

SUPPORTING INFORMATION (SI)

Reducing Energy Consumption in the Synthesis of Dimethyl Ether (DME) from Methanol Dehydration by Modifying Heat Transfer Unit Using Aspen HYSYS

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Table S1. Heat and material balance for modified process

Data	Unit	1	2	3	4	5	6	7	8	9	10	11	DME	Water	Methanol	Wastewater
Vapour Fraction		0	0	0	0	1	1	0.90	0.47	0	0	0	0	0	0	0
Temperature	°C	30.0	30.0	30.1	139.7	250.0	365.7	147.9	100.0	44.6	163.6	30.0	35.0	20.0	30.0	36.0
Pressure	bar	1.0	1.0	11.0	10.9	10.8	10.8	10.8	10.8	10.0	10.2	1.0	10.0	9.0	1.0	10.0
Molecular Weight		32.02	32.02	32.02	32.02	32.02	32.02	32.02	32.02	46.00	22.74	32.04	46.00	18.02	32.04	18.02
Molar Flow	lbmole/h	166.60	208.57	208.57	208.57	208.57	208.57	208.57	208.57	83.22	125.35	41.97	83.22	83.10	42.25	83.10
Mass Flow	lb/hr	5333.96	6678.78	6678.78	6678.78	6678.78	6678.80	6678.80	6678.80	3827.87	2850.94	1344.82	3827.87	1497.09	1353.85	1497.09
Heat Flow	MMBtu/hr	-17.67	-22.12	-22.11	-20.45	-17.06	-17.06	-18.73	-20.54	-7.21	-13.96	-4.45	-7.26	-10.22	-4.48	-10.17
Std Gas Flow	MMSCFD	1.51	1.90	1.90	1.90	1.90	1.90	1.90	1.90	0.76	1.14	0.38	0.76	0.76	0.38	0.76
Phase Mass Flow (Vapour Phase)	lb/hr				0.00	6678.78	6678.80	6225.71	4167.40							
Phase Molecular Weight (Vapour Phase)					32.04	32.02	32.02	33.33	42.88							
Phase Mass Density (Vapour Phase)	lb/ft3				0.72	0.52	0.41	0.69	1.04							
Phase Actual Volume Flow (Vapour Phase)	ft3/hr				0.00	12803.30	16189.64	8969.47	4015.60							
Phase Z Factor (Vapour Phase)					0.87	0.95	0.98	0.92	0.89							
Phase Cp/Cv (Vapour Phase)					1.32	1.20	1.14	1.22	1.20							
Phase Viscosity (Vapour Phase)	cP				0.01	0.01	0.02	0.01	0.01							
Phase Mass Heat Capacity (Vapour Phase)	Btu/lb-F				0.46	0.48	0.55	0.46	0.42							
Phase Thermal Conductivity (Vapour Phase)	Btu/h-ft-F				0.01	0.02	0.03	0.02	0.01							
Phase Mass Flow (Liquid Phase)	lb/hr	5333.96	6678.78	6678.78	6678.78		0.00			3827.87		1344.82	3827.87		1353.85	
Phase Molecular Weight (Liquid Phase)		32.02	32.02	32.02	32.02		32.02			46.00		32.04	46.00		32.04	
Phase Mass Density (Liquid Phase)	lb/ft3	48.75	48.75	48.78	40.42		0.41			35.83		48.74	36.81		48.74	
Phase Actual Volume Flow (Liquid Phase)	ft3/hr	109.40	136.99	136.92	165.23		0.00			106.84		27.59	103.99		27.77	
Phase Viscosity (Liquid Phase)	cP	0.51	0.51	0.51	0.15		0.00			0.08		0.51	0.08		0.51	
Phase Mass Heat Capacity (Liquid Phase)	Btu/lb-F	1.22	1.22	1.22	1.35		0.55			0.64		1.22	0.61		1.22	
Phase Thermal Conductivity (Liquid Phase)	Btu/h-ft-F	0.10	0.10	0.10	0.07		0.05			0.07		0.10	0.07		0.10	
Phase Surface Tension (Liquid Phase)	lb/ft	0.00	0.00	0.00	0.00		0.00			0.00		0.00	0.00		0.00	