T3-Vol.1-18B, Prepared by W.R. Grace &Co. for the U.S. Department of Energy, August 1982

Hamelinck, C.N., A.P.C. Faaij, 2001. *Future prospects for production of methanol and hydrogen from biomass*, NWS-E-2001-49, ISBN 90-73958-84-9, September 2001.

Hamelinck, C.N. and A.P.C. Faaij, 2002. Future Prospects for Production of Methanol and Hydrogen from Biomass. *Journal of Power Sources*, 111 (1):1-22. 18 September 2002.

Hamelinck, C.N., A.P.C. Faaij, H. den Uil, and H. Boerrigter. 2003. Production of FT Transportation Fuels from Biomass; Technical Options, Process Analysis and Optimization and Development Potential. NWS 90-393-3342-4. Utrecht University. The Netherlands, March 2003.

Kaneko, T., F. Derbyshire, E. Makino, D. Gray, and M. Tamura, 2002. *Coal Liquefaction*. Ullmann's Encyclopedia of Industrial Chemistry, Electronic Release, 7th ed., Wiley-VCH, Weinheim, 2007.

Ondry, G., 2008. Coal-to-Gasoline process will make U.S. debut. *Chemical Engineering*, 115(September 2008):16.

Phillips, S., A. Aden, J. Jechura, and D. Dayton, 2007. *Thermochemical Ethanol via Indirect Gasification and Mixed Alcohol Synthesis of Lignocellulosic Biomass*. NREL/TP-510-41168. April 2007.

Schuster, *et al*. 1985. Continuous Preparation of Ethanol. U.S. Patent 4,517,391. May 14, 1985.

Spath, P., A. Aden, T. Eggerman, M. Ringer, B. Wallace, J. Jechura, 2005. *Biomass Hydrogen Production Detailed Design and Economics Utiltizing the Battelle Columbus Laboratory Indirectly Heated Gasifier*. NREL/TP-510-37408. National Renewable Energy Laboratory, Golden, CO.

SRI PEP 2003 Yearbook International. SRI Consulting, United States. Menlo Park, CA. 2003.

SRI PEP 2007 Yearbook International. SRI Consulting, United States. Menlo Park, CA. 2007.

Tabak, S., X. Zhao, A. Brandl, and M. Heinritz-Adrian, 2008. An Alternative Route for Coal to Liquid Fuel - ExxonMobil Methanol-to-gasoline (MTG) Process. *First World Coal-to-Liquids Conference,* April 3-4, 2008, Paris, France.

Appendix A. Heat and Material Balances for the Indirectly-heated Gasifier Case

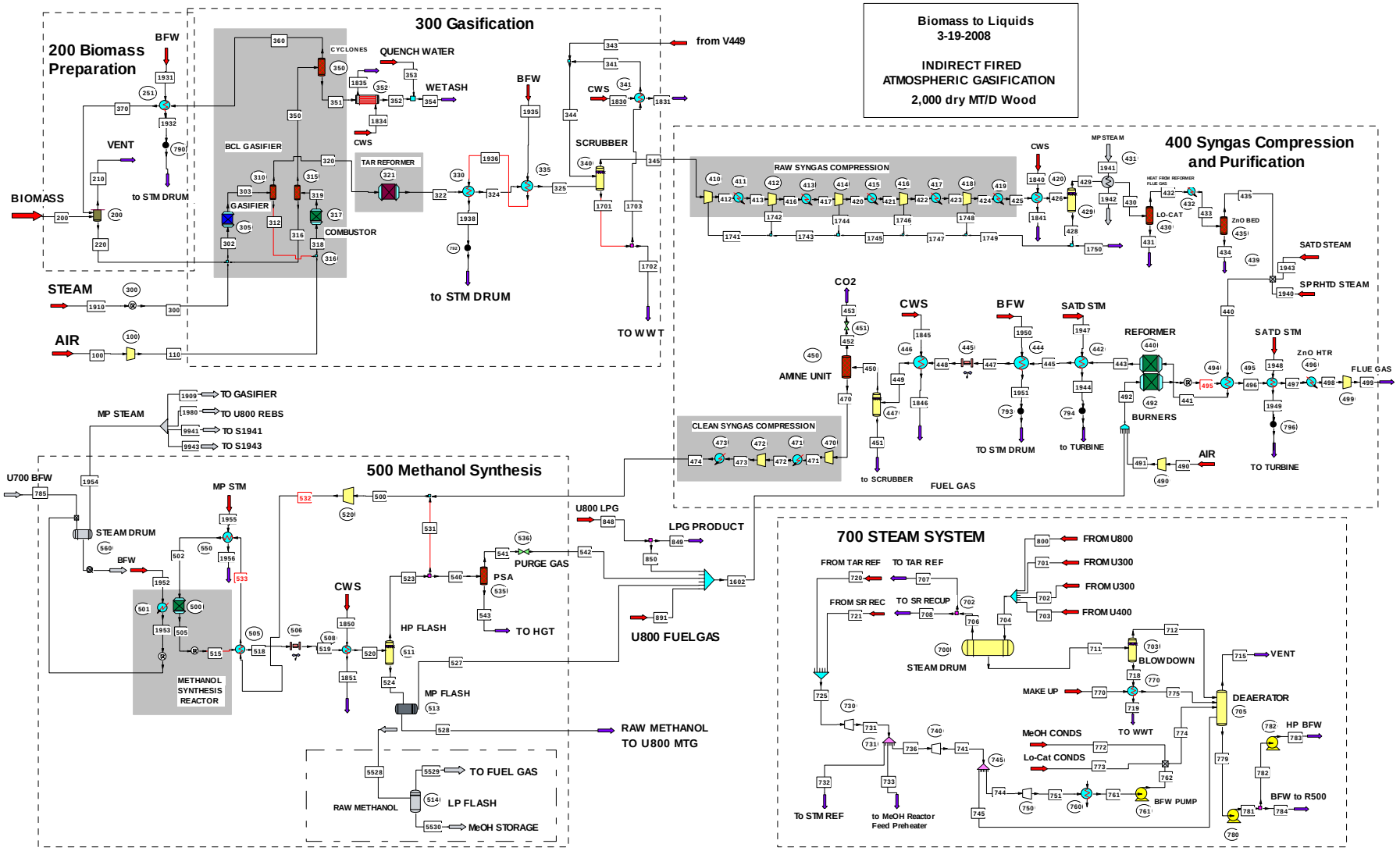

Figure A-1 Process Flow Diagram for the Indirectly-heated Gasifier Case – Feed Prep through Methanol Synthesis

Table A-1 Steam Results for the Indirectly-heated Gasifier Case – Feed Prep through Methanol Synthesis

