

SUPPORTING INFORMATION (SI)

**Improving Net Energy Efficiency of Dimethyl Ether Production
Process from Methanol**

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Table S1. Mass balance and energy balance in the process of forming dimethyl ether calculated using ASPEN HYSYS

Total Phase Properties								
	Unit	Methanol	Pumped	Heated	Vout	Lout	Mixed	DME
Vapour Fraction		0.00E+00	0.00E+00	5.62E-01	1.00E+00	0.00E+00	0.00E+00	1.00E+00
Temperature	C	2.80E+01	2.80E+01	8.06E+01	3.71E+02	3.71E+02	2.74E+01	-1.85E+00
Pressure	bar	1.00E+00	2.00E+00	1.90E+00	1.80E+00	1.80E+00	2.00E+00	1.40E+00
Molar Flow	kgmole/h	2.73E+02	2.73E+02	3.12E+02	3.12E+02	0.00E+00	3.12E+02	1.20E+02
Mass Flow	tonne/year	7.90E+04	7.60E+04	8.80E+04	8.80E+04	0.00E+00	8.80E+04	5.03E+04
Liquid Volume Flow	USGPH	2.87E+03	2.87E+03	3.35E+03	3.55E+03	0.00E+00	3.35E+03	2.18E+03
Heat Flow	kJ/h	-6.55E+07	-6.55E+07	-6.68E+07	-5.90E+07	0.00E+00	-7.46E+07	-2.24E+07
		methanol -water	Methanol rec	to mixer	to Rxtr	to sep	to sep 2	Pumped 2
Vapour Fraction		2.11E-06	1.59E-06	0.00E+00	1.00E+00	8.31E-01	5.00E-01	0.00E+00
Temperature	C	7.00E+01	2.28E+01	2.29E+01	2.60E+02	8.20E+01	8.90E+01	2.29E+01
Pressure	bar	1.40E+00	1.20E+00	2.10E+00	1.80E+00	1.50E+00	1.30E+00	2.10E+00
Molar Flow	kgmole/h	1.92E+02	3.94E+01	3.94E+01	3.12E+02	3.12E+02	1.92E+02	3.94E+01
Mass Flow	tonne/year	3.96E+04	1.20E+04	1.20E+04	8.80E+04	8.80E+04	3.96E+04	1.20E+04
Liquid Volume Flow	USGPH	1.37E+03	4.77E+02	4.77E+02	3.35E+03	3.55E+03	1.37E+03	4.77E+02
		Water	Water out					
Vapour Fraction		0.00E+00	0.00E+00					
Temperature	C	8.50E+01	5.00E+01					
Pressure	bar	1.20E+00	1.10E+00					
Molar Flow	kgmole/h	1.52E+02	1.52E+02					
Mass Flow	tonne/year	2.76E+04	2.76E+04					
Liquid Volume Flow	USGPH	8.95E+02	8.95E+02					
Heat Flow	kJ/h	-4.14E+07	-4.18E+07					
Composition								
	Unit	Methanol	Pumped	Heated	Vout	Lout	Mixed	DME
Comp Mole Frac (H2O)	mole%	1.76E-02	1.76E-02	1.55E-02	3.99E-01	6.48E-01	1.55E-02	2.43E-04
Comp Mole Frac (diM-Ether)	mole%	0.00E+00	0.00E+00	2.47E-02	4.09E-01	2.30E-01	2.47E-02	9.90E-01
Comp Mole Frac (Methanol)	mole%	9.82E-01	9.82E-01	9.60E-01	1.92E-01	1.21E-01	9.60E-01	1.02E-02
Total	mole%	1	1	1	1	1	1	1
		methanol -water	Methanol rec	to mixer	to Rxtr	to sep	to sep 2	Pump 2
Comp Mole Frac (H2O)	mole%	6.50E-01	9.72E-04	9.73E-04	1.55E-02	3.99E-01	6.50E-01	9.72E-04
Comp Mole Frac (diM-Ether)	mole%	4.39E-02	1.96E-01	1.96E-01	2.47E-02	4.09E-01	4.39E-02	1.96E-01
Comp Mole Frac (Methanol)	mole%	3.06E-01	8.03E-01	8.03E-01	9.60E-01	1.92E-01	3.06E-01	8.03E-01
Total	mole%	1	1	1	1	1	1	1
		Water	Water out					
Frac (H2O)	mole%	8.18E-01	8.18E-01					
Comp Mole Frac (diM-Ether)	mole%	4.55E-03	4.55E-03					
Comp Mole Frac (Methanol)	mole%	1.78E-01	1.78E-01					
Total	mole%	1	1					