

Maximizing Ethylene Production Yield by Modifying the Methanol to Olefin Process with the Addition of a Distillation Tower

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Received: 19th December 2024; Revised: 20th December 2024; Accepted: 26th December 2024
Available online: 30th December 2024; Published regularly: December 2024



SUPPORTING INFORMATION (SI), DOI: <https://doi.org/10.9767/jcerp.20278>

Table S1. Material and energy balances of modified process

	Unit	Methanol Feed	ERVap	ERLiq	ERcondensor	ERMixed	CRVap	CRLiq	CRSepVap
Vapour Fraction		0	1	0	0	0.0148269	1	0	1
Temperature	C	25	76.204053	76.204053	30.711473	65.310134	125.190416	125.1904158	-103.0644
Pressure	atm	6	6	6	6	6	5	5	5
Molar Flow	gmole/min	24132.353	5103.1076	26188.122	5103.1076	31291.23	22312.0215	1213.107024	1451.807378
Mass Flow	tn(long)/year	400000	116029.31	402632.29	116029.31	518661.59	276153.458	11352.83194	21069.32933
Master Comp Molar Flow (Methanol)	kgmole/h	1447.9412	25.507676	404.26157	25.507676	429.76925	4.8872E-09	8.98624E-11	3.80457E-16
Master Comp Molar Flow (diM-Ether)	kgmole/h	0	270.34091	453.50922	270.34091	723.85013	35.996121	0.196384384	0.00248276
Master Comp Molar Flow (H ₂ O)	kgmole/h	0	10.337872	713.51655	10.337872	723.85442	615.069209	72.58839361	3.2571E-07
Master Comp Molar Flow (Ethylene)	kgmole/h	0	0	0	0	0	687.655959	0.001643472	87.10595958

	Unit	CRSepLiq	Ethylene Condensed	Methanol Cooled	Recycled	inlet	DME	Methanol +Water	MethanolDis
Vapour Fraction		0	0	0	0	0	0	0	0
Temperature	C	-103.0643999	-111.8736256	25	25	25	20.04800723	128.5012892	111.8288749
Pressure	atm	5	1	6	6	6	5	5.5	5
Molar Flow	gmole/min	22073.32113	1451.807378	7158.805198	7158.868989	31291.22165	12064.16846	19227.06112	7158.805198
Mass Flow	tn(long)/year	266436.961	21069.32933	118658.5321	118659.5895	518659.5895	287506.8784	231154.7091	118658.5321
Master Comp Molar Flow (Methanol)	kgmole/h	4.97707E-09	3.80457E-16	429.5240167	429.5278446	1877.469005	4.97707E-09	429.7692456	429.5240167
Master Comp Molar Flow (diM-Ether)	kgmole/h	36.19002263	0.00248276	1.40618E-08	1.73043E-08	1.73043E-08	723.8501079	1.40618E-08	1.40618E-08
Master Comp Molar Flow (H ₂ O)	kgmole/h	687.6576022	3.2571E-07	0.004295159	0.004294734	0.004294734	1.54296E-15	723.8544214	0.004295159
Master Comp Molar Flow (Ethylene)	kgmole/h	600.5516429	87.10595958	0	0	0	0	0	0

	Unit	Waste (H2O)	Methanol Pump	Feed Heated	CRCondensed	OutCRMix	Ethylene	No Ethylene	Ethylene Prod
Vapour Fraction		0	0	0	0	0.061713048	0	0	0.180072716
Temperature	C	155.2211632	111.8774543	65	-103.8686889	-103.0643999	-70.59403076	-127.7671089	-111.8728766
Pressure	atm	5.4	6	6	5	5	5	5	1
Molar Flow	gmole/min	12068.25563	7158.805198	31291.22165	22312.02148	23525.12851	10009.19405	12064.12708	11461.00143
Mass Flow	tn(long)/year	112496.1722	118658.5321	518659.5895	276153.4584	287506.2904	145255.5962	121181.3649	166324.9255
Master Comp Molar Flow (Methanol)	kgmole/h	0.24521154	429.5240167	1877.469005	4.8872E-09	4.97707E-09	0	4.97707E-09	3.80457E-16
Master Comp Molar Flow (diM-Ether)	kgmole/h	1.30137E-22	1.40618E-08	1.73043E-08	35.99612101	36.19250539	0	36.19002263	0.00248276
Master Comp Molar Flow (H2O)	kgmole/h	723.8501262	0.004295159	0.004294734	615.0692089	687.6576025	0	687.6576022	3.2571E-07
Master Comp Molar Flow (Ethylene)	kgmole/h	0	0	0	687.655959	687.6576025	600.5516429	0	687.6576025

Table S2. Energy stream of process

	Unit	E-Cond3	E-Cl1	Qc-Dis1	Qr-Dis1	QcDis2
Heat Flow	kcal/h	294118.1696	1083245.265	46059285.54	46658152.82	67038677.81

	Unit	QrDis2	E-Pump1	EHeater1	E-Cond2	E-Cond1
Heat Flow	kcal/h	67169013.11	647.9946644	2112716.875	12523264.85	1793342.693