

Investigation of separation efficiency indicator for the optimization of the acetone-methanol extractive distillation with water

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Supporting information

Table S1. Sizing parameters for the columns and cost data of the design G1-G6 belonging to Pareto front

	G1	G2	G3	G4	G5	G6
Extractive column						
Diameter /m	2.825	2.954	2.962	3.135	3.564	3.679
Height /m	45.72	45.72	45.72	42.68	44.50	45.72
$I_{CS} / 10^6 \$$	1.462	1.533	1.538	1.546	1.833	1.937
A_C / m^2	878	954	959	1066	1353	1435
A_R / m^2	441	480	479	527	683	704
$I_{HE} / 10^6 \$$	1.257	1.328	1.330	1.421	1.668	1.720
$Cost_{cap} / 10^6 \$$	3.044	3.210	3.218	3.323	3.954	4.147
$Cost_{ope} / 10^6 \$$	1.033	1.125	1.124	1.236	1.600	1.652
$Cost_{CA} / 10^6 \$$	2.048	2.195	2.196	2.344	2.918	3.034
Regeneration column						
Diameter /m	1.614	1.626	1.630	1.625	1.689	1.618
Height /m	23.78	23.78	23.78	23.78	23.78	23.78
$I_{CS} / 10^6 \$$	0.477	0.480	0.482	0.480	0.500	0.478
A_C / m^2	183	185	186	185	200	184
A_R / m^2	289	294	294	290	321	286
$I_{HE} / 10^6 \$$	0.648	0.656	0.656	0.652	0.691	0.647
$Cost_{cap} / 10^6 \$$	1.196	1.208	1.210	1.203	1.268	1.196
$Cost_{ope} / 10^6 \$$	0.675	0.689	0.687	0.678	0.750	0.671
$Cost_{CA} / 10^6 \$$	1.074	1.091	1.091	1.079	1.173	1.069

Q_{HA}/MW	0.67	0.76	0.65	0.53	1.06	0.491
$Cost_{HA}/10^6\$$	0.018	0.019	0.017	0.015	0.024	0.014
OF /kJ/kmol	28657.5	30429.8	30368.2	32111.7	39431.6	38964.8
TAC	3.140	3.305	3.304	3.438	4.115	4.117
$E_{ext}/10^{-3}$	166	230	284	353	351	517
$e_{ext}/10^{-3}$	8.3	14.4	12.9	14.7	27.0	16.7

Table S2. Sizing parameters for the columns and cost data of the design case 3opt', case G1 and case SQP

	Case 3opt'	Case G1	Case SQP
Extractive column			
Diameter /m	2.857	2.825	2.796
Height /m	39.63	45.72	45.72
$I_{CS}/10^6\$$	1.319	1.462	1.446
A_C/m^2	896	878	861
A_R/m^2	452	441	434
$I_{HE}/10^6\$$	1.276	1.257	1.242
$Cost_{cap}/10^6\$$	2.882	3.044	3.008
$Cost_{ope}/10^6\$$	1.059	1.033	1.016
$Cost_{CA}/10^6\$$	2.020	2.048	2.018
Regeneration column			
Diameter /m	1.683	1.614	1.609
Height /m	17.68	23.78	23.78
$I_{CS}/10^6\$$	0.393	0.477	0.475
A_C/m^2	198	183	182
A_R/m^2	315	289	288
$I_{HE}/10^6\$$	0.685	0.648	0.647
$Cost_{cap}/10^6\$$	1.234	1.196	1.192
$Cost_{ope}/10^6\$$	0.736	0.675	0.673
$Cost_{CA}/10^6\$$	1.114	1.074	1.071
Q_{HA}/MW	0.77	0.67	0.69
$Cost_{HA}/10^6\$$	0.020	0.018	0.018
OF /kJ/kmol	30119.8	28657.5	28326.3
TAC	3.153	3.140	3.107
$E_{ext}/10^{-3}$	153	166	161
$e_{ext}/10^{-3}$	9.0	8.3	7.3