Stream No.	100	110	200	210	220	300	302	303	312	316	318	319	320	322	324	325	341	343	344	345	350	351	352	353	354
Temp F	60	170.6882	60	277.2043	240	456.586	1663.052	1598	1598	1800	1521.162	1800	1598	1383	553.0704	291.9578	110	110	110.0019	118.1274	1800	1800	300	60	200.067
Pres psia	14.696	30	25	23	23	450	23	23	23	23	23	23	23	20	19	18	15	415	15	15	23	23	23	14.7	14.7
Enth MMBtu/h	-56.758	-40.556	-1744.9	-1447.7	-643.52	-447.89	-9383.6	-9437	-8747.1	-8292.2	-8787.7	-8653.4	-689.85	-670.02	-767.66	-795.52	-71882	-271.71	-72153	-428.13	-361.18	-22.255	-23.92	-5.1321	-29.052
Vapor mass fraction	0.99099	1	0	1	0	0.39969	1	1	1	0	1	1	1	1	1	1	5.56E-05	0	5.52E-05	1	1	0	0	0	0
Total lb/h	442163	442163	367437.4	634805.1	208771.3	73121.01	5268839	5268840	5025882	4986947	5468045	5468047	242958	242957.6	242957.6	242957.6	10591805	40000	10631806	175970.1	481099.4	4960.452	4960.452	750	5710.452
Flowrates in lb/h																									
Oxygen	100320	100320	0	9938.209	0	0	0	3427.312	3427.312	0	103747.3	9938.209	0	0	0	0	0	0	0	0	9938.209	0	0	0	0
Nitrogen	327414	327414	0	327393	0	0	0	0	0	0	327414	327393	0	781.9422	781.9422	781.9422	0.3353	0	0.3353	781.9388	327393	0	0	0	0
Argon	5584	5584	0	5584	0	0	0	0	0	0	5584	5584	0	0	0	0	0	0	0	0	5584	0	0	0	0
Carbon	0	0	0	0	0	0	0	28194.95	28194.95	0	28194.95	0.0012	0	0	0	0	0	0	0	0	0.0012	0.0012	0.0012	0	0.0012
Hydrogen	0	0	0	0.0007	0	0	0	5458.31	2351.679	0	2351.679	0.0007	3106.631	6362.954	6362.954	6362.954	5.133	0	5.133	6362.901	0.0007	0	0	0	0
Carbon Monoxide	0	0	0	0	0	0	0	76303.37	0	0	0	0	76303.37	96358	96358	96358	80.8379	0	80.8379	96357.13	0	0	0	0	0
Carbon Dioxide	218	218	0	103533.3	0	0	0	36358.24	0	0	218	103533.3	36358.24	36358.24	36358.24	36358.24	772.7721	0	772.7722	36350.44	103533.3	0	0	0	0
Methane	0	0	0	0	0	0	0	15913.64	0	0	0	0	15913.64	12730.91	12730.91	12730.91	14.114	0	14.114	12730.77	0	0	0	0	0
Acetylene	0	0	0	0	0	0	0	685.7475	0	0	0	0	685.7475	342.8737	342.8737	342.8737	12.382	0	12.382	342.7487	0	0	0	0	0
Ethylene	0	0	0	0	0	0	0	7877.764	0	0	0	0	7877.764	3938.882	3938.882	3938.882	65.5711	0	65.5711	3938.22	0	0	0	0	0
Ethane	0	0	0	0	0	0	0	566.7108	0	0	0	0	566.7108	56.6711	56.6711	56.6711	0.8075	0	0.8075	56.663	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	8627	8627	183718.7	188311.5	25052.55	73121.01	98173.55	98173.55	0	0	8627	29645.3	98173.55	85275.2	85275.2	85275.2	10578807	40000	10618809	18419	29645.3	0	0	750	750
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	38.3004	0	0	0	0	38.3004	38.3004	38.3004	38.3004	1.9483	0	1.9483	38.2807	0	0	0	0	0
Ammonia	0	0	0	0	0	0	0	1358.225	0	0	0	0	1358.225	407.4674	407.4674	407.4674	10121.51	0	10121.51	305.232	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	18.5296	0	0	0	0	18.5296	18.5296	18.5296	18.5296	1834.419	0	1834.419	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	4986947	4986947	4986947	4986947	4986947	4986947	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	4960.405	4960.405	0	4960.405	4960.451	0	0	0	0	0	0	0	0	4960.451	4960.451	4960.451	0	4960.451
Benzene	0	0	0	0	0	0	0	639.3005	0	0	0	0	639.3005	191.7902	191.7902	191.7902	25.1261	0	25.1261	191.5364	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	1917.902	0	0	0	0	1917.902	95.8951	95.8951	95.8951	62.5937	0	62.5937	95.2628	0	0	0	0	0
Hybrid Poplar Ch	0	0	183718.7	0	183718.7	0	183718.7	0.0041	0.0041	0	0.0041	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	45.3599	0	0	0	0	0	0	0	45.3599	0	0	0	0	0	0	0	0	45.3599	0	0	0	0
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Propanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	360	370	412	413	416	417	420	421	422	423	424	425	426	428	429	430	431	432	433	434	435	440	441	443	445
Temp F	1800	1750	252.8497	140	268.9654	140	194.8721	140	207.8941	140	229.1196	140	110	110	110	120	120	120	707	707	707	711.727	955	1652	1353.795
Pres psia	23	23	28	28	54	54	109.5	109.5	220	220	465	465	465	465	465	460	460	460	460	460	460	450	445	430	427.5
Enth MMBtu/h	-338.92	-346.29	-418.46	-427.92	-417.31	-436.67	-408.89	-424.73	-375.7	-388.67	-359.07	-371.83	-374.61	-48.869	-325.74	-325.08	0	-325.08	-285.25	-0.24613	-285	-1058.2	-1022.9	-873.13	-921.85
Vapor mass fraction	1	1	1	0.9926	1	0.94363	1	0.93177	1	0.95098	1	0.96006	0.95639	0	1	0.99992	0	0.99992	1	1	1	1	1	1	1
Total lb/h	476139	476139	175970.1	175970.1	175970.1	175970.1	173546	173546	167893	167893	165215.7	165215.7	165215.7	7204.441	158011.2	158011.2	0	158011.2	158011.2	339.5272	157671.7	298516	298516	298517	298517
Flowrates in lb/h																									
Oxygen	9938.209	9938.209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	327393	327393	781.9388	781.9388	781.9388	781.9388	781.9388	781.9388	781.9388	781.9388	781.9388	781.9388	781.9388	0	781.9387	781.9387	0	781.9387	781.9387	0	781.9387	781.9387	781.9387	767.1981	767.1981
Argon	5584	5584	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0.0007	0.0007	6362.901	6362.901	6362.901	6362.901	6362.9	6362.9	6362.898	6362.898	6362.893	6362.893	6362.893	0.0017	6362.891	6362.891	0	6362.891	6362.891	0	6362.891	6362.891	6362.891	12914.3	12914.3
Carbon Monoxide	0	0	96357.13	96357.13	96357.13	96357.13	96357.12	96357.12	96357.1	96357.1	96357.06	96357.06	96357.06	0.0114	96357.05	96357.05	0	96357.05	96357.05	0	96357.05	96357.05	96357.05	82509.18	82509.18
Carbon Dioxide	103533.3	103533.3	36350.44	36350.44	36350.44	36350.44	36349.75	36349.75	36346.77	36346.77	36344.16	36344.16	36344.16	18.9229	36325.23	36325.23	0	36325.23	36325.23	0	36325.23	36325.23	36325.23	92337.79	92337.79
Methane	0	0	12730.77	12730.77	12730.77	12730.77	12730.77	12730.77	12730.75	12730.75	12730.72	12730.72	12730.72	0.0162	12730.71	12730.71	0	12730.71	12730.71	0	12730.71	12730.71	12730.71	5586.085	5586.085
Acetylene	0	0	342.7487	342.7487	342.7487	342.7487	342.7475	342.7475	342.741	342.741	342.734	342.734	342.734	0.0094	342.7245	342.7245	0	342.7245	342.7245	0	342.7245	342.7245	342.7245	0.0005	0.0005
Ethylene	0	0	3938.22	3938.22	3938.22	3938.22	3938.217	3938.217	3938.201	3938.201	3938.18	3938.18	3938.18	0.0124	3938.168	3938.168	0	3938.168	3938.168	0	3938.168	3938.168	3938.168	0.1222	0.1222
Ethane	0	0	56.663	56.663	56.663	56.663	56.6629	56.6629	56.6627	56.6627	56.6625	56.6625	56.6625	0.0001	56.6623	56.6623	0	56.6623	56.6623	0	56.6623	56.6623	56.6623	0.3203	0.3203
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	29645.3	29645.3	18419	18419	18419	18419	15995.75	15995.75	10346.32	10346.32	7672.177	7672.177	7672.177	7182.581	489.5941	489.5941	0	489.5941	489.5941	0	489.5941	141333.6	141333.6	104384	104384
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	38.2807	38.2807	38.2807	38.2807	38.2774	38.2774	38.2615	38.2615	38.246	38.246	38.246	0.0442	38.2017	38.2017	0	38.2017	38.2017	38.2017	0	0	0	0	0
Ammonia	0	0	305.232	305.232	305.232	305.232	305.1141	305.1141	304.5999	304.5999	304.1574	304.1574	304.1574	2.832	301.3254	301.3254	0	301.3254	301.3254	301.3254	0	0	0	17.9266	17.9266
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	191.5364	191.5364	191.5364	191.5364	191.5341	191.5341	191.5221	191.5221	191.5079	191.5079	191.5079	0.0074	191.5005	191.5005	0	191.5005	191.5005	0	191.5005	191.5005	191.5005	0	0
Naphthalene	0	0	95.2628	95.2628	95.2628	95.2628	95.2614	95.2614	95.2532	95.2532	95.243	95.243	95.243	0.0022	95.2408	95.2408	0	95.2408	95.2408	0	95.2408	95.2408	95.2408	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	45.3599	45.3599	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.056	0.056
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Propanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	447	448	449	450	451	452	453	470	471	472	473	474	490	491	492	495	496	497	498	499	500	502	505	515	518
Temp F	300	150	110	110	110	120	59.7881	120	205.2048	150	242.3097	150	60	124.4883	111.1885	1800	1367.633	870.1641	316.4648	334.2016	106.6531	446	500	500	190.0061
Pres psia	427.5	427.5	425	425	425	420	22	420	614.6959	614.6959	914.6959	914.6959	14.696	20	20	20	15	15	15	16	820	890	840	840	835
Enth MMBtu/h	-1136.8	-1203	-1212.1	-506.27	-705.86	-322.85	-322.85	-183.57	-177.47	-181.43	-174.75	-181.42	-0.98453	2.6915	-38.497	-188.33	-223.66	-262.14	-301.94	-300.71	-1589.5	-1408.1	-1499	-1499	-1666.2
Vapor mass fraction	0.79311	0.65634	0.65126	1	0	0.99343	0.99586	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.98888
Total lb/h	298517	298517	298517	194413.3	104103.7	83431.41	83431.41	110982	110982	110982	110982	110982	235544.1	235544.1	256817.3	256817	256818	256818	256818	256818	846472	846472	846473	846473	846420
Flowrates in lb/h																									
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	54861.66	54861.66	54861.66	6746.636	6745.959	6745.959	6745.959	6745.959	0	0	0	0	0
Nitrogen	767.1981	767.1981	767.1981	767.1977	0.0004	0	0	767.1977	767.1977	767.1977	767.1977	767.1977	180682.5	180682.5	181447.7	181436.1	181436.1	181436.1	181436.1	181436.1	37731.27	37731.27	37731.27	37731.27	37730.81
Argon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	12914.3	12914.3	12914.3	12914.27	0.0315	0	0	12914.27	12914.27	12914.27	12914.27	12914.27	0	0	1042.396	0.0007	0.0007	0.0007	0.0007	0.0007	65847.7	65847.7	54030.01	54030.01	54027.54
Carbon Monoxide	82509.18	82509.18	82509.18	82509.09	0.0913	0	0	82509.09	82509.09	82509.09	82509.09	82509.09	0	0	5629.909	0.009	0.009	0.009	0.009	0.009	354816.5	354816.5	277987	277987	277981.1
Carbon Dioxide	92337.79	92337.79	92337.79	91884.29	453.507	82695.86	82695.86	9188.431	9188.431	9188.431	9188.431	9188.431	0	0	4036.357	40361.23	40362.66	40362.66	40362.66	40362.66	113173.3	113173.3	107647.8	107647.8	107619.3
Methane	5586.085	5586.085	5586.085	5586.019	0.0669	0	0	5586.019	5586.019	5586.019	5586.019	5586.019	0	0	5640.335	0.0001	0.0001	0.0001	0.0001	0.0001	258996.1	258996.1	258996.1	258996.1	258982.5
Acetylene	0.0005	0.0005	0.0005	0.0005	0	0	0	0.0005	0.0005	0.0005	0.0005	0.0005	0	0	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0131	0.0131	0.0131	0.0131	0.0131
Ethylene	0.1222	0.1222	0.1222	0.1222	0	0	0	0.1222	0.1222	0.1222	0.1222	0.1222	0	0	11.912	0.0002	0.0002	0.0002	0.0002	0.0002	4.6027	4.6027	4.6027	4.6027	4.6021
Ethane	0.3203	0.3203	0.3203	0.3203	0	0	0	0.3203	0.3203	0.3203	0.3203	0.3203	0	0	31.9187	0.0003	0.0003	0.0003	0.0003	0.0003	12.0623	12.0623	12.0623	12.0623	12.0605
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	923.1663	0.0004	0.0004	0.0004	0.0004	0.0004	0	0	0	0	0
Water	104384	104384	104384	735.557	103648.5	735.557	735.5569	0	0	0	0	0	0	0	18.7381	28245.16	28245.33	28245.33	28245.33	28245.33	87.6452	87.6452	2349.449	2349.449	2348.768
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia	17.9266	17.9266	17.9266	16.453	1.4736	0	0	16.453	16.453	16.453	16.453	16.453	0	0	1.7605	0.0002	0.0002	0.0002	0.0002	0.0002	100.6533	100.6533	100.6533	100.6533	100.6477
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1397	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1495	0.0007	0.0007	0.0007	0.0007	0.0007	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27.825	27.8236	27.8236	27.8236	27.8236	0	0	0	0	0
Methanol	0.056	0.056	0.056	0.0038	0.0521	0	0	0.0038	0.0038	0.0038	0.0038	0.0038	0	0	327.7415	0.0003	0.0003	0.0003	0.0003	0.0003	15701.46	15701.46	107613.6	107613.6	107612.4
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Propanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10.657	0.0003	0.0003	0.0003	0.0003	0.0003	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1533.925	0.0004	0.0004	0.0004	0.0004	0.0004	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	461.9769	0.0004	0.0004	0.0004	0.0004	0.0004	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	259.5576	0.0004	0.0004	0.0004	0.0004	0.0004	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	467.0116	0.0005	0.0005	0.0005	0.0005	0.0005	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34.2485	0.0005	0.0005	0.0005	0.0005	0.0005	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57.3611	0.0005	0.0005	0.0005	0.0005	0.0005	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4577	0.0005	0.0005	0.0005	0.0005	0.0005	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.6392	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.833	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5339	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2334	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2549	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1414	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0841	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0672	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0591	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0359	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0322	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.655	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0939	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0023	0.0007	0.0007	0.0007	0.0007	0.0007	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0085	0.0007	0.0007	0.0007	0.0007	0.0007	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0042	0.0007	0.0007	0.0007	0.0007	0.0007	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0003	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0004	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0071	0.0008	0.0008	0.0008	0.0008	0.0008	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0061	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2532	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0045	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0063	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2974	0.0006	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	519	520	523	524	527	528	531	532	533	540	541	542	543	701	702	703	704	706	707	708	711	712	715	718	719
Temp F	150	100	100	100	102.5961	102.5961	100	124.8199	437	100	100	88.8391	100	525.0076	525.0076	525.0076	525.0076	525.0076	525.0076	525.0076	525.0076	525.0056	173.7588	525.0056	150
Pres psia	825	820	820	820	414.696	414.696	820	900	895	820	820	90	820	850	850	850	850	850	850	850	850	850	20	850	850
Enth MMBtu/h	-1712.1	-1754.4	-1436.7	-317.66	-0.53525	-317.13	-1408	-1580.4	-1413	-28.735	-28.749	-28.749	0.007434	-39.993	-681.7	-1167.4	-1950.3	-1928.5	-1077.4	-851.11	-21.815	0	0	-21.815	-23.202
Vapor mass fraction	0.92563	0.88662	1	0	1	0	1	1	1	1	0.99945	1	1	0.99	0.99	0.99	0.98999	1	1	1	0	1	1	0	0
Total lb/h	846420	846420	750457	95963.02	246.1152	95717	735448	846472	846472	15009.13	14928.5	14928.5	80.632	7039.941	120000	205500	343320	339884	189884	150000	3435.869	0	0	3435.869	3435.869
Flowrates in lb/h																									
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	37730.81	37730.81	37719.91	10.8995	6.9888	3.9107	36965.51	37731.27	37731.27	754.3982	754.3982	754.3982	0	0	0	0	0	0	0	0	0	0	0	0	0
Argon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	54027.54	54027.54	54013.56	13.9771	9.2953	4.6818	52933.29	65847.7	65847.7	1080.271	999.6392	999.6392	80.632	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Monoxide	277981.1	277981.1	277829	152.0257	73.3278	78.6979	272272.5	354816.5	354816.5	5556.581	5556.581	5556.581	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Dioxide	107619.3	107619.3	106101.5	1517.804	50.8187	1466.985	103979.4	113173.3	113173.3	2122.03	2122.03	2122.03	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane	258982.5	258982.5	258579.5	403.054	98.2743	304.7797	253408	258996.1	258996.1	5171.589	5171.589	5171.589	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetylene	0.0131	0.0131	0.0129	0.0002	0	0.0002	0.0126	0.0131	0.0131	0.0003	0.0003	0.0003	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	4.6021	4.6021	4.5714	0.0306	0.0021	0.0285	4.48	4.6027	4.6027	0.0914	0.0914	0.0914	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethane	12.0605	12.0605	11.9803	0.0803	0.0054	0.0748	11.7407	12.0623	12.0623	0.2396	0.2396	0.2396	0	0	0	0	0	0	0	0	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	2348.768	2348.768	89.4438	2259.324	0.0439	2259.28	87.6549	87.6452	87.6452	1.7889	1.7889	1.7889	0	7039.941	120000	205500	343320	339884	189884	150000	3435.869	0	0	3435.869	3435.869
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia	100.6477	100.6477	85.9182	14.7295	0.0421	14.6874	84.1999	100.6533	100.6533	1.7184	1.7184	1.7184	0	0	0	0	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	107612.4	107612.4	16021.3	91591.09	7.3168	91583.78	15700.88	15701.46	15701.46	320.426	320.426	320.426	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Propanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	720	721	725	731	732	733	736	741	744	745	751	761	762	770	772	773	774	775	779	781	782	783	784	785	800
Temp F	900	900	900.0004	743.2642	743.2642	743.2642	743.2642	286.8237	286.8237	286.8237	155.0581	155.0581	155.1192	60	455.4031	455.47	166.1114	66.0682	173.7588	175.3918	175.3918	176.9129	175.3918	173.1954	525.0076
Pres psia	850	850	850	450	450	450	450	35	35	35	4.1	4.1	20	60	444.696	444.9947	20	60	20	450	450	850	450	450	850
Enth MMBtu/h	-1028.7	-812.63	-1841.3	-1865.1	-770.02	-28.958	-1066.2	-1105.4	-963.2	-142.24	-983.49	-1142.3	-1142.3	-1563.6	-33.943	-5.497	-1181.7	-1562.2	-2886.2	-2885.5	-2309.6	-2309.1	-575.89	-575.48	-61.239
Vapor mass fraction	1	1	1	1	1	1	1	1	1	1	0.9336	0	0	0	1.00E-05	0	0	0	0	0	0	0	0	0	0.99
Total lb/h	189884	150000	339884	339884	140321	5277	194286	194286	169286	25000	169286	169286	169286	228507	5277	854.6103	175417.6	228507	428924.6	428924.6	343319.6	343319.6	85605	85516.14	10780
Flowrates in lb/h																									
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Argon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Monoxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	189884	150000	339884	339884	140321	5277	194286	194286	169286	25000	169286	169286	169286	228507	5277	854.6103	175417.6	228507	428924.6	428924.6	343319.6	343319.6	85605	85516.14	10780
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Propanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	848	891	1602	1701	1702	1703	1741	1742	1743	1744	1745	1746	1747	1748	1749	1750	1830	1831	1834	1835	1840	1841	1845	1846	1850
Temp F	117.8229	42.0944	43.9445	118.1274	118.1274	118.1274	252.8497	268.9654	0	194.8721	194.8719	207.8941	203.9674	229.1196	210.2323	170.2928	90	110	90	110	90	110	90	110	90
Pres psia	110	100	90	15	15	15	28	54	0	109.5	109.5	220	109.5	465	109.5	109.5	60	60	60	60	65	65	65	65	65
Enth MMBtu/h	-7.8046	-8.5056	-41.189	-72521	-725.21	-71796	0	0	0	-16.257	-16.257	-37.833	-54.09	-17.856	-71.946	-120.81	-29323	-29237	-567.06	-565.4	-946.44	-943.66	-3113.2	-3104.1	-28804
Vapor mass fraction	0	0.99473	0.99856	0	0	0	0	0	0	0	0	0	6.03E-06	0	1.74E-05	2.26E-05	0	0	0	0	0	0	0	0	0
Total lb/h	7620.981	2779.692	21273.2	10698793	106988	10591805	0	0	0	2424.067	2424.067	5653.031	8077.098	2677.334	10754.43	17958.87	4304043	4304043	83234.32	83234.32	138920	138920	456969.2	456969.2	4227987
Flowrates in lb/h																									
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	3.8458	765.2329	0.3386	0.0034	0.3353	0	0	0	0	0	0	0	0	0.0001	0.0001	0	0	0	0	0	0	0	0	0
Argon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	33.4608	1042.396	5.1849	0.0518	5.133	0	0	0	0.0006	0.0006	0.0035	0.0041	0.005	0.0091	0.0108	0	0	0	0	0	0	0	0	0
Carbon Monoxide	0	0	5629.909	81.6545	0.8165	80.8379	0	0	0	0.0039	0.0039	0.0229	0.0268	0.0321	0.0588	0.0702	0	0	0	0	0	0	0	0	0
Carbon Dioxide	0	1863.509	4036.357	780.5779	7.8058	772.7721	0	0	0	0.681	0.681	2.9869	3.6679	2.6135	6.2814	25.2043	0	0	0	0	0	0	0	0	0
Methane	0	370.4719	5640.335	14.2566	0.1426	14.114	0	0	0	0.0035	0.0035	0.0193	0.0228	0.0238	0.0466	0.0628	0	0	0	0	0	0	0	0	0
Acetylene	0	0	0.0003	12.507	0.1251	12.382	0	0	0	0.0013	0.0013	0.0064	0.0077	0.007	0.0147	0.0241	0	0	0	0	0	0	0	0	0
Ethylene	0	11.8184	11.912	66.2334	0.6623	65.5711	0	0	0	0.003	0.003	0.0165	0.0195	0.0202	0.0397	0.0521	0	0	0	0	0	0	0	0	0
Ethane	0	31.6736	31.9187	0.8156	0.0082	0.8075	0	0	0	0	0	0.0002	0.0002	0.0003	0.0005	0.0006	0	0	0	0	0	0	0	0	0
Propane	1437.236	297.2563	923.1663	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	16.9057	18.7381	10685664	106856.6	10578807	0	0	0	2423.249	2423.249	5649.425	8072.674	2674.15	10746.82	17929.4	4304043	4304043	83234.32	83234.32	138920	138920	456969.2	456969.2	4227987
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	1.968	0.0197	1.9483	0	0	0	0.0034	0.0034	0.0159	0.0193	0.0155	0.0348	0.079	0	0	0	0	0	0	0	0	0
Ammonia	0	0	1.7605	10223.75	102.2375	10121.51	0	0	0	0.1179	0.1179	0.5142	0.6321	0.4425	1.0746	3.9066	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	1852.949	18.5295	1834.419	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0.0001	0.1397	0.1397	25.3799	0.2538	25.1261	0	0	0	0.0022	0.0022	0.012	0.0143	0.0141	0.0284	0.0358	0	0	0	0	0	0	0	0	0
Naphthalene	0	0.1495	0.1495	63.226	0.6323	62.5937	0	0	0	0.0014	0.0014	0.0082	0.0096	0.0102	0.0198	0.022	0	0	0	0	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	327.7415	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Propanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	10.4122	6.1225	10.657	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	3411.84	48.0827	1533.925	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	1013.892	20.4313	461.9769	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	564.7487	13.6119	259.5576	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	993.9574	34.1474	467.0116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	65.4574	5.742	34.2485	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	116.4683	6.6397	57.3611	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0.1416	0.396	0.4577	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0.343	3.4898	3.6392	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0.0114	1.828	1.833	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0.0055	2.5315	2.5339	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0.0016	1.2327	1.2334	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0.2549	0.2549	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0.1414	0.1414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0.0841	0.0841	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0.0672	0.0672	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0.0591	0.0591	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0.0359	0.0359	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0.0322	0.0322	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	6.4445	2.8484	5.655	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0.0939	0.0939	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0.0023	0.0023	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0.0085	0.0085	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0.0042	0.0042	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0.0003	0.0003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0.0004	0.0004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0.0071	0.0071	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0.0213	0.9968	1.0061	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0.2532	0.2532	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0.0045	0.0045	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0.0063	0.0063	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0.008	0.008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	1.2974	1.2974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	1851	1909	1910	1931	1932	1935	1936	1938	1940	1941	1942	1943	1944	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1980
Temp F	100	456.586	456.586	176	525.0076	176	400	525.0076	743.0002	456.5881	455.4713	456.586	900	525.0096	525.0096	900	176	525.0076	456	456.586	456.586	743.0002	456.586	456.586
Pres psia	60	450	450	850	850	850	850	850	450	450	445	450	850	850	850	850	850	850	450	450	450	450	450	450
Enth MMBtu/h	-28762	-414.33	-447.89	-47.356	-39.993	-807.2	-779.34	-681.7	-770.04	-4.8423	-5.4961	-3.2036	-1028.7	-1077.4	-851.11	-812.63	-1382.3	-1167.4	-772.5	-681.52	-484.4	-28.964	-33.942	-62.93
Vapor mass fraction	0	1	0.39969	0	0.99	0	0	0.99	1	1	0.001	0.39969	1	1	1	1	0	0.99	0	0.98976	1	1	1.00E-06	1
Total lb/h	4227987	73121	73121.01	7039.941	7039.941	120000	120000	120000	140321	854.5667	854.5667	523	189884	189884	150000	150000	205500	205500	120109.8	120109.8	85486.84	5277.925	5277.925	11106
Flowrates in lb/h																								
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Argon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Monoxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	4227987	73121	73121.01	7039.941	7039.941	120000	120000	120000	140321	854.5667	854.5667	523	189884	189884	150000	150000	205500	205500	120109.8	120109.8	85486.84	5277.925	5277.925	11106
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Propanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

