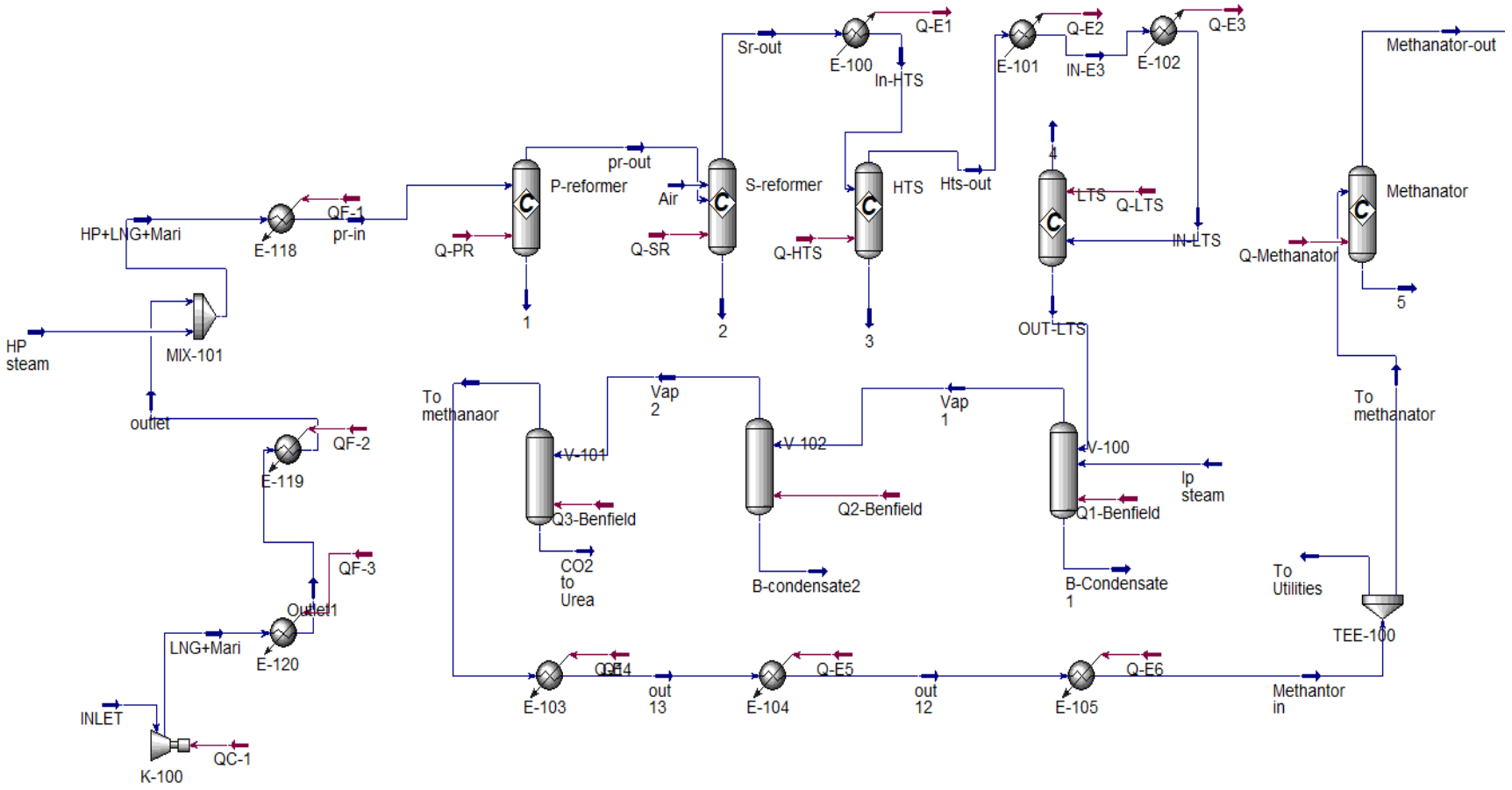
APPENDIX

Table Error! No text of specified style in document.**A.1 - Material Balance of RLNG and Mari Mixture used as feed-in ASPEN HYSYS**

Even though a stream is entirely made up of vapor, it will have a Liquid Volume flow due to the stream's Standard Ideal Liquid Mass density, which is computed using ideal mixing of pure component ideal densities at 60°F. The data base contains GPA tabular values of the equivalent liquid density for each component that is non-condensable at 60°F under any pressure. The displacement of hydrocarbon liquids by dissolved non-condensable components was used to determine these densities in an experiment.

