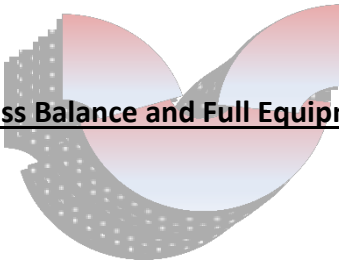


MTO Mass Balance and Full Equipment List



<i>Stream No.</i>	1	2	3	4	5	6
Temperature (°F)	77	77	527	752	752	198
Pressure (psia)	15	50	44	41	34	29
Total Mass Flow (lb/hr)	459,296	459,296	459,296	459,296	459,296	459,296
Total Mole Flow (lbmol/hr)	14,334	14,334	14,334	14,334	19,726	19,726
Vapor Fraction	0	0	1	1	1	0.444
<i>Mole Fraction</i>						
Methanol	1	1	1	1	0.0007	0.0007
Water					0.7134	0.7134
Ethylene					0.1488	0.1488
Propylene					0.0992	0.0992
Butylene					0.0236	0.0236
Pentene					0.0073	0.0073
Methane					0.0018	0.0018
Ethane					0.0028	0.0028
Propane					0.0019	0.0019
Butane					0.0005	0.0005

<i>Stream No.</i>	7	8	9	10	11	12
Temperature (°F)	113	41	41	288	288	131
Pressure (psia)	24	21	21	332	332	327
Total Mass Flow (lb/hr)	459,296	459,296	205,317	205,317	205,317	205,317
Total Mole Flow (lbmol/hr)	19,726	19,726	5,639	5,639	5,639	5,639
Vapor Fraction	0.301	0.287	1	1	1	1
<i>Mole Fraction</i>						
Methanol	0.0007	0.0007				
Water	0.7134	0.7134	traces	traces		
Ethylene	0.1488	0.1488	0.5206	0.5206	0.5206	0.5206
Propylene	0.0992	0.0992	0.3470	0.3470	0.3470	0.3470
Butylene	0.0236	0.0236	0.0825	0.0825	0.0825	0.0825
Pentene	0.0073	0.0073	0.0254	0.0254	0.0254	0.0254
Methane	0.0018	0.0018	0.0062	0.0062	0.0062	0.0062
Ethane	0.0028	0.0028	0.0099	0.0099	0.0099	0.0099
Propane	0.0019	0.0019	0.0068	0.0068	0.0068	0.0068
Butane	0.0005	0.0005	0.0016	0.0016	0.0016	0.0016

<i>Stream No.</i>	13	14	15	16	17a	17b
Temperature (°F)	86	25	25	-20	48	49
Pressure (psia)	322	319	363	348	353	435
Total Mass Flow (lb/hr)	205,317	205,317	205,317	6,415	198,902	198,902
Total Mole Flow (lbmol/hr)	5,639	5,639	5,639	244	5,395	5,395
Vapor Fraction	0.746	0	0	1	0	0
<i>Mole Fraction</i>						
Methanol						
Water						
Ethylene	0.5206	0.5206	0.5206	0.8562	0.5054	0.5054
Propylene	0.3470	0.3470	0.3470		0.3627	0.3627
Butylene	0.0825	0.0825	0.0825		0.0863	0.0863
Pentene	0.0254	0.0254	0.0254		0.0265	0.0265
Methane	0.0062	0.0062	0.0062	0.1431		
Ethane	0.0099	0.0099	0.0099		0.0103	0.0103
Propane	0.0068	0.0068	0.0068		0.0071	0.0071
Butane	0.0016	0.0016	0.0016		0.0017	0.0017

<i>Stream No.</i>	18	19	20	21	22	22d
Temperature (°F)	7	178	178	-3.8	163	-8
Pressure (psia)	421	426	450	363	363	348
Total Mass Flow (lb/hr)	78,996	119,906	119,906	78,996	119,906	76,624
Total Mole Flow (lbmol/hr)	2,802	2,593	2,593	2,802	2,593	2,731
Vapor Fraction	0	0	0	0.077	0.123	0
<i>Mole Fraction</i>						
Methanol						
Water						
Ethylene	0.973			0.973		0.999
Propylene	0.007	0.747	0.747	0.007	0.747	
Butylene		0.179	0.179		0.179	
Pentene		0.055	0.055		0.055	
Methane						
Ethane	0.020			0.020		0.001
Propane		0.015	0.015		0.015	
Butane		0.004	0.004		0.004	