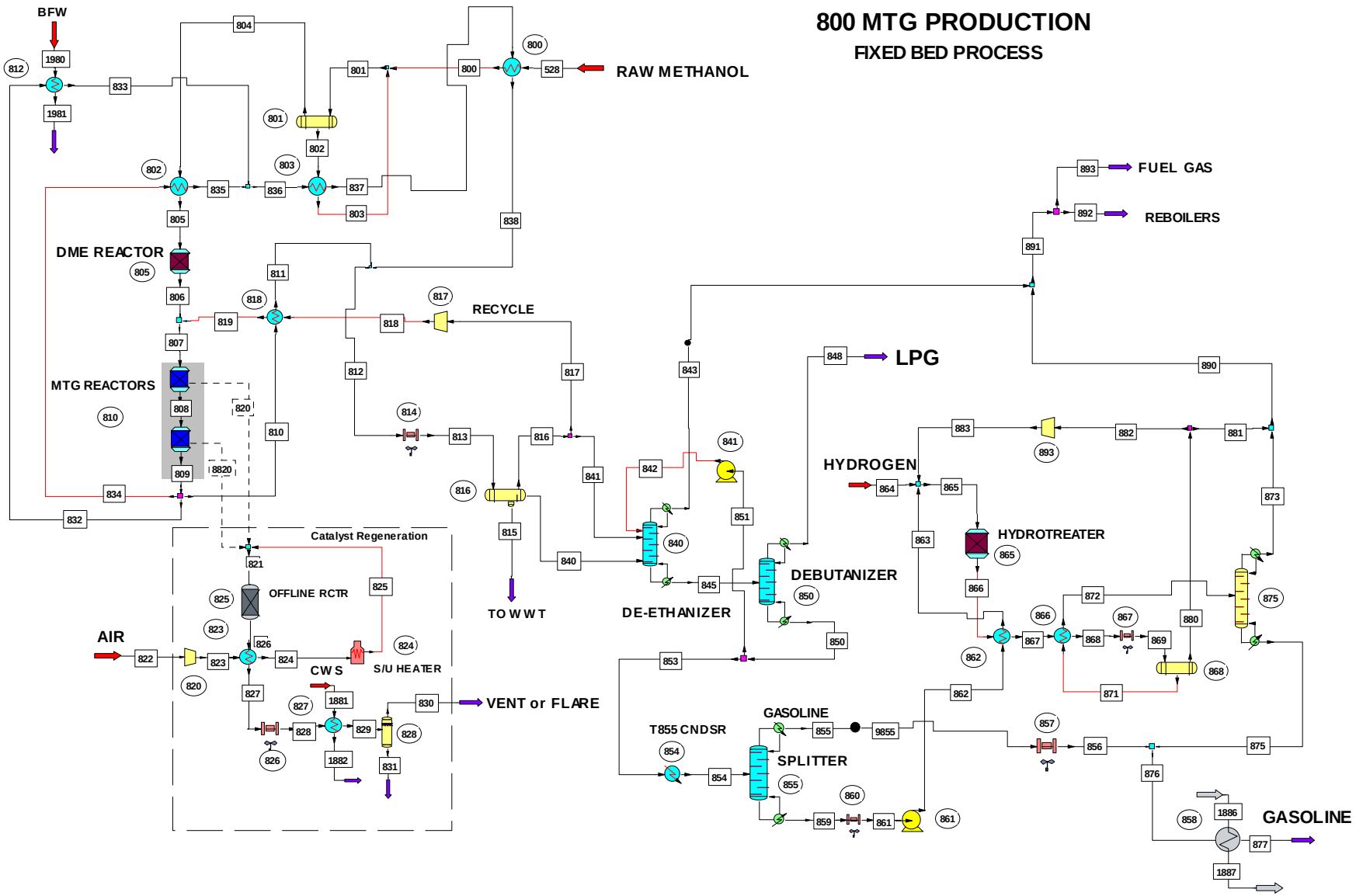

Figure A-2 Process Flow Diagram for the Indirectly-heated Gasifier Case – Gasoline Production

Table A-2 Steam Results for the Indirectly-heated Gasifier Case – Gasoline Production