Name	Vapour Fraction	Temperature [°C]	Pressure [kPa]	Molar Flow [kgmole/h]	Mass Flow [kg/h]	Liquid Volume Flow [m^3/h]	Heat Flow [kJ/h]
pr-in	1	532	3363.681653	7758.63	142308.2528	207.3150492	-1410939958
pr-out	1	805	3108.708699	10246.5692	142309.1734	288.1857671	-1053370486
1	0	805	3108.708699	0	0	0	0
Air	1	117	3177.355264	1583.817	45793.18542	52.62925098	1976240.245
Sr-out	1	951	3108.708699	12324.88492	188102.1348	345.0141584	-1020577672
2	0	951	3108.708699	0	0	0	0
In-HTS	1	370	3108.708699	12324.88492	188102.1348	345.0141584	-1277454800
Hts-out	1	429	3108.708699	12324.88492	188101.9008	367.6913942	-1282084349
3	0	429	3108.708699	0	0	0	0
IN-E3	1	328	3108.708699	12324.88492	188101.9008	367.6913942	-1325127110
IN-LTS	1	203	3108.708699	12324.88492	188101.9008	367.6913942	-1377480148
OUT-LTS	1	217	3108.708699	12324.88492	188101.8365	373.9232164	-1380073620
4	0	217	3108.708699	0	0	0	0
lp steam	1	180	114.2068791	691	12448.43443	12.47355589	-163478057.8
Vap 1	1	45.3	114.2068791	10028.73947	146731.6704	332.4676925	-891413819.8
B-Cond 1	0	45.3	114.2068791	2987.145447	53818.60057	53.92907977	850286783.4
Vap 2	1	15.03353542	114.2068791	9312.357555	133823.5224	319.5326043	-727227356.4
B-cond 2	0	15.03353542	114.2068791	716.3819182	12908.14798	12.93508822	-205608017.6
To methanaor	1	-153.0752698	114.2068791	7438.464831	54956.13316	224.4924146	-45564846.3
CO2 to Urea	0	-153.0752698	114.2068791	1873.892724	78867.38922	95.04018966	-770781611.8
out 13	1	100	980.6652048	7438.464831	54956.13316	224.4924146	
out 12	1	200	1961.33041	7438.464831	54956.13316	224.4924146	
Methantor-in	1	300	2549.729533	7438.464831	54956.13316	224.4924146	
Methantor-out	1	317	2549.729533	7312.856609	54417.54171	220.7448661	
5	0	317	2549.729533	0	0	0	
To Utilities	1	300	2549.729533	72.89695534	538.570105	2.200025664	505780.093
To methanator	1	300	2549.729533	7365.567876	54417.56305	222.292389	51104433.48
To comp	1	317.0000384	2549.729533	7312.856609	54417.54171	220.7448661	49391979.04
water	0	317.0000384	2549.729533	0	0	0	0
out	1	105	2549.729533	7312.856609	54417.54171	220.7448661	3785773.651
out 1	0.997986708	36	2549.729533	7312.856609	54417.54171	220.7448661	11507807.86
out 2	1	-39.57697781	2549.729533	7278.641113	53800.98289	220.1269518	-18516677.77
7	0	-39.57697781	2549.729533	34.21549603	616.558823	0.61791432	-9959637.329
out 3	1	10	2490.88962	7278.641113	53800.98289	220.1269518	-8060358.272
out 4	1	114.339992	5770.234065	7278.641113	53800.98289	220.1269518	13951830.82

Name	Vapour Fraction	Temperature [ºC]	Pressure [kPa]	Molar Flow [kgmole/h]	Mass Flow [kg/h]	Liquid Volume Flow [m^3/h]	Heat Flow [kJ/h]
out5	1	49	5770.234065	7278.641113	53800.98289	220.1269518	18768.85171
out 6	1	109.3004879	9069.191814	7278.641113	53800.98289	220.1269518	12885853.6
out 7	1	38	9069.191814	7278.641113	53800.98289	220.1269518	-2448431.806
out 8	1	165.0205125	22692.59284	7278.641113	53800.98289	220.1269518	25377811.33
out 9	1	38	22692.59284	7278.641113	53800.98289	220.1269518	-2546418.097
mix stream	1	14.32702726	22692.59284	111572.1678	506228.5143	3317.489807	-563917166
cooled stream	0.975134956	-9.3	22692.59284	111572.1678	506228.5143	3317.489807	-695946100
P-Ammonia	0	-9.3	22692.59284	2774.246817	46725.75987	77.11264014	-188765481.7
recycled gas	1	-9.3	22692.59284	108797.921	459502.7544	3240.377167	-507180618.3
heated stream	1	34	22692.59284	108797.921	459502.7544	3240.377167	-362087809.3
compress gas	1	39.48564153	23751.71126	108797.921	459502.7544	3240.377167	-34364244.1
outlet7	1	164	24026.29752	108797.921	459502.7544	3240.377167	68771538.98
Product	1	204.3	24026.29752	106008.3795	459501.3607	3148.283527	59403199.52
6	0	204.3	24026.29752	0	0	0	0
out 10	1	204	24026.29752	106008.3795	459501.3607	3148.283527	58419877.18