<i>Stream No.</i>	23	25	27	28a	28	29
Temperature (°F)	54	136	23	260	195	17
Pressure (psia)	353	348	73	353	174	65
Total Mass Flow (lb/hr)	2,372	83,912	83,912	35,994	35,994	82,251
Total Mole Flow (lbmol/hr)	71	1,988	1,988	605	605	1,955
Vapor Fraction	0	0	0.456	0	0.409	0
<i>Mole Fraction</i>						
Methanol						
Water						
Ethylene	traces					
Propylene	0.272	0.975	0.975			0.997
Butylene		0.006	0.006	0.748	0.748	
Pentene				0.237	0.237	
Methane						
Ethane	0.727					
Propane		0.019	0.019			0.003
Butane				0.015	0.015	

<i>Stream No.</i>	30	31	32
Temperature (°F)	53	169	247
Pressure (psia)	70	160	165
Total Mass Flow (lb/hr)	1,661	25,219	10,774
Total Mole Flow (lbmol/hr)	38	450	156
Vapor Fraction	0	0	0
<i>Mole Fraction</i>			
Methanol			
Water			
Ethylene			
Propylene	0.219		
Butylene	0.083	0.999	0.025
Pentene		traces	0.918
Methane			
Ethane			
Propane	0.698		
Butane	0.008	0.0007	0.057

<i>Unit</i>	<i>Equipment Type</i>	<i>Size/Power</i>	<i>Material</i>
P-101	Centrifugal Pump	Liquid Flow Rate: 73 L/s	Carbon Steel (A285)
HX-101	TEMA Heat Exchanger	Heat Transfer Area: 5,737 sqm Front end TEMA symbol: B Shell TEMA symbol: E Rear end TEMA symbol: M	Stainless Steel (347S)
H-101	Electric Heater	Power: 150 kW	Stainless Steel (347S)
R-201	MTO Reactor (Vertical Vessel)	Diameter: 8 m Tangent to Tangent Height: 24 m	Stainless Steel (347S)
HX-201	TEMA Heat Exchanger	Heat Transfer Area: 865 sqm Front end TEMA symbol: B Shell TEMA symbol: E Rear end TEMA symbol: M	Carbon Steel (A285)
HX-202	TEMA Heat Exchanger	Heat Transfer Area: 370 sqm Front end TEMA symbol: B Shell TEMA symbol: E Rear end TEMA symbol: M	Carbon Steel (A285)
CR-201	Electric Cooler	Power: -87.921 kW	Carbon Steel (A285)
P-201	Centrifugal Pump	Liquid Flow Rate: 302 L/s	Carbon Steel (A285)
VS-201	Vessel	Diameter: 0.305 m Height: 0.381 m	Carbon Steel (A285)
QT-301	Quench Tank	Liquid Volume: 6.78 cum	Carbon Steel (A285)
HX-301	TEMA Heat Exchanger	Heat Transfer Area: 130.2 sqm Front end TEMA symbol: B Shell TEMA symbol: E Rear end TEMA symbol: M	Carbon Steel (A285)
C-301	Stage 1 Compressor	Actual Gas Flow In: 40,032 cum/h Design G. Press. Inlet: 145 kPa Design G, Press. Outlet: 1,070 kPa	Carbon Steel (A285)
CR-301	Electric Immersion Tank Cooler	Power Output: 129.16 kW	Carbon Steel (A285)
C-302	Stage 2 Compressor	Actual Gas Flow In: 40,032 cum/h Design G. Press. Inlet: 1,070 kPa Design G, Press. Outlet: 2,290 kPa	Carbon Steel (A285)
D-301	Dryer	Surface Area:	Carbon Steel (A285)
HX-303	TEMA Heat Exchanger	Heat Transfer Area: 399 sqm Front end TEMA symbol: B Shell TEMA symbol: E Rear end TEMA symbol: M	Carbon Steel (A285)