Stream No.	528	800	801	802	803	804	805	806	807	808	809	810	811	812	813	815	816	817	818	819	820	821	822	823	824
Temp F	102.597	300	353.238	353.238	357.819	353.238	600	756.866	616.374	622.54	734.055	734.055	212.227	236.964	110	110	110	110	169.75	600	622.54	576.487	70	102.76	572
Pres psia	414.696	414.696	400	400	400	400	400	385	385	330	300	300	300	300	300	300	300	300	400	400	330	16	15	17	16
Enth MMBtu/h	-313.98	-299.35	-596.64	-332.59	-297.29	-264.05	-253.32	-253.32	-2187.1	-2187.1	-2187.1	-1312.3	-1454.4	-2401.2	-2484.5	-360.66	-2087.9	-2084.4	-2074.3	-1933	0.00272	1.4456	-0.01983	0.06954	1.4001
Vapor mass fraction	0	0.00928	0.4646	0	0.98994	1	1	1	1	1	1	1	0.96187	0.98046	0.892	0	1	1	1	1	0	1	1	1	1
Total lb/h	95674.4	95674.4	205921	110247	110247	95674.2	95674.2	95674.2	874486	874466	874231	524538	524538	874246	874246	53155.3	779830	778514	778514	778660	19.1156	11796.2	11540.3	11540.3	11540.3
Flowrates in lb/h																									
Methanol	91637.9	91637.9	201024	109387	109387	91637.4	91637.4	9163.75	9163.75	0	0	0	0	0.0001	0.0001	0	0.0001	0.0001	0.0001	0.0002	0	0	0	0	0
Water	2256.1	2256.1	2990.35	734.015	734.015	2256.34	2256.34	25441	27372.9	32486	55111.8	33067.1	33067.1	55111.9	55111.9	53155.3	1935.21	1931.95	1931.95	1931.95	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19.1156	255.857	0	0	0
Hydrogen	4.6855	4.6855	4.8142	0.1288	0.1288	4.6855	4.6855	4.6855	3491.22	3491.83	3495.45	2097.27	2097.27	3495.37	3495.37	0	3493.9	3488	3488	3487.26	0	0	0	0	0
Carbon Dioxide	1466.74	1466.74	1583.81	117.075	117.075	1466.74	1466.74	1466.74	413241	413289	413972	248383	248383	413996	413996	0	411974	411279	411279	411523	0	0	0	0	0
Methane	304.972	304.972	313.874	8.9015	8.9015	304.972	304.972	304.972	152155	152193	152558	91534.6	91534.6	152550	152550	0	152260	152003	152003	151928	0	0	0	0	0
Ethylene	0.0286	0.0286	0.0306	0.0021	0.0021	0.0286	0.0286	0.0286	2097.63	2099.54	2117.74	1270.65	1270.65	2117.61	2117.61	0	2103.85	2100.3	2100.3	2098.95	0	0	0	0	0
Ethane	0.0749	0.0749	0.08	0.0051	0.0051	0.0749	0.0749	0.0749	4195.51	4200.28	4245.82	2547.49	2547.49	4245.6	4245.6	0	4206.86	4199.77	4199.77	4197.61	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	748.213	750.129	768.33	460.998	460.998	768.311	768.311	0	749.848	748.583	748.583	748.397	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	62752.3	62933.8	64664	38798.4	38798.4	64662.6	64662.6	0	62885.7	62779.6	62779.6	62765.9	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	55061.6	55396.1	58583.3	35150	35150	58582.7	58582.7	0	55165.2	55072.1	55072.1	55066.6	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	14056.9	14171.5	15264.3	9158.57	9158.57	15264.2	15264.2	0	14082.3	14058.5	14058.5	14057.6	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	7594.5	7666.17	8349.12	5009.47	5009.47	8349.07	8349.07	0	7608.04	7595.21	7595.21	7594.81	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	21527.8	21910.1	25552.6	15331.6	15331.6	25552.6	25552.6	0	21563.6	21527.2	21527.2	21527.4	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	4678.84	4783.95	5785.64	3471.39	3471.39	5785.65	5785.65	0	4686.53	4678.62	4678.62	4678.71	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	5169.67	5293.98	6386.74	3832.04	3832.04	6386.74	6386.74	0	5178.21	5169.47	5169.47	5169.54	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	554.7	573.815	755.951	453.571	453.571	755.952	755.952	0	555.613	554.675	554.675	554.686	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	5056.27	5223.49	6817.12	4090.27	4090.27	6817.13	6817.13	0	5064.5	5055.96	5055.96	5056.1	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	3870	4037.22	5630.85	3378.51	3378.51	5630.86	5630.86	0	3876.32	3869.78	3869.78	3869.89	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	3622.86	3790.08	5383.71	3230.23	3230.23	5383.72	5383.72	0	3628.78	3622.66	3622.66	3622.76	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	3302.68	3469.9	5063.53	3038.12	3038.12	5063.54	5063.54	0	3308.09	3302.51	3302.51	3302.6	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	922.963	1018.52	1564.93	938.958	938.958	1564.93	1564.93	0	924.494	922.934	922.934	922.952	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	513.323	554.642	913.401	548.04	548.04	913.401	913.401	0	514.183	513.315	513.315	513.321	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	820.354	892.024	1574.97	944.985	944.985	1574.98	1574.98	0	821.709	820.323	820.323	820.343	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	445.954	493.734	858.006	514.803	514.803	858.006	858.006	0	446.699	445.945	445.945	445.952	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	596.651	668.321	1351.27	810.763	810.763	1351.27	1351.27	0	597.641	596.632	596.632	596.646	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	563.006	634.676	1317.63	790.576	790.576	1317.63	1317.63	0	563.941	562.99	562.99	563.002	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	453.807	525.477	1208.43	725.057	725.057	1208.43	1208.43	0	454.56	453.793	453.793	453.804	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	377.087	472.646	1019.05	611.433	611.433	1019.05	1019.05	0	377.717	377.08	377.08	377.086	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	2895.59	2981.59	3710.08	2226.05	2226.05	3710.08	3710.08	0	2900.34	2895.45	2895.45	2895.51	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	1215.95	1473.96	3714.14	2228.48	2228.48	3714.14	3714.14	0	1218	1215.94	1215.94	1215.96	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	184.544	232.324	687.664	412.598	412.598	687.664	687.664	0	184.851	184.539	184.539	184.543	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	168.183	215.962	671.302	402.781	402.781	671.302	671.302	0	168.462	168.177	168.177	168.182	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	146.939	195.636	650.976	390.585	390.585	650.975	650.975	0	147.182	146.934	146.934	146.938	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	1895.86	1981.87	2710.35	1626.21	1626.21	2710.35	2710.35	0	1898.97	1895.77	1895.77	1895.82	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	189.329	296.499	1226.98	736.189	736.189	1226.98	1226.98	0	189.643	189.323	189.323	189.327	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	401.197	637.365	2687.94	1612.76	1612.76	2687.93	2687.93	0	401.863	401.185	401.185	401.193	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	137.56	234.65	1077.62	646.573	646.573	1077.62	1077.62	0	137.788	137.556	137.556	137.558	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	37.6582	88.0496	525.603	315.362	315.362	525.602	525.602	0	37.7201	37.6565	37.6565	37.6574	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	926.667	1012.67	1559.08	935.446	935.446	1559.08	1559.08	0	928.197	926.631	926.631	926.652	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	59289.1	59289.1	59289.1	0.0013	0.0008	0.0008	0.0011	0.0011	0	0.0011	0.0011	0.0011	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	73.8279	214.922	1440.01	864.007	864.007	1440.01	1440.01	0	73.9492	73.8244	73.8244	73.8264	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	6.9277	52.2791	446.077	267.646	267.646	446.077	446.077	0	6.939	6.9272	6.9272	6.9275	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	4.137	28.595	264.862	158.917	158.917	264.862	264.862	0	4.1438	4.1368	4.1368	4.1369	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0.1988	4.2308	39.2114	23.5268	23.5268	39.2113	39.2113	0	0.1991	0.1988	0.1988	0.1988	0	0	0	0	0
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2687.92	2687.92	2687.92	2687.92
Nitrogen	3.9133	3.9133	4.0058	0.0925	0.0925	3.9133	3.9133	3.9133	2505.6	2505.6	2505.6	1503.36	1503.36	2505.69	2505.69	0	2504.2	2499.98	2499.98	2500.86	0	8852.42	8852.42	8852.42	8852.42
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	825	826	827	828	829	830	831	832	833	834	835	836	837	838	840	841	842	843	845	848	850	851	853	854	855
Temp F	572	1705.94	1303.86	150	110	110	110	734.055	650	734.055	483.569	609.713	391.655	292.108	110	110	291.814	20.0034	261.16	117.823	290.607				GASOLIN
Pres psia	16	16	15	5	3	3	3	300	300	300	300	300	300	300	300	300	200	165	172	110	110	290.607	290.607	496.681	166.691
Enth MMBtu/h	1.4001	1.4456	0.11501	-3.3604	-3.4568	-3.4568	0	-656.14	-667.4	-218.71	-229.53	-896.92	-932.23	-946.85	-35.95	-3.5231	-3.2542	-12.449	-26.91	-7.7859	-19.258	110	110	110	25
Vapor mass fraction	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	0	-3.259	-15.999	-8.9993	-18.232
Total lb/h	11540.3	11796.2	11796.2	11796.2	11796.2	11796.2	0	262269	262269	87423.1	87437.6	349707	349707	349707	41259.9	1315.84	6300.9	4021.9	44854.7	7620.98	37233.7	0	0	1	0
Flowrates in lb/h																									
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	16533.6	16533.6	5511.18	5511.19	22044.7	22044.7	22044.7	21.3488	3.2654	0	24.6142	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	0	1048.63	1048.63	349.545	349.471	1398.1	1398.1	1398.1	1.4755	5.8954	0	7.3709	0	0	0	0	0	0	0
Carbon Dioxide	0	937.495	937.495	937.495	937.495	937.495	0	124192	124192	41397.2	41421.6	165613	165613	165613	2022.03	695.144	0	2717.17	0	0	0	0	0	0	0
Methane	0	0	0	0	0	0	0	45767.3	45767.3	15255.8	15248.3	61015.6	61015.6	61015.6	290.292	256.915	0	547.207	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	0	635.324	635.324	211.775	211.639	846.962	846.962	846.962	13.7608	3.5499	0	17.3108	0	0	0	0	0	0	0
Ethane	0	0	0	0	0	0	0	1273.75	1273.75	424.582	424.363	1698.11	1698.11	1698.11	38.7351	7.0984	0	45.8336	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	230.499	230.499	76.833	76.814	307.313	307.313	307.313	18.4632	1.2653	0	9.3163	10.4121	10.4122	0	0	0	0	0
Propane	0	0	0	0	0	0	0	19399.2	19399.2	6466.4	6464.98	25864.2	25864.2	25864.2	1776.85	106.11	0	445.722	1437.24	1437.24	0.0001	0	0	0	0
I-Butane	0	0	0	0	0	0	0	17575	17575	5858.33	5857.73	23432.7	23432.7	23432.7	3417.52	93.0828	5.8321	70.1319	3446.3	3411.84	34.4632	5.8321	28.6311	28.6311	28.6311
N-Butane	0	0	0	0	0	0	0	4579.28	4579.28	1526.43	1526.33	6105.61	6105.61	6105.61	1181.92	23.7617	33.3589	28.0451	1211.02	1013.89	197.127	33.3589	163.768	163.768	163.768
Cis-2-Butene	0	0	0	0	0	0	0	2504.73	2504.73	834.912	834.866	3339.6	3339.6	3339.6	741.026	12.8374	34.4852	19.847	768.531	564.749	203.782	34.4852	169.297	169.297	169.297
I-Pentane	0	0	0	0	0	0	0	7665.79	7665.79	2555.26	2555.27	10221.1	10221.1	10221.1	3989.05	36.3853	608.064	46.3767	4587.17	993.957	3593.21	608.064	2985.15	2985.15	2985.15
N-Pentane	0	0	0	0	0	0	0	1735.69	1735.69	578.564	578.572	2314.26	2314.26	2314.26	1099.12	7.9078	210.467	8.3276	1309.16	65.4574	1243.7	210.467	1033.24	1033.24	1033.24
Trans-2-Pentene	0	0	0	0	0	0	0	1916.02	1916.02	638.674	638.679	2554.7	2554.7	2554.7	1208.53	8.7374	222.328	9.3275	1430.26	116.468	1313.8	222.328	1091.47	1091.47	1091.47
Cyclopentane	0	0	0	0	0	0	0	226.785	226.785	75.5951	75.5962	302.382	302.382	302.382	200.34	0.9375	40.8533	0.5748	241.555	0.1416	241.413	40.8533	200.56	200.56	200.56
2-2-DiMth-Butane	0	0	0	0	0	0	0	2045.14	2045.14	681.712	681.726	2726.86	2726.86	2726.86	1752.63	8.5456	357.644	5.0563	2113.76	0.343	2113.42	357.644	1755.77	1755.77	1755.77
2-3-DiMth-Butane	0	0	0	0	0	0	0	1689.26	1689.26	563.085	563.095	2252.35	2252.35	2252.35	1754.54	6.5407	358.182	2.6484	2116.6	0.0114	2116.59	358.182	1758.41	1758.41	1758.41
2-Methylpentane	0	0	0	0	0	0	0	1615.11	1615.11	538.371	538.381	2153.49	2153.49	2153.49	1754.94	6.123	358.268	2.2175	2117.1	0.0055	2117.1	358.268	1758.83	1758.83	1758.83
3-Methylpentane	0	0	0	0	0	0	0	1519.06	1519.06	506.353	506.361	2025.42	2025.42	2025.42	1755.44	5.5819	358.349	1.7854	2117.58	0.0016	2117.58	358.349	1759.23	1759.23	1759.23
MthCyclopentane	0	0	0	0	0	0	0	469.479	469.479	156.493	156.495	625.974	625.974	625.974	640.438	1.5599	130.697	0.3695	772.322	0	772.323	130.697	641.626	641.626	641.625
Benzene	0	0	0	0	0	0	0	274.02	274.02	91.34	91.3404	365.361	365.361	365.361	399.218	0.8676	81.4544	0.2028	481.335	0.0001	481.336	81.4544	399.881	399.881	399.881
2-4-DiMthPentane	0	0	0	0	0	0	0	472.492	472.492	157.497	157.499	629.991	629.991	629.991	753.266	1.3865	153.678	0.2046	908.123	0	908.123	153.678	754.445	754.445	754.446
Cyclohexane	0	0	0	0	0	0	0	257.402	257.402	85.8006	85.8009	343.203	343.203	343.203	411.308	0.7537	83.9103	0.1219	495.848	0	495.848	83.9103	411.938	411.938	411.938
2-Methylhexane	0	0	0	0	0	0	0	405.382	405.382	135.127	135.128	540.509	540.509	540.509	753.632	1.0084	153.697	0.0972	908.236	0	908.237	153.697	754.54	754.54	754.54
3-Methylhexane	0	0	0	0	0	0	0	395.288	395.288	131.763	131.763	527.051	527.051	527.051	753.686	0.9516	153.699	0.0855	908.247	0	908.247	153.699	754.549	754.549	754.549
2-2-4-TriMth-C5	0	0	0	0	0	0	0	362.528	362.528	120.843	120.843	483.371	483.371	483.371	753.868	0.767	153.705	0.0519	908.284	0	908.284	153.705	754.579	754.579	754.579
MthCyclohexane	0	0	0	0	0	0	0	305.716	305.716	101.905	101.905	407.622	407.622	407.622	641.337	0.6373	130.758	0.0466	772.682	0	772.682	130.758	641.924	641.924	641.924
33-2Mth-1-Butene	0	0	0	0	0	0	0	1113.02	1113.02	371.008	371.013	1484.04	1484.04	1484.04	809.74	4.8939	163.783	4.1292	974.283	6.4445	967.839	163.783	804.056	804.056	804.056
Toluene	0	0	0	0	0	0	0	1114.24	1114.24	371.414	371.412	1485.65	1485.65	1485.65	2496.14	2.0552	508.843	0.1362	3006.89	0	3006.89	508.843	2498.05	2498.05	2498.04
2-3-3-TriMth-C5	0	0	0	0	0	0	0	206.299	206.299	68.7664	68.7662	275.065	275.065	275.065	502.813	0.3119	102.482	0.0116	605.592	0	605.592	102.482	503.11	503.11	503.11
2-3-DiMth-Hexane	0	0	0	0	0	0	0	201.391	201.391	67.1302	67.13	268.521	268.521	268.521	502.841	0.2843	102.482	0.0091	605.596	0	605.596	102.482	503.113	503.113	503.113
3-Methylheptane	0	0	0	0	0	0	0	195.293	195.293	65.0975	65.0973	260.39	260.39	260.39	503.793	0.2483	102.67	0.0065	606.701	0	606.702	102.67	504.032	504.032	504.032
23-2Mth-1-Butene	0	0	0	0	0	0	0	813.105	813.105	271.035	271.039	1084.14	1084.14	1084.14	811.38	3.2042	165.629	1.4445	978.766	0.0213	978.745	165.629	813.116	813.116	813.116
P-Xylene	0	0	0	0	0	0	0	368.094	368.094	122.698	122.697	490.792	490.792	490.792	1037.34	0.32	211.365	0.0061	1249.01	0	1249.01	211.365	1037.65	1037.65	1037.65
M-Xylene	0	0	0	0	0	0	0	806.381	806.381	268.794	268.792	1075.17	1075.17	1075.17	2286.07	0.6781	465.797	0.0123	2752.52	0	2752.52	465.797	2286.72	2286.72	2286.72
O-Xylene	0	0	0	0	0	0	0	323.286	323.286	107.762	107.761	431.048	431.048	431.048	939.832	0.2325	191.486	0.0034	1131.54	0	1131.54	191.486	940.056	940.056	940.056
M-Ethyltoluene	0	0	0	0	0	0	0	157.681	157.681	52.5603	52.5598	210.241	210.241	210.241	487.882	0.0636	99.3922	0.0004	587.335	0	587.335	99.3922	487.943	487.943	487.941
23-2Mth-2-Butene	0	0	0	0	0	0	0	467.723	467.723	155.908	155.91	623.632	623.632	623.632	630.882	1.5662	128.752	0.3667	760.83	0	760.831	128.752	632.079	632.079	632.078
Dimethyl Ether	0	0	0	0	0	0	0	0.0004	0.0004	0.0001	0	0.0004	0.0004	0.0004	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	432.004	432.004	144.001	144	576.003	576.003	576.003	1366.06	0.1248	278.286	0.0005	1644.46	0	1644.46	278.286	1366.18	1366.18	1366.17
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	133.823	133.823	44.6077	44.6072	178.43	178.43	178.43	439.138	0.0117	89.4526	0	528.599	0	528.599	89.4526	439.147	439.147	21.9705
Naphthalene	0	0	0	0	0	0	0	79.4586	79.4586	26.4862	26.4859	105.945	105.945	105.945	260.718	0.007	53.1084	0	313.832	0	313.832	53.1084	260.723	260.723	0.0005
2-MthNaphthalene	0	0	0	0	0	0	0	11.7634	11.7634	3.9211	3.9211	15.6845	15.6845	15.6845	39.0122	0.0003	7.9467	0	46.959	0	46.959	7.9467	39.0123	39.0123	0
Oxygen	2687.92	2006.28	2006.28	2006.28	2006.28	2006.28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	8852.42	8852.42	8852.42	8852.42	8852.42	8852.42	0	751.68	751.68	250.56	250.649	1002.33	1002.33	1002.33	1.4843	4.2255	0	5.7097	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	856	859	861	862	863	864	865	866	867	868	869	871	872	873	875	876	877	880	881	882	883	890	891	892	893
Stream Name						HYDROGEN							200	231.548	550.77	159.571	110	150	150	150	177.321	149.652	41.6806	41.6806	41.6806
Temp F	149	443.08	175	179.876	400	110	268.016	539.743	454.699	439.931	150	150	445	100	100	25	20	450	450	450	500	100	100	100	100
Pres psia	25	25	20	475	470	650	470	470	465	460	450	450	-0.2533	-0.0049	-0.09021	-18.611	-19.412	-0.00711	-0.00356	-0.00356	0.00031	-0.00845	-12.457	-3.7997	-8.6575
Enth MMBtu/h	-18.52	0.0813	-0.01431	-0.01276	0.06451	-0.00165	0.06317	0.06317	-0.0141	-0.03146	-0.27778	-0.27066	0	1	0	0	0	1	1	1	1	1	0.9944	0.9944	0.9944
Vapor mass fraction	0	0	0	0	0	1	0.16551	1	0.76498	0.67917	0.12062	0	727.507	6.1455	721.362	30937.3	30937.3	99.7881	49.894	49.894	49.894	56.0396	4077.94	1243.85	2834.09
Flowrates in lb/h																									
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24.6142	7.5078	17.1064
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	60.474	101.522	82.276	82.281	82.281	82.281	0.1859	0.1859	0.1855	0.0004	0.0004	0.0004	82.0951	41.0476	41.0476	41.0476	41.2331	48.604	14.8251	33.7788
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2717.17	828.789	1888.38
Methane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	547.207	166.909	380.299
Ethylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17.3108	5.2801	12.0307
Ethane	0	0	0	0	0	0	0.4104	0.859	0.8589	0.8589	0.8589	0.0381	0.0381	0.0377	0.0004	0.0004	0.0004	0.8208	0.4104	0.4104	0.4104	0.4481	46.2817	14.1168	32.1649
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.3163	2.8416	6.4746
Propane	0	0	0	0	0	0	2.2553	5.1335	5.1332	5.1332	5.1332	0.6226	0.6224	0.6051	0.0174	0.0174	0.0174	4.5106	2.2553	2.2553	2.2553	2.8603	448.582	136.826	311.756
I-Butane	28.6311	0	0	0	0	0	1.7326	4.4728	4.4727	4.4727	4.4727	1.0075	1.0073	0.9524	0.0549	28.686	28.686	3.4652	1.7326	1.7326	1.7326	2.685	72.8169	22.2105	50.6063
N-Butane	163.768	0	0	0	0	0	1.02	2.8453	2.8453	2.8453	2.8453	0.8054	0.8052	0.7511	0.0541	163.822	163.822	2.0399	1.02	1.02	1.02	1.7711	29.8161	9.0945	20.7216
Cis-2-Butene	169.297	0	0	0	0	0	0	0	0	0	0	0	0	0	0	169.297	169.297	0	0	0	0	0	19.847	6.0537	13.7933
I-Pentane	2985.15	0	0	0	0	0	1.2952	4.7499	4.7499	4.7499	4.7499	2.1595	2.1593	1.8835	0.2758	2985.42	2985.42	2.5905	1.2952	1.2952	1.2952	3.1788	49.5555	15.1154	34.4401
N-Pentane	1033.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1033.24	1033.24	0	0	0	0	0	8.3276	2.5401	5.7875
Trans-2-Pentene	1091.47	0	0	0	0	0	0.1038	0.4549	0.4549	0.4549	0.4549	0.2474	0.2474	0.2053	0.0421	1091.51	1091.51	0.2075	0.1038	0.1038	0.1038	0.3091	9.6366	2.9393	6.6972
Cyclopentane	200.56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200.56	200.56	0	0	0	0	0	0.5748	0.1753	0.3995
2-2-DiMth-Butane	1755.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1755.77	1755.77	0	0	0	0	0	5.0563	1.5423	3.5141
2-3-DiMth-Butane	1758.41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1758.41	1758.41	0	0	0	0	0	2.6484	0.8078	1.8406
2-Methylpentane	1758.83	0	0	0	0	0	0.3563	2.1972	2.1972	2.1972	2.1972	1.4847	1.4847	1.0943	0.3904	1759.22	1759.22	0.7125	0.3563	0.3563	0.3563	1.4506	3.6681	1.1188	2.5492
3-Methylpentane	1759.23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1759.23	1759.23	0	0	0	0	0	1.7854	0.5446	1.2408
MthCyclopentane	641.625	0	0	0	0	0	0	0	0	0	0	0	0	0	0	641.625	641.626	0	0	0	0	0	0.3695	0.1127	0.2568
Benzene	399.881	0	0	0	0	0	0	0	0	0	0	0	0	0	0	399.881	399.882	0	0	0	0	0	0.2028	0.0619	0.141
2-4-DiMthPentane	754.446	0	0	0	0	0	0	0	0	0	0	0	0	0	0	754.446	754.446	0	0	0	0	0	0.2046	0.0624	0.1422
Cyclohexane	411.938	0	0	0	0	0	0	0	0	0	0	0	0	0	0	411.938	411.938	0	0	0	0	0	0.1219	0.0372	0.0847
2-Methylhexane	754.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	754.54	754.54	0	0	0	0	0	0.0972	0.0297	0.0676
3-Methylhexane	754.549	0	0	0	0	0	0	0	0	0	0	0	0	0	0	754.549	754.549	0	0	0	0	0	0.0855	0.0261	0.0595
2-2-4-TriMth-C5	754.579	0	0	0	0	0	0	0	0	0	0	0	0	0	0	754.579	754.58	0	0	0	0	0	0.0519	0.0158	0.0361
MthCyclohexane	641.924	0	0	0	0	0	0	0	0	0	0	0	0	0	0	641.924	641.925	0	0	0	0	0	0.0466	0.0142	0.0324
33-2Mth-1-Butene	804.056	0	0	0	0	0	0	0	0	0	0	0	0	0	0	804.056	804.056	0	0	0	0	0	4.1292	1.2595	2.8697
Toluene	2498.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2498.04	2498.05	0	0	0	0	0	0.1362	0.0415	0.0947
2-3-3-TriMth-C5	503.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	503.11	503.111	0	0	0	0	0	0.0116	0.0035	0.008
2-3-DiMth-Hexane	503.113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	503.113	503.114	0	0	0	0	0	0.0091	0.0028	0.0063
3-Methylheptane	504.032	0	0	0	0	0	0	0	0	0	0	0	0	0	0	504.032	504.032	0	0	0	0	0	0.0065	0.002	0.0045
23-2Mth-1-Butene	813.116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	813.116	813.116	0	0	0	0	0	1.4445	0.4406	1.0039
P-Xylene	1037.65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1037.65	1037.65	0	0	0	0	0	0.0061	0.0019	0.0042
M-Xylene	2286.72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2286.72	2286.73	0	0	0	0	0	0.0123	0.0037	0.0085
O-Xylene	940.056	0	0	0	0	0	0	0	0	0	0	0	0	0	0	940.056	940.056	0	0	0	0	0	0.0034	0.001	0.0023
M-Ethyltoluene	487.941	0.0001	0.0001	0.0001	0.0001	0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0.0001	487.942	487.942	0	0	0	0	0	0.0004	0.0001	0.0003
23-2Mth-2-Butene	632.078	0	0	0	0	0	0	0	0	0	0	0	0	0	0	632.078	632.078	0	0	0	0	0	0.3667	0.1118	0.2548
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	1366.17	0.0067	0.0067	0.0067	0.0067	0	0.0067	0.0067	0.0067	0.0067	0.0067	0.0066	0.0066	0	0.0066	1366.18	1366.18	0.0001	0	0	0	0	0.0006	0.0002	0.0004
1-2-4-5-TetMthBz	21.9705	417.179	417.179	417.179	417.179	0	417.179	0	0	0	0	0	0	0	0	21.9705	21.9705	0	0	0	0	0	0	0	0
Naphthalene	0.0005	260.723	260.723	260.723	260.723	0	260.93	260.93	260.93	260.93	260.93	260.516	260.516	0.0088	260.507	260.507	260.507	0.4147	0.2073	0.2073	0.2073	0.2162	0.2162	0.0659	0.1502
2-MthNaphthalene	0	39.0123	39.0123	39.0123	39.0123	0	39.0225	39.0225	39.0225	39.0225	39.0225	39.0021	39.0021	0.0001	39.002	39.002	39.002	0.0204	0.0102	0.0102	0.0102	0.0103	0.0103	0.0031	0.0072
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.7097	1.7416	3.9682
1-2-3-4-Tetramet	0	0	0	0	0	0	1.4555	424.343	424.343	424.343	424.343	421.432	421.432	0.4214	421.011	421.011	421.011	2.9109	1.4555	1.4555	1.4555	1.8769	1.8769	0.5725	1.3044
1-1-Dichloro-2-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	1740	1741	1840	1841	1881	1882	1886	1887	1980	1981	8820	9840	9841	9842	9843	9855
Temp F	2	20	90	110	90	110	90	110	176	525.213	734.055	165.272	164	20	20.0034	166.691
Pres psia	16	16	90	90	90	88	90	85	850	850	300	165	165	165	165	25
Enth MMBtu/h	-462.32	-461.39	-1.9533	-1.9475	-32.845	-32.749	-273.36	-272.55	-72.431	-61.177	0.04276	-16.089	-16.095	-17.02	-12.449	-18.232
Vapor mass fraction	0	0	0	0	0	0	0	0	0	0.99	0	1	0.9977	0.51813	1	0
Total lb/h	211758	211758	287.032	287.032	4826.65	4826.65	40169.8	40169.8	10779.9	10779.9	236.741	7633.77	7633.77	7633.77	4021.9	30215.9
Flowrates in lb/h																
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	287.032	287.032	4826.65	4826.65	40169.8	40169.8	10779.9	10779.9	0	35.7899	35.7899	35.7899	24.6142	0
Carbon	0	0	0	0	0	0	0	0	0	0	236.741	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	0	0	0	0	0	7.1799	7.1799	7.1799	7.3709	0
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	0	3056.45	3056.45	3056.45	2717.17	0
Methane	0	0	0	0	0	0	0	0	0	0	0	555.132	555.132	555.132	547.207	0
Ethylene	0	0	0	0	0	0	0	0	0	0	0	20.1408	20.1408	20.1408	17.3108	0
Ethane	0	0	0	0	0	0	0	0	0	0	0	59.0568	59.0568	59.0568	45.8336	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	18.4619	18.4619	18.4619	9.3163	0
Propane	0	0	0	0	0	0	0	0	0	0	0	999.676	999.676	999.676	445.722	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	316.497	316.497	316.497	70.1319	28.6311
N-Butane	0	0	0	0	0	0	0	0	0	0	0	181.221	181.221	181.221	28.0451	163.768
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	148.699	148.699	148.699	19.847	169.297
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	769.807	769.807	769.807	46.3767	2985.15
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	189.163	189.163	189.163	8.3276	1033.24
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	202.562	202.562	202.562	9.3275	1091.47
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	20.8642	20.8642	20.8642	0.5748	200.56
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	187.616	187.616	187.616	5.0563	1755.77
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	137.544	137.544	137.544	2.6484	1758.41
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	129.333	129.333	129.333	2.2175	1758.83
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	116.626	116.626	116.626	1.7854	1759.23
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	32.0084	32.0084	32.0084	0.3695	641.625
Benzene	0	0	0	0	0	0	0	0	0	0	0	18.4904	18.4904	18.4904	0.2028	399.881
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	28.0406	28.0406	28.0406	0.2046	754.446
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	15.3705	15.3705	15.3705	0.1219	411.938
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	20.6567	20.6567	20.6567	0.0972	754.54
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	19.5156	19.5156	19.5156	0.0855	754.549
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	15.4364	15.4364	15.4364	0.0519	754.579
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	12.9635	12.9635	12.9635	0.0466	641.924
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	115.995	115.995	115.995	4.1292	804.056
Toluene	0	0	0	0	0	0	0	0	0	0	0	44.1962	44.1962	44.1962	0.1362	2498.04
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	6.4637	6.4637	6.4637	0.0116	503.11
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	6.0861	6.0861	6.0861	0.0091	503.113
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	5.4256	5.4256	5.4256	0.0065	504.032
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	69.2526	69.2526	69.2526	1.4445	813.116
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	7.4536	7.4536	7.4536	0.0061	1037.65
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	15.9148	15.9148	15.9148	0.0123	2286.72
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	5.5591	5.5591	5.5591	0.0034	940.056
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	1.6837	1.6837	1.6837	0.0004	487.941
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	31.861	31.861	31.861	0.3667	632.078
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	3.3439	3.3439	3.3439	0.0005	1366.17
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0.3652	0.3652	0.3652	0	21.9705
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0.223	0.223	0.223	0	0.0005
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0.012	0.012	0.012	0	0
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	0	0	0	0	0	0	0	5.6387	5.6387	5.6387	5.7097	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-1-Dichloro-2-2	211758	211758	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B. Heat and Material Balances for the Directly-heated Gasifier Case