HP+LNG+Mari
E-118
QF-1
pr-in
P-reformer
pr-out
Q-PR
1
Air
S-reformer
Sr-out
Q-SR
2
E-100
Q-E1
In-HTS
HTS
Q-HTS
3
E-101
Q-E2
IN-E3
E-102
Q-E3
Hts-out
4
LTS
Q-LTS
IN-LTS
OUT-LTS
Methanator-out
Methanator
Q-Methanator
5
To
methanator
HP
steam
MIX-101
outlet
QF-2
E-119
QF-3
Outlet1
LNG+Mari
E-120
INLET
K-100
QC-1
To
methanaor
V-101
Q3-Benfield
CO2
to
Urea
Vap
2
V-102
Q2-Benfield
B-condensate2
Vap
1
V-100
lp
steam
Q1-Benfield
B-Condensate
1
To
Utilities
TEE-100
E-103
QF-4
out
13
E-104
Q-E5
out
12
E-105
Q-E6
Methantor
in

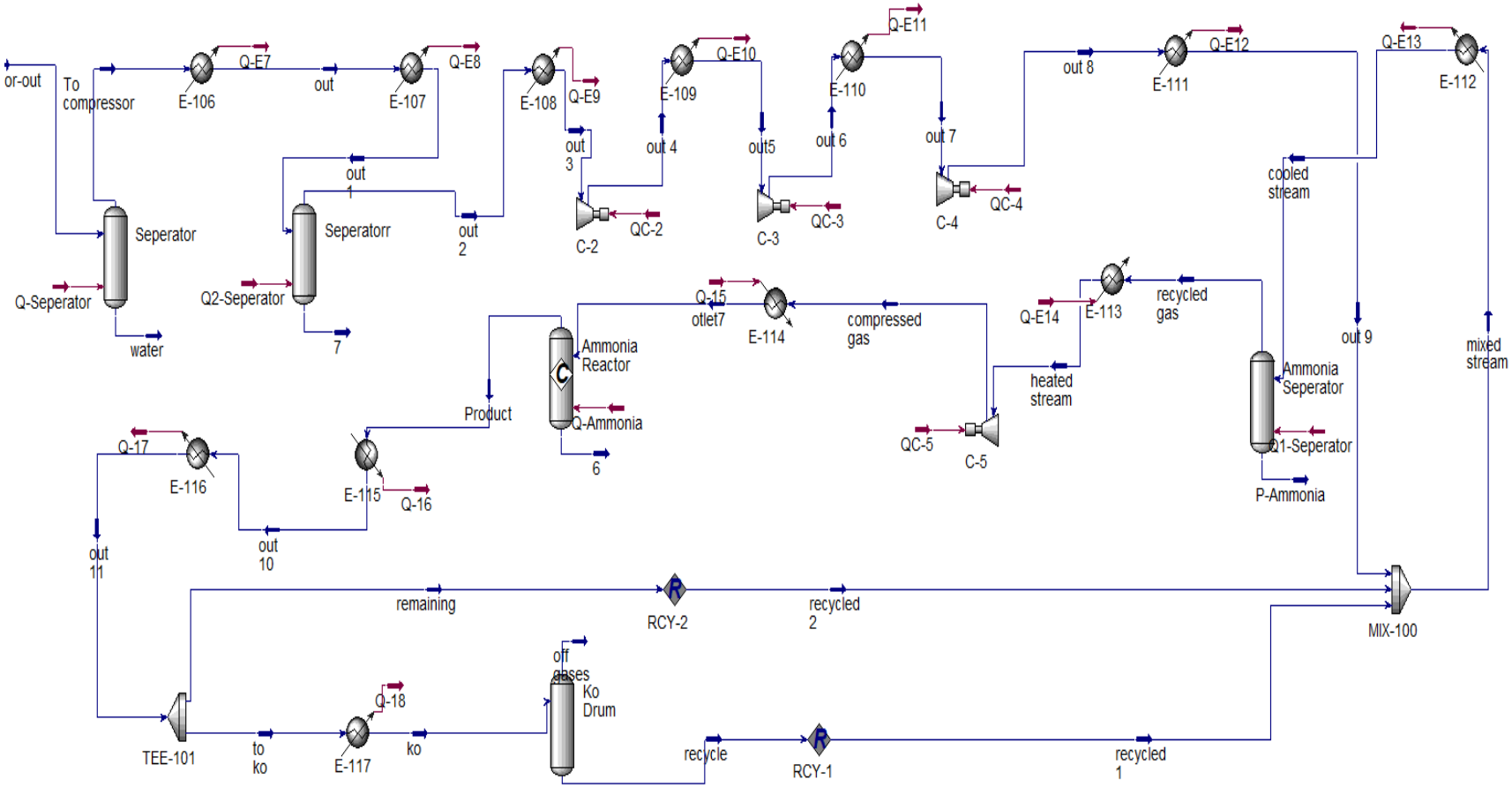


Fig. 5A1: [Fig. 2 (Zoomed)] ASPEN Flow sheet for processes with 70% Mari Gas and 30% LNG used as feed

1