HX-304	TEMA Heat Exchanger	Heat Transfer Area: 130 sqm Front end TEMA symbol: B Shell TEMA symbol: E Rear end TEMA symbol: M	Carbon Steel (A285)
CR-302	TEMA Heat Exchanger	Heat Transfer Area: 183 sqm Front end TEMA symbol: B Shell TEMA symbol: E Rear end TEMA symbol: M	Carbon Steel (A285)
P-301	Centrifugal Pump	Liquid flow rate: 52 L/s	Carbon Steel (A285)
T-401	Sieve Tray De-Methanizer	Diameter: 1.52 m Tangent to Tangent Height: 11 m Number of Trays: 32	Aluminum Alloy (A03560)
T-402	Sieve Tray De-Ethanizer	Diameter: 2.3 m Tangent to Tangent Height: 32 m Number of Trays: 92	Carbon Steel (A285)
T-403	Sieve Tray Ethane/Ethylene Tower	Diameter: 2.4 m Tangent to Tangent Height: 43.5 m Number of Trays: 126	Carbon Steel (A285)
T-404	Sieve Tray De-Propanizer	Diameter: 2.1 m Tangent to Tangent Height: 36.6 m Number of Trays: 106	Carbon Steel (A285)
T-405	Sieve Tray Propane/Propylene Tower	Diameter: 4.6 m Tangent to Tangent Height: 90 m Number of Trays: 260	Carbon Steel (A285)
T-406	Sieve Tray C4+ Tower	Diameter: 2.4 m Tangent to Tangent Height: 73 m Number of Trays: 209	Carbon Steel (A285)
RD-401	Reflux Drum De-Methanizer	Liquid Volume: 8.1 cum Diameter: 1.5 m Tangent to Tangent Height: 4.4 m	Aluminum Alloy (A03560)
RD-402	Reflux Drum De-Ethanizer	Liquid Volume: 23.4 cum Diameter: 2.1 m Tangent to Tangent Height: 6.6 m	Carbon Steel (A285)
RD-403	Reflux Drum Ethane/Ethylene Tower	Liquid Volume: 37 cum Diameter: 2.4 m Tangent to Tangent Height: 7.9 m	Carbon Steel (A285)
RD-404	Reflux Drum De-Propanizer	Liquid Volume: 28.1 cum Diameter: 2.3 m Tangent to Tangent Height: 6.9 m	Carbon Steel (A285)
RD-405	Reflux Drum Propane/Propylene Tower	Liquid Volume: 50.4 cum Diameter: 2.7 m Tangent to Tangent Height: 8.5 m	Carbon Steel (A285)

RD-406	Reflux Drum C4+ Tower	Liquid Volume: 28.1 cum Diameter: 2.3 m Tangent to Tangent Height: 6.86 m	Carbon Steel (A285)
P-401	Centrifugal Pump De-Methanizer	Liquid Flow Rate: 19.4 L/s	Aluminum Alloy (A03560)
P-402	Centrifugal Pump	Liquid Flow Rate: 27.2 L/s	Carbon Steel (A285)
P-403	Centrifugal Pump De-Ethanizer	Liquid Flow Rate: 63 L/s	Carbon Steel (A285)
P-404	Centrifugal Pump Ethane/Ethylene Tower	Liquid Flow Rate: 106 L/s	Carbon Steel (A285)
P-405	Centrifugal Pump De-Propanizer	Liquid Flow Rate: 72.8 L/s	Carbon Steel (A285)
P-406	Centrifugal Pump Propane/Propylene Tower	Liquid Flow Rate: 120 L/s	Carbon Steel (A285)
P-407	Centrifugal Pump C4+ Tower	Liquid Flow Rate: 73.2 L/s	Carbon Steel (A285)
HX-401	De-Methanizer Condenser	Heat Transfer Area: 2,073 sqm	Aluminum Alloy (A03560)
HX-402	De-Methanizer Re-Boiler	Heat Transfer Area: 27sqm	Aluminum Alloy (A03560)
HX-403	De-Ethanizer Condenser	Heat Transfer Area: 821 sqm	Carbon Steel (A285)

HX-404	De-Ethanizer Re-Boiler	Heat Transfer Area: 129 sqm	Carbon Steel (A285)
HX-405	Ethane/Ethylene Tower Condenser	Heat Transfer Area: 3,405 sqm	Carbon Steel (A285)
HX-406	Ethane/Ethylene Tower Re-Boiler	Heat Transfer Area: 97 sqm	Carbon Steel (A285)
HX-407	De-Propanizer Condenser	Heat Transfer Area: 364 sqm	Carbon Steel (A285)
HX-408	De-Propanizer Re-Boiler	Heat Transfer Area: 259 sqm	Carbon Steel (A285)
HX-409	Propane/Propylene Tower Condenser	Heat Transfer Area: 6,768 sqm	Carbon Steel (A285)
HX-410	Propane/Propylene Tower Re-Boiler	Heat Transfer Area: 188 sqm	Carbon Steel (A285)
HX-411	C4+ Tower Condenser	Heat Transfer Area: 301 sqm	Carbon Steel (A285)
HX-412	C4+ Tower Re-Boiler	Heat Transfer Area: 289 sqm	Carbon Steel (A285)