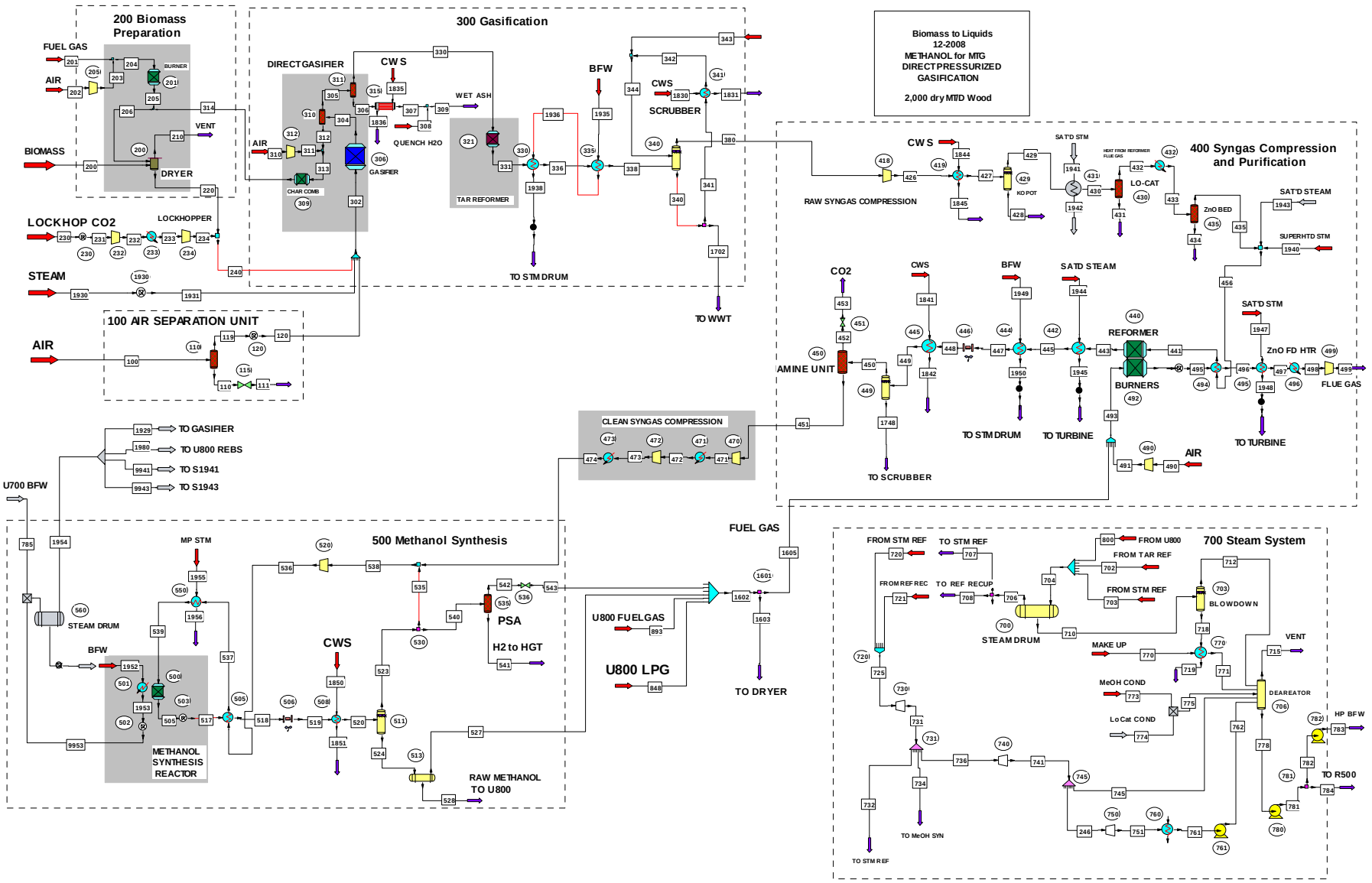

Figure B-1 Process Flow Diagram for the Directly-heated Gasifier Case – Feed Prep through Methanol Synthesis

Table B-1 Steam Results for the Directly-heated Gasifier Case – Feed Prep through Methanol Synthesis

Stream No.	100	110	111	119	120	200	201	202	203	204	205	206	210	220	230	231	232	233	234	240	246	302	304	305
Temp F	60	60	43.232	60	60	60	58.9967	60	76.9876	73.5884	3131.99	3518.63	241.951	240	70	70	329.524	140	360.069	239.616	287	357.687	1600	1600
Pres psia	14.696	350	25	350	350	25	90	14.696	16	16	16	16	16	16	22	22	100	100	330	330	35	330	330	330
Enth MMBtu/h	-26.112	-28.339	-28.339	-0.27723	-0.27723	-1744.9	-12.57	-0.26333	-0.00461	-12.575	-12.576	-2.9397	-1104.3	-643.52	-23.166	-23.166	-22.829	-23.089	-22.801	-666.32	-2340.3	-903.19	-857.61	-865.95
Vapor mass fraction	0.99099	0.97525	0.9781	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0.19591	1	0.64635	0.98301	0.98293
Total lb/h	203421	157071	157071	46350.4	46350.4	367437	6413.24	63000	63000	69413.3	69413.3	192327	350993	208771	6023.08	6023.08	6023.08	6023.08	6023.08	214794	411318	302899	302899	295388
Flowrates in lb/h																								
Oxygen	46153.1	39.6902	39.6902	46113.4	46113.4	0	0	14673.7	14673.7	14673.7	3728.45	7271.14	7271.14	0	0	0	0	0	0	0	0	46113.4	307.108	0
Nitrogen	150630	150547	150547	82.8463	82.8463	0	107.807	48326.4	48326.4	48434.2	48310.2	136506	136506	0	0	0	0	0	0	0	0	82.8463	120.38	82.8463
Argon	2568.97	2414.83	2414.83	154.138	154.138	0	19.5242	0	0	19.5242	19.5242	19.5242	19.5242	0	0	0	0	0	0	0	0	154.138	154.138	154.138
Carbon	0	0	0	0	0	0	0	0	0	0	0	0.0002	0.0002	0	0	0	0	0	0	0	0	0	6254.95	0
Hydrogen	0	0	0	0	0	0	438.492	0	0	438.492	0.9094	11.4084	11.4084	0	0	0	0	0	0	0	0	0	4562.56	3655.06
Carbon Monoxide	0	0	0	0	0	0	2741.24	0	0	2741.24	37.9279	1021.48	1021.48	0	0	0	0	0	0	0	0	0	49736.8	49736.8
Carbon Dioxide	100.293	100.293	100.293	0	0	0	1462.82	0	0	1462.82	10338.6	31712.5	31712.5	0	6023.08	6023.08	6023.08	6023.08	6023.08	6023.08	0	6023.08	135752	135752
Methane	0	0	0	0	0	0	465.165	0	0	465.165	0	0	0	0	0	0	0	0	0	0	0	0	21336.9	21336.9
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	1.7048	0	0	1.7048	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	1041.31	1041.31
Ethane	0	0	0	0	0	0	4.3219	0	0	4.3219	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	1948.76	1948.76
Propane	0	0	0	0	0	0	224.917	0	0	224.917	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
Water	3968.93	3968.93	3968.93	0	0	183719	2.6508	0	0	2.6508	6712.12	14728.7	173395	25052.5	0	0	0	0	0	25052.5	411318	66806.3	62887.6	62887.6
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0.0002	0.0002	0	0	0	0	0	0	0	0	0	3.0449	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35.064	35.064
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1312.59	1312.59
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.5296	18.5296
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4960.38	4960.38
Benzene	0	0	0	0	0	0	0.0172	0	0	0.0172	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	8488.38	8488.38
Naphthalene	0	0	0	0	0	0	0.0182	0	0	0.0182	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	3977.61	3977.61
Hybrid Poplar Ch	0	0	0	0	0	183719	0	0	0	0	0	0	0	183719	0	0	0	0	0	183719	0	183719	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	6.0849	6.0849	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	265.563	1050.51	1050.51	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	0	0	0	0	129.046	0	0	129.046	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	2.1402	0	0	2.1402	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	446.04	0	0	446.04	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	133.11	0	0	133.11	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	74.3971	0	0	74.3971	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	132.08	0	0	132.08	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	9.1253	0	0	9.1253	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	15.7974	0	0	15.7974	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0.0671	0	0	0.0671	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0.4728	0	0	0.4728	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0.226	0	0	0.226	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0.3121	0	0	0.3121	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0.1516	0	0	0.1516	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0.0314	0	0	0.0314	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0.0173	0	0	0.0173	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0.0104	0	0	0.0104	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0.0082	0	0	0.0082	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0.0072	0	0	0.0072	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0.0044	0	0	0.0044	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0.004	0	0	0.004	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	1.1781	0	0	1.1781	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0.0116	0	0	0.0116	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0.0003	0	0	0.0003	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0.001	0	0	0.001	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0.0005	0	0	0.0005	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0.0009	0	0	0.0009	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0.125	0	0	0.125	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0.0311	0	0	0.0311	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0.0006	0	0	0.0006	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0.0008	0	0	0.0008	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0.001	0	0	0.001	0.0002	0.0002	0.0002	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0.1585	0	0	0.1585	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0

Stream No.	306	307	308	309	310	311	312	313	314	330	331	336	338	340	341	342	343	344	380	426	427	428	429	430
Temp F	1600	300	90	197.375	60	123.533	1600	371.924	3742.18	1600	1383	431.788	259.677	115.038	115.038	110	110	110	115.038	186.576	105	105	105	120
Pres psia	330	330	60	60	14.696	20	330	25	25	330	327	326	325	324	324	324	440	324	324	465	465	465	465	465
Enth MMBtu/h	-41.992	-49.708	-62.541	-112.25	-0.48237	1.2919	8.3438	9.6358	9.636	-824.05	-775.49	-897.54	-931.62	-58342	-57759	-57802	-305.68	-58108	-697.33	-690.94	-698.64	-0.04214	-698.6	-697.44
Vapor mass fraction	0.00031	0.00031	0	0	1	1	1	1	1	1	1	1	0.94837	0	0	0.00075	0	0.00074	1	1	0.99919	0	1	0.99905
Total lb/h	4960.38	4960.38	9179.93	14140.3	115403	115403	7510.14	122914	122914	290428	290428	290428	290428	8645062	8558611	8558611	45000	8603611	248976	248976	248976	201.456	248775	248775
Flowrates in lb/h																								
Oxygen	0	0	0	0	26879.2	26879.2	307.108	27186.3	3542.68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	88524.2	88524.2	37.5337	88561.7	88195.3	82.8463	838.515	838.515	838.515	5.4521	5.3976	5.3976	0	5.3976	838.461	838.461	838.461	0.0015	838.459	838.459
Argon	0	0	0	0	0	0	0	0	0	154.138	154.138	154.138	154.138	2.8638	2.8352	2.8352	0	2.8352	154.11	154.11	154.11	0.001	154.109	154.109
Carbon	0	0	0	0	0	0	6254.95	6254.95	0.0002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	907.505	907.505	10.4989	3655.06	8376.3	8376.3	8376.3	104.967	103.917	103.917	0	103.917	8375.25	8375.25	8375.25	0.0115	8375.24	8375.24
Carbon Monoxide	0	0	0	0	0	0	0	0	983.555	49736.8	82536	82536	82536	1135.86	1124.5	1124.5	0	1124.5	82524.6	82524.6	82524.6	0.2103	82524.4	82524.4
Carbon Dioxide	0	0	0	0	0	0	0	0	21373.9	135752	135752	135752	135752	40314.4	39911.2	39911.2	0	39911.2	135349	135349	135349	11.3006	135338	135338
Methane	0	0	0	0	0	0	0	0	0	21336.9	17069.5	17069.5	17069.5	283.61	280.774	280.774	0	280.774	17066.7	17066.7	17066.7	0.1709	17066.5	17066.5
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	0	0	0	1041.31	520.654	520.654	520.654	117.545	116.37	116.37	0	116.37	519.478	519.478	519.478	0.0252	519.453	519.453
Ethane	0	0	0	0	0	0	0	0	0	1948.76	194.877	194.877	194.877	37.4562	37.0816	37.0816	0	37.0816	194.502	194.502	194.502	0.0139	194.488	194.488
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	9179.93	9179.93	0	0	0	0	8016.54	62887.6	41792.4	41792.4	41792.4	8563825	8478186	8478186	45000	8523186	1153.27	1153.27	1153.27	8.1167	1145.16	1145.16
Sulphur	0	0	0	0	0	0	3.0449	3.0449	0.0002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	35.064	35.064	35.064	35.064	24.7553	24.5078	24.5078	0	24.5078	34.8165	34.8165	34.8165	0.008	34.8084	34.8084
Ammonia	0	0	0	0	0	0	0	0	0	1312.59	393.777	393.777	393.777	32166.8	31845.2	31845.2	0	31845.2	72.1072	72.1072	72.1072	0.0285	72.0787	72.0787
HydrogenChloride	0	0	0	0	0	0	0	0	0	18.5296	18.5296	18.5296	18.5296	1852.95	1834.42	1834.42	0	1834.42	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	4960.38	4960.38	0	4960.38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	8488.38	2546.51	2546.51	2546.51	3912.01	3872.89	3872.89	0	3872.89	2507.39	2507.39	2507.39	39.5955	2467.8	2467.8
Naphthalene	0	0	0	0	0	0	0	0	0	3977.61	198.881	198.881	198.881	1278.38	1265.59	1265.59	0	1265.59	186.097	186.097	186.097	141.973	44.1134	44.1134
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	6.0849	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	784.944	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetaldehyde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	431	432	433	434	435	441	443	445	447	448	449	450	451	452	453	456	471	472	473	474	490	491	493	495
Temp F	120	120	707	707	707	950	1652	1389.21	300.001	150	110	110	120	120	60.0217	655.031	203.335	150	249.847	150	60	124.488	111.107	1800
Pres psia	445	445	445	440	440	437	422	421	421	421	418.5	418.5	413.5	413.5	22	440	600	600	915	915	14.696	20	20	20
Enth MMBtu/h	0	-697.36	-639.53	-0.06147	-639.47	-1683.5	-1436.9	-1498	-1837.5	-1928.7	-1942	-775.24	-232.64	-542.85	-542.85	-1744.8	-225.61	-230.12	-221.59	-230.11	-1.507	4.1197	-81.03	-328.82
Vapor mass fraction	0	0.99918	1	1	1	1	1	1	0.73847	0.62026	0.61558	1	1	0.99549	0.99792	1	1	1	1	1	1	1	1	1
Total lb/h	0	248775	248775	106.887	248668	447879	447879	447879	447879	447879	447879	275708	135204	140504	140504	447879	135204	135204	135204	135204	360534	360534	403977	403977
Flowrates in lb/h																								
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	83974	83974	83974	10570.9
Nitrogen	0	838.459	838.459	0	838.459	838.459	838.459	838.459	838.459	838.459	838.459	838.459	838.459	0	0	838.459	838.459	838.459	838.459	838.459	276560	276560	277291	277270
Argon	0	154.109	154.109	0	154.109	154.109	154.109	154.109	154.109	154.109	154.109	154.103	154.103	0	0	154.109	154.103	154.103	154.103	154.103	0	0	132.257	132.257
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	8375.24	8375.24	0	8375.24	8375.24	15275.8	15275.8	15275.8	15275.8	15275.8	15275.7	15275.7	0	0	8375.24	15275.7	15275.7	15275.7	15275.7	0	0	2970.43	0.0011
Carbon Monoxide	0	82524.4	82524.4	0	82524.4	82524.4	100041	100041	100041	100041	100041	100041	100041	0	0	82524.4	100041	100041	100041	100041	0	0	18568.4	0.0157
Carbon Dioxide	0	135338	135338	0	135338	135338	156029	156029	156029	156029	156029	155051	15505.1	139546	139546	135338	15505.1	15505.1	15505.1	15505.1	0	0	9908.94	70436
Methane	0	17066.5	17066.5	0	17066.5	17066.5	3389.91	3389.91	3389.91	3389.91	3389.91	3389.86	3389.86	0	0	17066.5	3389.86	3389.86	3389.86	3389.86	0	0	3151.01	0.0002
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0	519.453	519.453	0	519.453	519.453	0.0456	0.0456	0.0456	0.0456	0.0456	0.0456	0.0456	0	0	519.453	0.0456	0.0456	0.0456	0.0456	0	0	11.5483	0.0004
Ethane	0	194.488	194.488	0	194.488	194.488	0.0997	0.0997	0.0997	0.0997	0.0997	0.0997	0.0997	0	0	194.488	0.0997	0.0997	0.0997	0.0997	0	0	29.2772	0.0004
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1523.62	0.0006
Water	0	1145.16	1145.16	0	1145.16	200356	172152	172152	172152	172152	172152	957.713	0	957.713	957.713	200356	0	0	0	0	0	0	17.9567	45524
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	34.8084	34.8084	34.8084	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia	0	72.0787	72.0787	72.0787	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	2467.8	2467.8	0	2467.8	2467.8	0	0	0	0	0	0	0	0	0	2467.8	0	0	0	0	0	0	0.1168	0.0009
Naphthalene	0	44.1134	44.1134	0	44.1134	44.1134	0	0	0	0	0	0	0	0	0	44.1134	0	0	0	0	0	0	0.1234	0.0012
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43.0564
Methanol	0	0	0	0	0	0	0.047	0.047	0.047	0.047	0.047	0.0026	0.0026	0	0	0	0.0026	0.0026	0.0026	0.0026	0	0	874.154	0.0005
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14.4982	0.0006
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3021.54	0.0007
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	901.71	0.0007
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	503.977	0.0007
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	894.732	0.0008
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61.8165	0.0008
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	107.014	0.0008
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4545	0.0008
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.2025	0.0009
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5313	0.0009
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.1139	0.0009
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0266	0.0009
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2127	0.0009
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1173	0.001
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0701	0.0009
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0557	0.001
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.049	0.001
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0297	0.001
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0268	0.001
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.9805	0.0009
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0783	0.001
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0019	0.0011
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0.0011
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0035	0.0011
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0002	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0003	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0059	0.0012
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8467	0.0009
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2105	0.0009
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0037	0.001
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0052	0.001
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0066	0.001
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0734	0.001

Stream No.	496	497	498	499	505	517	518	519	520	523	524	527	528	535	536	537	538	539	540	541	542	543	702	703
Temp F	1323.16	815.126	302.301	319.646	500	500	226.241	150	110	110	110	112.175	112.175	110	142.156	420	122.697	482	110	110	110	104.02	525.008	525.008
Pres psia	17	16	15	16	840	840	835	825	820	820	820	415	415	820	900	895	820	890	820	820	820	90	850	850
Enth MMBtu/h	-390.14	-451.72	-509.52	-507.64	-902.28	-902.28	-976.64	-1028.8	-1046.3	-730.7	-315.58	-0.50296	-315.08	-650.32	-875.33	-800.97	-880.43	-784.19	-80.377	0.00766	-80.39	-80.39	-852.13	-1847.6
Vapor mass fraction	1	1	1	1	1	1	0.97278	0.81782	0.78767	1	0	1	0	1	1	1	1	1	1	1	0.99978	1	0.99	0.99
Total lb/h	403977	403977	403977	403977	452232	452232	452232	452232	452232	356207	96024.4	213.854	95810.6	317025	452231	452231	452231	452231	39182.8	60.474	39122.3	39122.3	150000	325232
Flowrates in lb/h																								
Oxygen	10570.8	10570.8	10570.8	10570.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	277270	277270	277270	277270	7584.12	7584.12	7584.12	7584.12	7584.12	7579.38	4.7334	2.7956	1.9377	6745.65	7584.12	7584.12	7584.12	7584.12	833.732	0	833.732	833.732	0	0
Argon	132.257	132.257	132.257	132.257	1375.03	1375.03	1375.03	1375.03	1375.03	1371.82	3.2065	0.8808	2.3258	1220.92	1375.03	1375.03	1375.03	1375.03	150.9	0	150.9	150.9	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0.0011	0.0011	0.0011	0.0011	31158.2	31158.2	31158.2	31158.2	31158.2	31139.8	18.3349	11.0668	7.2681	27714.4	42990.1	42990.1	42990.1	42990.1	3425.38	60.474	3364.91	3364.91	0	0
Carbon Monoxide	0.0157	0.0157	0.0157	0.0157	193056	193056	193056	193056	193056	192821	234.612	99.1957	135.416	171611	271653	271653	271653	271653	21210.3	0	21210.3	21210.3	0	0
Carbon Dioxide	70436.3	70436.3	70436.3	70436.3	86761.7	86761.7	86761.7	86761.7	86761.7	84307.8	2453.86	71.5538	2382.31	75034	90539.7	90539.7	90539.7	90539.7	9273.86	0	9273.86	9273.86	0	0
Methane	0.0002	0.0002	0.0002	0.0002	29998.1	29998.1	29998.1	29998.1	29998.1	29896.8	101.324	20.9277	80.3959	26608.1	29998.1	29998.1	29998.1	29998.1	3288.65	0	3288.65	3288.65	0	0
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0.0004	0.0004	0.0004	0.0004	0.372	0.372	0.372	0.372	0.372	0.3668	0.0052	0.0003	0.0049	0.3264	0.372	0.372	0.372	0.372	0.0403	0	0.0403	0.0403	0	0
Ethane	0.0004	0.0004	0.0004	0.0004	0.8136	0.8136	0.8136	0.8136	0.8136	0.8021	0.0115	0.0007	0.0109	0.7139	0.8136	0.8136	0.8136	0.8136	0.0882	0	0.0882	0.0882	0	0
Propane	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	45524	45524	45524	45524	1579.02	1579.02	1579.02	1579.02	1579.02	36.5621	1542.46	0.032	1542.42	32.5402	32.5402	32.5402	32.5402	32.5402	4.0218	0	4.0218	4.0218	150000	325232
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	0.0012	0.0012	0.0012	0.0012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	43.0562	43.0562	43.0562	43.0562	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0.0005	0.0005	0.0005	0.0005	100719	100719	100719	100719	100719	9052.71	91665.9	7.4001	91658.5	8056.92	8056.94	8056.94	8056.94	8056.94	995.799	0	995.799	995.799	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0.0006	0.0006	0.0006	0.0006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0.0007	0.0007	0.0007	0.0007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0.0007	0.0007	0.0007	0.0007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0.0007	0.0007	0.0007	0.0007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0.0008	0.0008	0.0008	0.0008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0.0008	0.0008	0.0008	0.0008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0.0008	0.0008	0.0008	0.0008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0.0008	0.0008	0.0008	0.0008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0.0011	0.0011	0.0011	0.0011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0.0011	0.0011	0.0011	0.0011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0.0011	0.0011	0.0011	0.0011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0.0012	0.0012	0.0012	0.0012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0.0009	0.0009	0.0009	0.0009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0.001	0.001	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	704	706	707	708	710	712	715	718	719	720	721	725	731	732	734	736	741	745	751	761	762	770	771	773
Temp F	525.008	525.008	525.008	525.008	525.008	525.006	175.579	525.006	200	900	900	899.968	743.513	743.513	743.513	743.513	287	287	116.755	116.755	116.882	60	72.9587	456
Pres psia	850	850	850	850	850	850	35	850	850	850	849	849	450	450	450	450	35	35	1.5	1.5	35	60	60	450
Enth MMBtu/h	-2742	-2711.3	-1349.5	-1361.8	-30.665	0	0	-30.665	-32.371	-1288.5	-1300.2	-2588.7	-2622.1	-99.201	-106.7	-2416.2	-2505.3	-165	-2408.9	-2791.2	-2791.2	-901.18	-899.47	-116.27
Vapor mass fraction	0.98999	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	0.90484	1.00E-06	0	0	0	0
Total lb/h	482669	477839	237839	240000	4829.71	0	0	4829.71	4829.71	237840	240000	477840	477840	18078	19444	440318	440318	29000	411318	411318	411318	131697	131697	18078
Flowrates in lb/h																								
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Argon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Monoxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	482669	477839	237839	240000	4829.71	0	0	4829.71	4829.71	237840	240000	477840	477840	18078	19444	440318	440318	29000	411318	411318	411318	131697	131697	18078
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	774	775	778	781	782	783	784	785	800	848	893	1602	1603	1605	1702	1748	1830	1831	1835	1836	1841	1842	1844	1845
Temp F	456.586	456.586	175.579	177.155	177.155	180.314	177.155	174.635	525.008	117.994	40.8126	58.9967	58.9967	58.9967	115.038	110	90	110	90	110	90	110	90	105
Pres psia	450	450	35	450	450	1280.8	450	450	850	110	100	90	90	90	324	418.5	60	60	60	60	65	65	65	65
Enth MMBtu/h	-23.331	-139.6	-3995.2	-3994.3	-3246.2	-3244.7	-748.1	-748.38	-42.248	-7.7953	-9.032	-97.72	-12.57	-85.15	-583.42	-1166.8	-14803	-14760	-2628.4	-2620.7	-4529.8	-4516.5	-3490.4	-3482.7
Vapor mass fraction	0.39969	0.06883	0	0	0	0	0	0	0.99	0	0.99504	1	1	1	0	0	0	0	0	0	0	0	0	0
Total lb/h	3809	21887	593902	593902	482669	482669	111233	111233	7437	7613.61	2905.85	49855.6	6413.09	43442.6	86450.6	172172	2172838	2172838	385802	385802	664899	664899	512328	512328
Flowrates in lb/h																								
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	0	0	0	0	0	0	1.573	838.101	107.808	730.293	0.0545	0.0006	0	0	0	0	0	0	0	0
Argon	0	0	0	0	0	0	0	0	0	0	0	151.781	19.5241	132.257	0.0286	0.0058	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	0	0	0	0	32.9603	3408.93	438.502	2970.43	1.0497	0.048	0	0	0	0	0	0	0	0
Carbon Monoxide	0	0	0	0	0	0	0	0	0	0	0	21309.5	2741.12	18568.4	11.3586	0.1423	0	0	0	0	0	0	0	0
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	2026.3	11371.7	1462.78	9908.94	403.144	977.655	0	0	0	0	0	0	0	0
Methane	0	0	0	0	0	0	0	0	0	0	306.601	3616.17	465.16	3151.01	2.8361	0.0521	0	0	0	0	0	0	0	0
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	0	0	0	0	13.2124	13.2531	1.7048	11.5483	1.1755	0	0	0	0	0	0	0	0	0
Ethane	0	0	0	0	0	0	0	0	0	0	33.5102	33.5991	4.322	29.2772	0.3746	0	0	0	0	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	0	1426.05	322.495	1748.54	224.921	1523.62	0	0	0	0	0	0	0	0	0	0
Water	3809	21887	593902	593902	482669	482669	111233	111233	7437	0	16.5537	20.6075	2.6508	17.9567	85638.2	171194	2172838	2172838	385802	385802	664899	664899	512328	512328
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2476	0	0	0	0	0	0	0	0	0
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	321.668	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.5294	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	0.0001	0.1339	0.134	0.0172	0.1168	39.1201	0	0	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	0	0.1416	0.1416	0.0182	0.1234	12.7838	0	0	0	0	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	0	0	0	0	0	0	0	0	0	1003.2	129.045	874.154	0	0.0445	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	9.8801	6.7583	16.6385	2.1403	14.4982	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	3414.58	53.0092	3467.59	446.047	3021.54	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	1014.89	19.9358	1034.82	133.113	901.71	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	565.21	13.1659	578.376	74.3983	503.977	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	994.13	32.6839	1026.81	132.083	894.732	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	65.4496	5.4924	70.9419	9.1255	61.8165	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	116.463	6.3486	122.811	15.7976	107.014	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0.1416	0.38	0.5216	0.0671	0.4545	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0.3432	3.3321	3.6753	0.4728	3.2025	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0.0114	1.7459	1.7573	0.2261	1.5313	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0.0056	2.4205	2.426	0.3121	2.1139	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0.0016	1.1766	1.1782	0.1516	1.0266	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0.244	0.2441	0.0314	0.2127	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0.1346	0.1346	0.0173	0.1173	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0.0805	0.0805	0.0104	0.0701	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0.064	0.064	0.0082	0.0557	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0.0563	0.0563	0.0072	0.049	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0.0341	0.0341	0.0044	0.0297	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0.0307	0.0307	0.004	0.0268	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	6.4443	2.7144	9.1587	1.1781	7.9805	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0.0898	0.0898	0.0116	0.0783	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0.0022	0.0022	0.0003	0.0019	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0.0081	0.0081	0.001	0.007	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0.004	0.004	0.0005	0.0035	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0.0002	0.0002	0	0.0002	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0.0004	0.0004	0	0.0003	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0.0068	0.0068	0.0009	0.0059	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0.0214	0.9503	0.9717	0.125	0.8467	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0.2416	0.2416	0.0311	0.2105	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0.0043	0.0043	0.0006	0.0037	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0.0059	0.0059	0.0008	0.0052	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0.0076	0.0076	0.001	0.0066	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	1.2318	1.2318	0.1585	1.0734	0	0	0	0	0	0	0	0	0	0

Stream No.	1850	1851	1929	1930	1931	1935	1936	1938	1940	1941	1942	1943	1944	1945	1947	1948	1949	1950	1952	1953	1954	1955	1956	1980
Temp F	90	110	456.586	456.588	456.588	181	400	525.008	715	456.586	456.586	456.588	525.01	900	525.01	900	178	525.008	456.584	456.586	456.586	715	456.586	456.586
Pres psia	65	60	450	450	450	850	850	850	450	450	450	450	850	850	850	849	850	850	450	450	450	450	450	450
Enth MMBtu/h	-5954.5	-5937	-236.59	-236.59	-236.59	-1008.3	-974.17	-852.13	-789.81	-23.333	-24.494	-315.55	-1349.5	-1288.5	-1361.8	-1300.2	-2187.1	-1847.6	-1003.3	-885.23	-630.21	-99.484	-116.26	-56.499
Vapor mass fraction	0	0	1	1	1	0	0	0.99	1	0.39969	0.001	1	1	1	1	1	0	0.99	0	0.98994	1	1	1.00E-06	1
Total lb/h	874013	874013	41754	41753.8	41753.8	150000	150000	150000	143523	3809.25	3809.25	55688	237840	237840	240000	240000	325232	325232	156014	156014	111220	18078.2	18078.2	9971
Flowrates in lb/h																								
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Argon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Monoxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	874013	874013	41754	41753.8	41753.8	150000	150000	150000	143523	3809.25	3809.25	55688	237840	237840	240000	240000	325232	325232	156014	156014	111220	18078.2	18078.2	9971
Sulphur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonyl Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HydrogenChloride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silicon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid Poplar Ch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen Cyanide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitric Oxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

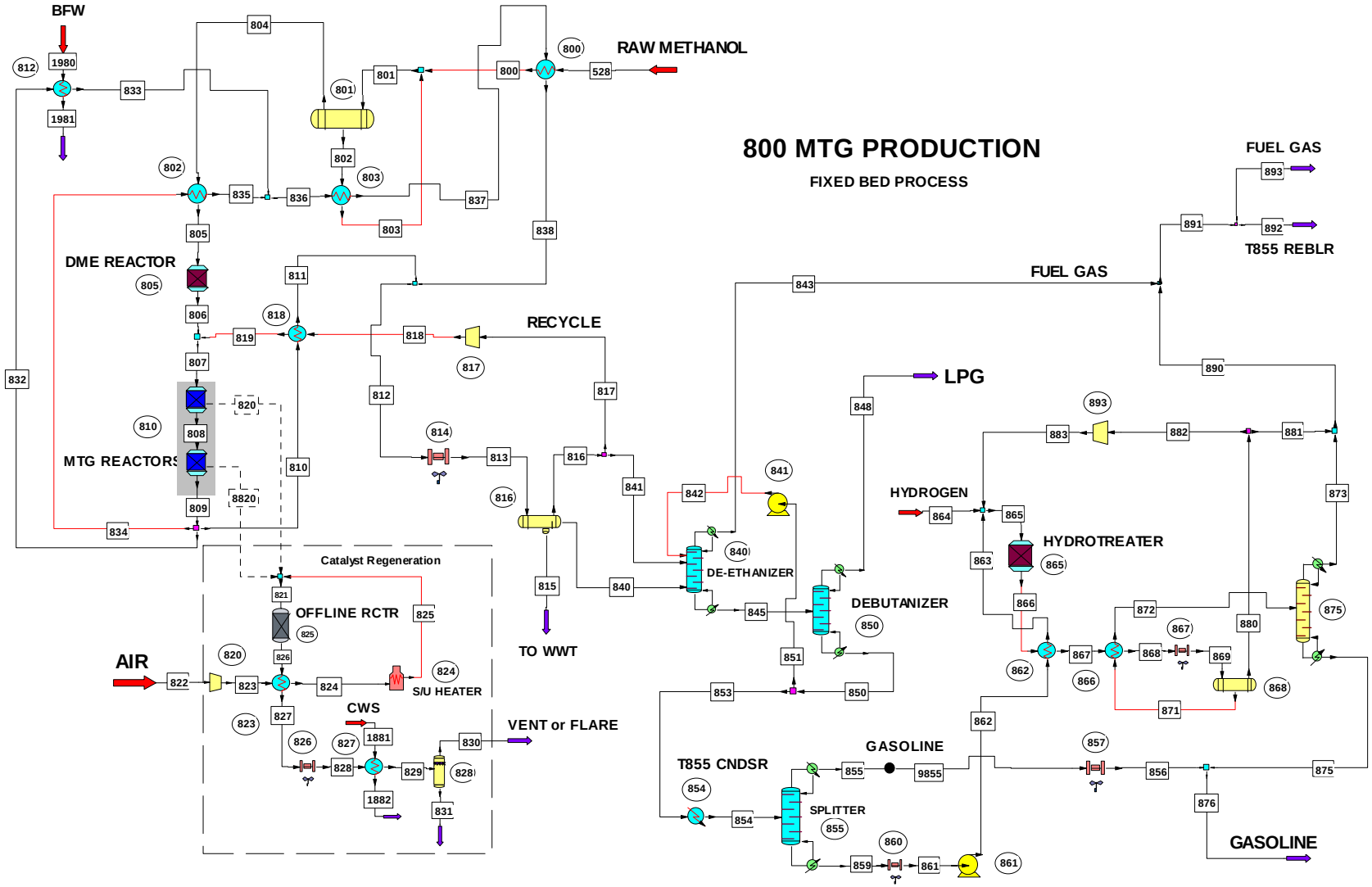

Figure B-2 Process Flows Diagram for the Directly-heated Gasifier Case – Gasoline Production

Table B-2 Steam Results for the Directly-heated Gasifier Case – Gasoline Production

Stream No.	528	800	801	802	803	804	805	806	807	808	809	810	811	812	813	815	816	817	818	819	820	821	822	823	824	825
Temp F	112.175	200	354.081	354.081	358.097	354.081	600	757.725	612.856	616.188	707.248	707.248	198.771	227.667	110	110	110	110	169.619	600	616.188	574.528	70	102.76	572	572
Pres psia	415	415	400	400	400	400	400	385	385	330	300	300	300	300	300	300	300	300	400	400	330	17	15	17	17	17
Enth MMBtu/h	-311.75	-305.81	-667.44	-404.38	-361.63	-263.06	-252.42	-252.42	-2884.3	-2884.3	-2884.3	-1874.8	-2053.9	-3130.5	-3220.6	-355.89	-2827.7	-2823.6	-2810.8	-2631.8	0.00268	2.1224	-0.02947	0.10334	2.0792	2.0792
Vapor mass fraction	0	0	0.41586	0	0.98993	1	1	1	1	1	1	1	0.96916	0.98663	0.91566	0	1	1	1	1	0	1	1	1	1	1
Total lb/h	95673.2	95673.2	230060	134387	134387	95672.8	95672.8	95672.8	1114626	1114606	1114371	724341	724341	1114373	1114373	52452.3	1020385	1018913	1018913	1018939	19.1199	17405	17149.1	17149.1	17149.1	17149.1
Flowrates in lb/h																										
Methanol	91658.8	91658.8	225193	133534	133534	91658.4	91658.4	9165.84	9165.84	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0	0.0002	0.0002	0.0002	0.0001	0	0	0	0	0	0
Water	1542.41	1542.41	2158.17	615.756	615.756	1542.41	1542.41	24732.3	27176.8	32291.1	54922.1	35699.4	35699.4	54922.2	54922.2	52452.3	2448.04	2444.51	2444.51	2444.51	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19.1199	255.915	0	0	0	0
Hydrogen	7.268	7.268	7.5149	0.2469	0.2469	7.268	7.268	7.268	5248.07	5248.68	5252.3	3414	3414	5252.19	5252.19	0	5250.41	5242.84	5242.84	5241.73	0	0	0	0	0	0
Carbon Dioxide	2382.37	2382.37	2616.52	234.162	234.162	2382.36	2382.36	2382.36	586437	586485	587168	381659	381659	587170	587170	0	584874	584030	584030	584054	0	0	0	0	0	0
Methane	80.3967	80.3967	83.2943	2.8977	2.8977	80.3966	80.3966	80.3966	163231	163269	163634	106362	106362	163634	163634	0	163385	163149	163149	163147	0	0	0	0	0	0
Ethylene	0.0049	0.0049	0.0054	0.0004	0.0004	0.0049	0.0049	0.0049	3052.56	3054.47	3072.68	1997.24	1997.24	3072.69	3072.69	0	3056.71	3052.31	3052.31	3052.38	0	0	0	0	0	0
Ethane	0.0109	0.0109	0.0118	0.0009	0.0009	0.0109	0.0109	0.0109	5790.97	5795.74	5841.29	3796.84	3796.84	5841.31	5841.31	0	5798.68	5790.32	5790.32	5790.55	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	957.524	959.44	977.646	635.47	635.47	977.649	977.649	0	958.81	957.427	957.427	957.462	0	0	0	0	0	0
Propane	0	0	0	0	0	0	0	0	79998	80179.5	81910.1	53241.6	53241.6	81910.4	81910.4	0	80105.5	79990	79990	79992.8	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	0	0	69344.5	69679	72867	47363.5	47363.5	72867.1	72867.1	0	69439.4	69339.2	69339.2	69341	0	0	0	0	0	0
N-Butane	0	0	0	0	0	0	0	0	17676	17790.7	18883.7	12274.4	12274.4	18883.8	18883.8	0	17700.4	17674.9	17674.9	17675.3	0	0	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	9542.76	9614.45	10297.6	6693.41	6693.41	10297.6	10297.6	0	9556.01	9542.23	9542.23	9542.41	0	0	0	0	0	0
I-Pentane	0	0	0	0	0	0	0	0	27042.6	27425	31068.4	20194.4	20194.4	31068.4	31068.4	0	27081	27042	27042	27042.2	0	0	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	5879.33	5984.46	6986.38	4541.15	4541.15	6986.39	6986.39	0	5887.76	5879.27	5879.27	5879.29	0	0	0	0	0	0
Trans-2-Pentene	0	0	0	0	0	0	0	0	6494.62	6618.97	7711.98	5012.78	5012.78	7711.98	7711.98	0	6503.93	6494.55	6494.55	6494.57	0	0	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	697.347	716.467	898.645	584.119	584.119	898.645	898.645	0	698.362	697.355	697.355	697.352	0	0	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	6354.32	6521.58	8115.57	5275.12	5275.12	8115.57	8115.57	0	6363.58	6354.4	6354.4	6354.37	0	0	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	4866.02	5033.28	6627.27	4307.73	4307.73	6627.27	6627.27	0	4873.17	4866.14	4866.14	4866.1	0	0	0	0	0	0
2-Methylpentane	0	0	0	0	0	0	0	0	4556.68	4723.93	6317.93	4106.65	4106.65	6317.93	6317.93	0	4563.38	4556.8	4556.8	4556.76	0	0	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	4153.92	4321.18	5915.17	3844.86	3844.86	5915.17	5915.17	0	4160.05	4154.05	4154.05	4154	0	0	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	1161.4	1256.99	1803.52	1172.29	1172.29	1803.52	1803.52	0	1163.12	1161.45	1161.45	1161.43	0	0	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	646.399	687.728	1046.57	680.269	680.269	1046.57	1046.57	0	647.351	646.417	646.417	646.411	0	0	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	1032.66	1104.34	1787.45	1161.84	1161.84	1787.45	1787.45	0	1034.19	1032.7	1032.7	1032.69	0	0	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	561.275	609.066	973.421	632.723	632.723	973.421	973.421	0	562.108	561.297	561.297	561.289	0	0	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	751.509	823.195	1506.3	979.096	979.096	1506.3	1506.3	0	752.629	751.543	751.543	751.531	0	0	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	709.077	780.763	1463.87	951.515	951.515	1463.87	1463.87	0	710.133	709.109	709.109	709.098	0	0	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	571.545	643.231	1326.34	862.119	862.119	1326.34	1326.34	0	572.395	571.57	571.57	571.561	0	0	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	475.012	570.593	1117.13	726.132	726.132	1117.13	1117.13	0	475.716	475.03	475.03	475.023	0	0	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	3636.18	3722.2	4450.85	2893.05	2893.05	4450.85	4450.85	0	3641.43	3636.18	3636.18	3636.18	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	1533.55	1791.62	4032.31	2621	2621	4032.31	4032.31	0	1535.81	1533.6	1533.6	1533.58	0	0	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	232.484	280.275	735.719	478.217	478.217	735.719	735.719	0	232.829	232.493	232.493	232.49	0	0	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	212.001	259.791	715.235	464.903	464.903	715.236	715.236	0	212.314	212.008	212.008	212.006	0	0	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	185.306	234.013	689.458	448.147	448.147	689.458	689.458	0	185.58	185.313	185.313	185.31	0	0	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	2382.68	2468.7	3197.36	2078.28	2078.28	3197.35	3197.35	0	2386.18	2382.74	2382.74	2382.72	0	0	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	239.15	346.344	1277.04	830.076	830.076	1277.04	1277.04	0	239.5	239.155	239.155	239.152	0	0	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	506.767	742.989	2794.03	1816.12	1816.12	2794.03	2794.03	0	507.509	506.777	506.777	506.772	0	0	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	173.755	270.867	1114.03	724.12	724.12	1114.03	1114.03	0	174.009	173.758	173.758	173.756	0	0	0	0	0	0
M-Ethyltoluene	0	0	0	0	0	0	0	0	47.608	98.011	535.664	348.182	348.182	535.665	535.665	0	47.6775	47.6087	47.6087	47.6084	0	0	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	1165.83	1251.85	1798.38	1168.95	1168.95	1798.38	1798.38	0	1167.56	1165.87	1165.87	1165.86	0	0	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	59302.6	59302.6	59302.6	0.0017	0.0011	0.0011	0.0018	0.0018	0	0.0017	0.0017	0.0017	0.0023	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	0	0	93.3972	234.524	1459.89	948.931	948.931	1459.9	1459.9	0	93.5332	93.3984	93.3984	93.3979	0	0	0	0	0	0
1-2-4-5-TetMthBz	0	0	0	0	0	0	0	0	8.7799	54.1416	448.03	291.219	291.219	448.03	448.03	0	8.7926	8.7799	8.7799	8.7799	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	5.2371	29.7007	266.022	172.914	172.914	266.022	266.022	0	5.2447	5.2371	5.2371	5.2371	0	0	0	0	0	0
2-MthNaphthalene	0	0	0	0	0	0	0	0	0.2521	4.2851	39.2736	25.5278	25.5278	39.2736	39.2736	0	0.2524	0.2521	0.2521	0.2521	0	0	0	0	0	0
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3994.28	3994.28	3994.28	3994.28	3994.28
Nitrogen	1.9377	1.9377	1.9944	0.0567	0.0567	1.9377	1.9377	1.9377	1325.98	1325.98	1325.98	861.886	861.886	1326	1326	0	1325.37	1323.46	1323.46	1323.72	0	13154.8	13154.8	13154.8	13154.8	13154.8
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	826	827	828	829	830	831	832	833	834	835	836	837	838	840	841	842	843	845	848	850	851	853	854	855	856	859
Temp F	1350.35	930.346	150	110	110	110	707.248	650	707.248	504.187	609.411	361.052	323.418	110	110	291.848	19.9982	262.052	118.613	290.641	290.641	290.641	496.713	166.717	149	443.08
Pres psia	7	7	7	7	7	7	300	300	300	300	300	300	300	300	300	200	165	172	110	110	110	110	110	25	25	25
Enth MMBtu/h	2.1224	0.14654	-3.2682	-3.436	-3.436	0	-721.08	-728.85	-288.43	-299.08	-1027.9	-1070.7	-1076.6	-36.992	-4.0775	-3.2539	-14.076	-26.834	-7.7284	-19.256	-3.2587	-15.997	-8.997	-18.23	-18.519	0.08132
Vapor mass fraction	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	1	0	0	0
Total lb/h	17405	17405	17405	17405	17405	0	278593	278593	111437	111440	390033	390033	390033	41536.9	1471.41	6301.26	4500.54	44809	7574.79	37234.2	6301.26	30933	30933	30215.9	30215.9	717.115
Flowrates in lb/h																										
Methanol	0	0	0	0	0	0	0.0001	0.0001	0	0	0.0001	0.0001	0.0001	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	13730.5	13730.5	5492.21	5492.28	19222.8	19222.8	19222.8	21.8414	3.5301	0	25.3715	0	0	0	0	0	0	0	0	0
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	0	0	0	1313.08	1313.08	525.23	525.117	1838.19	1838.19	1838.19	1.7774	7.5712	0	9.3485	0	0	0	0	0	0	0	0	0
Carbon Dioxide	937.71	937.71	937.71	937.71	937.71	0	146792	146792	58716.8	58719.4	205511	205511	205511	2296.59	843.397	0	3139.98	0	0	0	0	0	0	0	0	0
Methane	0	0	0	0	0	0	40908.4	40908.4	16363.4	16363.1	57271.6	57271.6	57271.6	248.961	235.603	0	484.565	0	0	0	0	0	0	0	0	0
Ethylene	0	0	0	0	0	0	768.17	768.17	307.268	307.274	1075.44	1075.44	1075.44	15.9708	4.4078	0	20.3786	0	0	0	0	0	0	0	0	0
Ethane	0	0	0	0	0	0	1460.32	1460.32	584.129	584.149	2044.47	2044.47	2044.47	42.6248	8.3618	0	50.9866	0	0	0	0	0	0	0	0	0
Propylene	0	0	0	0	0	0	244.412	244.412	97.7646	97.7678	342.179	342.179	342.179	18.8394	1.3826	0	11.4069	8.8151	8.8151	0	0	0	0	0	0	0
Propane	0	0	0	0	0	0	20477.5	20477.5	8191.01	8191.27	28668.8	28668.8	28668.8	1804.9	115.513	0	536.619	1383.79	1383.8	0.0001	0	0	0	0	0	0
I-Butane	0	0	0	0	0	0	18216.7	18216.7	7286.69	7286.87	25503.6	25503.6	25503.6	3427.72	100.133	5.8439	86.8526	3446.84	3412.31	34.5315	5.8439	28.6876	28.6876	28.6876	28.6876	0
N-Butane	0	0	0	0	0	0	4720.93	4720.93	1888.37	1888.41	6609.34	6609.34	6609.34	1183.33	25.5243	33.2291	28.8512	1213.24	1016.89	196.351	33.2291	163.122	163.122	163.122	163.122	0
Cis-2-Butene	0	0	0	0	0	0	2574.39	2574.39	1029.76	1029.77	3604.16	3604.16	3604.16	741.564	13.7799	34.334	20.1023	769.578	566.698	202.88	34.334	168.546	168.546	168.546	168.546	0
I-Pentane	0	0	0	0	0	0	7767.09	7767.09	3106.84	3106.87	10874	10874	10874	3987.39	39.0512	607.618	46.3592	4587.69	997.274	3590.42	607.618	2982.8	2982.8	2982.8	2982.8	0
N-Pentane	0	0	0	0	0	0	1746.6	1746.6	698.638	698.643	2445.24	2445.24	2445.24	1098.62	8.4902	210.493	8.3227	1309.28	65.4751	1243.81	210.493	1033.32	1033.32	1033.31	1033.31	0
Trans-2-Pentene	0	0	0	0	0	0	1927.99	1927.99	771.198	771.203	2699.2	2699.2	2699.2	1208.05	9.3788	222.351	9.3275	1430.45	116.572	1313.88	222.351	1091.53	1091.53	1091.53	1091.53	0
Cyclopentane	0	0	0	0	0	0	224.661	224.661	89.8645	89.8646	314.526	314.526	314.526	200.282	1.007	40.8575	0.5774	241.57	0.1416	241.428	40.8575	200.57	200.57	200.57	200.57	0
2-2-DiMth-Butane	0	0	0	0	0	0	2028.89	2028.89	811.557	811.558	2840.45	2840.45	2840.45	1751.99	9.1764	357.666	5.0396	2113.8	0.3434	2113.45	357.666	1755.79	1755.79	1755.79	1755.79	0
2-3-DiMth-Butane	0	0	0	0	0	0	1656.82	1656.82	662.727	662.727	2319.54	2319.54	2319.54	1754.1	7.0272	358.214	2.6404	2116.7	0.0115	2116.69	358.214	1758.48	1758.48	1758.48	1758.48	0
2-Methylpentane	0	0	0	0	0	0	1579.48	1579.48	631.793	631.792	2211.27	2211.27	2211.27	1754.55	6.5805	358.303	2.2089	2117.22	0.0056	2117.22	358.303	1758.91	1758.91	1758.91	1758.91	0
3-Methylpentane	0	0	0	0	0	0	1478.79	1478.79	591.517	591.516	2070.31	2070.31	2070.31	1755.12	5.9989	358.39	1.7783	2117.73	0.0016	2117.73	358.39	1759.34	1759.34	1759.34	1759.34	0
MthCyclopentane	0	0	0	0	0	0	450.88	450.88	180.352	180.352	631.232	631.232	631.232	640.394	1.6772	130.719	0.3698	772.421	0	772.421	130.719	641.702	641.702	641.702	641.702	0
Benzene	0	0	0	0	0	0	261.642	261.642	104.657	104.657	366.299	366.299	366.299	399.217	0.9335	81.4718	0.2037	481.418	0.0001	481.419	81.4718	399.947	399.947	399.946	399.946	0
2-4-DiMthPentane	0	0	0	0	0	0	446.863	446.863	178.745	178.745	625.607	625.607	625.607	753.256	1.4913	153.706	0.203	908.25	0	908.251	153.706	754.545	754.545	754.545	754.545	0
Cyclohexane	0	0	0	0	0	0	243.355	243.355	97.3421	97.3419	340.697	340.697	340.697	411.313	0.8106	83.9275	0.122	495.929	0	495.929	83.9275	412.002	412.002	412.001	412.001	0
2-Methylhexane	0	0	0	0	0	0	376.576	376.576	150.63	150.63	527.206	527.206	527.206	753.674	1.0853	153.73	0.0963	908.393	0	908.393	153.73	754.663	754.663	754.663	754.663	0
3-Methylhexane	0	0	0	0	0	0	365.968	365.968	146.387	146.387	512.355	512.355	512.355	753.737	1.024	153.733	0.0848	908.41	0	908.41	153.733	754.677	754.677	754.677	754.677	0
2-2-4-TriMth-C5	0	0	0	0	0	0	331.584	331.584	132.634	132.634	464.219	464.219	464.219	753.943	0.8254	153.741	0.0513	908.458	0	908.458	153.741	754.717	754.717	754.717	754.717	0
MthCyclohexane	0	0	0	0	0	0	279.282	279.282	111.713	111.713	390.994	390.994	390.994	641.41	0.686	130.79	0.0464	772.84	0	772.84	130.79	642.05	642.05	642.05	642.05	0
33-2Mth-1-Butene	0	0	0	0	0	0	1112.71	1112.71	445.085	445.087	1557.8	1557.8	1557.8	809.419	5.251	163.805	4.1095	974.365	6.4406	967.926	163.805	804.121	804.121	804.121	804.121	0
Toluene	0	0	0	0	0	0	1008.08	1008.08	403.231	403.233	1411.31	1411.31	1411.31	2496.5	2.2147	508.977	0.1363	3007.55	0	3007.56	508.977	2498.58	2498.58	2498.58	2498.58	0
2-3-3-TriMth-C5	0	0	0	0	0	0	183.93	183.93	73.5719	73.5723	257.502	257.502	257.502	502.891	0.3357	102.508	0.0114	605.724	0	605.724	102.508	503.215	503.215	503.215	503.215	0
2-3-DiMth-Hexane	0	0	0	0	0	0	178.809	178.809	71.5235	71.524	250.333	250.333	250.333	502.922	0.3062	102.509	0.0089	605.728	0	605.728	102.509	503.219	503.219	503.219	503.219	0
3-Methylheptane	0	0	0	0	0	0	172.364	172.364	68.9457	68.9463	241.311	241.311	241.311	503.878	0.2676	102.697	0.0064	606.836	0	606.836	102.697	504.139	504.139	504.139	504.139	0
23-2Mth-1-Butene	0	0	0	0	0	0	799.339	799.339	319.736	319.735	1119.07	1119.07	1119.07	811.178	3.4409	165.646	1.438	978.827	0.0214	978.806	165.646	813.16	813.16	813.159	813.159	0
P-Xylene	0	0	0	0	0	0	319.26	319.26	127.704	127.705	446.965	446.965	446.965	1037.54	0.3454	211.423	0.0061	1249.3	0	1249.3	211.423	1037.88	1037.88	1037.88	1037.88	0
M-Xylene	0	0	0	0	0	0	698.507	698.507	279.403	279.406	977.913	977.913	977.913	2286.52	0.7318	465.927	0.0122	2753.17	0	2753.17	465.927	2287.24	2287.24	2287.24	2287.24	0
O-Xylene	0	0	0	0	0	0	278.508	278.508	111.403	111.404	389.912	389.912	389.912	940.024	0.2509	191.54	0.0034	1131.81	0	1131.81	191.54	940.272	940.272	940.273	940.273	0
M-Ethyltoluene	0	0	0	0	0	0	133.916	133.916	53.5664	53.567	187.483	187.483	187.483	487.988	0.0688	99.4204	0.0004	587.476	0	587.477	99.4204	488.056	488.056	488.055	488.055	0.0001
23-2Mth-2-Butene	0	0	0	0	0	0	449.595	449.595	179.838	179.838	629.433	629.433	629.433	630.824	1.6836	128.772	0.3651	760.914	0	760.914	128.772	632.143	632.143	632.143	632.143	0
Dimethyl Ether	0	0	0	0	0	0	0.0004	0.0004	0.0002	0.0002	0.0007	0.0007	0.0007	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0	0	0	0	0	0	364.973	364.973	145.989	145.991	510.964	510.964	510.964	1366.36	0.1349	278.365	0.0005	1644.86	0	1644.86	278.365	1366.5	1366.5	1366.49	1366.49	0.0067
1-2-4-5-TetMthBz	0	0	0	0	0	0	112.007	112.007	44.803	44.8035	156.811	156.811	156.811	439.238	0.0127	89.4783	0	528.729	0	528.729	89.4783	439.251	439.251	21.9524	21.9524	417.302
Naphthalene	0	0	0	0	0	0	66.5054	66.5054	26.6022	26.6025	93.1079	93.1079	93.1079	260.777	0.0076	53.1237	0	313.909	0	313.909	53.1237	260.785	260.785	0.0005	0.0005	260.785
2-MthNaphthalene	0	0	0	0	0	0	9.8184	9.8184	3.9274	3.9274	13.7458	13.7458	13.7458	39.0212	0.0004	7.949	0	46.9705	0	46.9706	7.949	39.0216	39.0216	0	0	39.0216
Oxygen	3312.49	3312.49	3312.49	3312.49	3312.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	13154.8	13154.8	13154.8	13154.8	13154.8	0	331.495	331.495	132.598	132.623	464.118	464.118	464.118	0.6311	1.9112	0	2.5423	0	0	0	0	0	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Stream No.	861	862	863	864	865	866	867	868	869	871	872	873	875	876	880	881	882	883	890	891	892	893	1881	1882	1980	1981
Temp F	175	179.876	400	110	269.038	545.476	458.452	443.796	150	150	200	231.152	550.778	159.57	150	150	150	174.453	149.623	39.8155	39.8155	39.8155	80	110	176	525.213
Pres psia	20	475	470	650	470	470	465	465	455	455	455	100	100	25	455	455	455	500	100	100	100	100	90	90	850	850
Enth MMBtu/h	-0.01432	-0.01277	0.06452	-0.00165	0.06281	0.06281	-0.01452	-0.03188	-0.27745	-0.27068	-0.2533	-0.00492	-0.0902	-18.609	-0.00678	-0.00353	-0.00325	#######	-0.00845	-14.085	-4.632	-9.4528	-38.197	-38.029	-49.971	-42.206
Vapor mass fraction	0	0	0	1	0.16114	1	0.76705	0.67656	0.11628	0	0	1	0	0	1	1	1	1	1	0.99481	0.99481	0.99481	0	0	0	0.99
Total lb/h	717.115	717.115	717.115	60.474	823.463	823.465	823.17	823.17	823.17	727.448	727.428	6.1774	721.251	30937.1	95.7223	49.8486	45.8736	45.8736	56.0261	4556.56	1498.5	3058.07	5604.84	5604.84	7437.14	7437.14
Flowrates in lb/h																										
Methanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25.3715	8.3438	17.0277	5604.84	5604.84	7437.14	7437.14
Carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrogen	0	0	0	60.474	98.2439	78.9926	79.0005	79.0005	79.0005	0.1879	0.1879	0.1876	0.0004	0.0004	78.8126	41.0427	37.7699	37.7699	41.2303	50.5788	16.6337	33.9451	0	0	0	0
Carbon Dioxide	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3139.98	1032.63	2107.35	0	0	0	0
Methane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	484.565	159.357	325.208	0	0	0	0
Ethylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20.3786	6.7018	13.6768	0	0	0	0
Ethane	0	0	0	0	0.3773	0.8261	0.8259	0.8259	0.8259	0.0385	0.0385	0.0381	0.0004	0.0004	0.7874	0.41	0.3773	0.3773	0.4481	51.4348	16.9152	34.5196	0	0	0	0
Propylene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.4069	3.7513	7.6555	0	0	0	0
Propane	0	0	0	0	2.0709	4.9499	4.9487	4.9487	4.9487	0.6275	0.6274	0.6101	0.0174	0.0174	4.3212	2.2503	2.0709	2.0709	2.8604	539.479	177.416	362.063	0	0	0	0
I-Butane	0	0	0	0	1.5886	4.3295	4.3284	4.3284	4.3284	1.0136	1.0135	0.9588	0.0547	28.7423	3.3148	1.7262	1.5886	1.5886	2.685	89.5377	29.4459	60.0918	0	0	0	0
N-Butane	0	0	0	0	0.9345	2.7604	2.7596	2.7596	2.7596	0.8096	0.8096	0.7556	0.0539	163.176	1.95	1.0155	0.9345	0.9345	1.7711	30.6224	10.0707	20.5517	0	0	0	0
Cis-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	168.546	0	0	0	0	0	20.1023	6.611	13.4913	0	0	0	0
I-Pentane	0	0	0	0	1.1848	4.6404	4.639	4.639	4.639	2.1668	2.1666	1.8921	0.2745	2983.08	2.4722	1.2874	1.1848	1.1848	3.1796	49.5388	16.2916	33.2471	0	0	0	0
N-Pentane	0	0	0	0	0	0	0	0	0	0	0	0	0	1033.32	0	0	0	0	0	8.3227	2.7371	5.5856	0	0	0	0
Trans-2-Pentene	0	0	0	0	0.0948	0.4461	0.446	0.446	0.446	0.2481	0.2481	0.2062	0.0419	1091.57	0.1979	0.103	0.0948	0.0948	0.3092	9.6368	3.1692	6.4675	0	0	0	0
Cyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	200.57	0	0	0	0	0	0.5774	0.1899	0.3875	0	0	0	0
2-2-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	1755.79	0	0	0	0	0	5.0396	1.6574	3.3822	0	0	0	0
2-3-DiMth-Butane	0	0	0	0	0	0	0	0	0	0	0	0	0	1758.48	0	0	0	0	0	2.6404	0.8684	1.7721	0	0	0	0
2-Methylpentane	0	0	0	0	0.3254	2.1669	2.1661	2.1661	2.1661	1.4872	1.4871	1.0985	0.3885	1759.3	0.679	0.3536	0.3254	0.3254	1.4521	3.661	1.204	2.457	0	0	0	0
3-Methylpentane	0	0	0	0	0	0	0	0	0	0	0	0	0	1759.34	0	0	0	0	0	1.7783	0.5848	1.1935	0	0	0	0
MthCyclopentane	0	0	0	0	0	0	0	0	0	0	0	0	0	641.702	0	0	0	0	0	0.3698	0.1216	0.2482	0	0	0	0
Benzene	0	0	0	0	0	0	0	0	0	0	0	0	0	399.946	0	0	0	0	0	0.2037	0.067	0.1367	0	0	0	0
2-4-DiMthPentane	0	0	0	0	0	0	0	0	0	0	0	0	0	754.545	0	0	0	0	0	0.203	0.0667	0.1362	0	0	0	0
Cyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	412.001	0	0	0	0	0	0.122	0.0401	0.0819	0	0	0	0
2-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	754.663	0	0	0	0	0	0.0963	0.0317	0.0647	0	0	0	0
3-Methylhexane	0	0	0	0	0	0	0	0	0	0	0	0	0	754.677	0	0	0	0	0	0.0848	0.0279	0.0569	0	0	0	0
2-2-4-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	754.717	0	0	0	0	0	0.0513	0.0169	0.0344	0	0	0	0
MthCyclohexane	0	0	0	0	0	0	0	0	0	0	0	0	0	642.05	0	0	0	0	0	0.0464	0.0153	0.0312	0	0	0	0
33-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	804.121	0	0	0	0	0	4.1095	1.3515	2.758	0	0	0	0
Toluene	0	0	0	0	0	0	0	0	0	0	0	0	0	2498.58	0	0	0	0	0	0.1363	0.0448	0.0915	0	0	0	0
2-3-3-TriMth-C5	0	0	0	0	0	0	0	0	0	0	0	0	0	503.215	0	0	0	0	0	0.0114	0.0038	0.0077	0	0	0	0
2-3-DiMth-Hexane	0	0	0	0	0	0	0	0	0	0	0	0	0	503.219	0	0	0	0	0	0.0089	0.0029	0.006	0	0	0	0
3-Methylheptane	0	0	0	0	0	0	0	0	0	0	0	0	0	504.139	0	0	0	0	0	0.0064	0.0021	0.0043	0	0	0	0
23-2Mth-1-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	813.16	0	0	0	0	0	1.438	0.4729	0.9651	0	0	0	0
P-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	1037.88	0	0	0	0	0	0.0061	0.002	0.0041	0	0	0	0
M-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	2287.24	0	0	0	0	0	0.0122	0.004	0.0082	0	0	0	0
O-Xylene	0	0	0	0	0	0	0	0	0	0	0	0	0	940.273	0	0	0	0	0	0.0034	0.0011	0.0023	0	0	0	0
M-Ethyltoluene	0.0001	0.0001	0.0001	0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0	0.0001	488.055	0	0	0	0	0	0.0004	0.0001	0.0002	0	0	0	0
23-2Mth-2-Butene	0	0	0	0	0	0	0	0	0	0	0	0	0	632.143	0	0	0	0	0	0.3651	0.1201	0.2451	0	0	0	0
Dimethyl Ether	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2-4-Trimethylb	0.0067	0.0067	0.0067	0	0.0067	0.0067	0.0067	0.0067	0.0067	0.0066	0.0066	0	0.0066	1366.5	0	0	0	0	0	0.0005	0.0002	0.0004	0	0	0	0
1-2-4-5-TetMthBz	417.302	417.302	417.302	0	417.302	0	0	0	0	0	0	0	0	21.9524	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	260.785	260.785	260.785	0	260.974	260.974	260.863	260.863	260.863	260.468	260.47	0.0088	260.461	260.462	0.3949	0.2057	0.1893	0.1893	0.2145	0.2145	0.0705	0.1439	0	0	0	0
2-MthNaphthalene	39.0216	39.0216	39.0216	0	39.0309	39.0309	39.0148	39.0148	39.0148	38.9954	38.9951	0.0001	38.9949	38.9949	0.0194	0.0101	0.0093	0.0093	0.0102	0.0102	0.0034	0.0069	0	0	0	0
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5423	0.8361	1.7062	0	0	0	0
1-2-3-4-Tetramet	0	0	0	0	1.3288	424.342	424.171	424.171	424.171	421.399	421.378	0.4214	420.956	420.956	2.7728	1.444	1.3288	1.3288	1.8654	1.8654	0.6135	1.2519	0	0	0	0

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