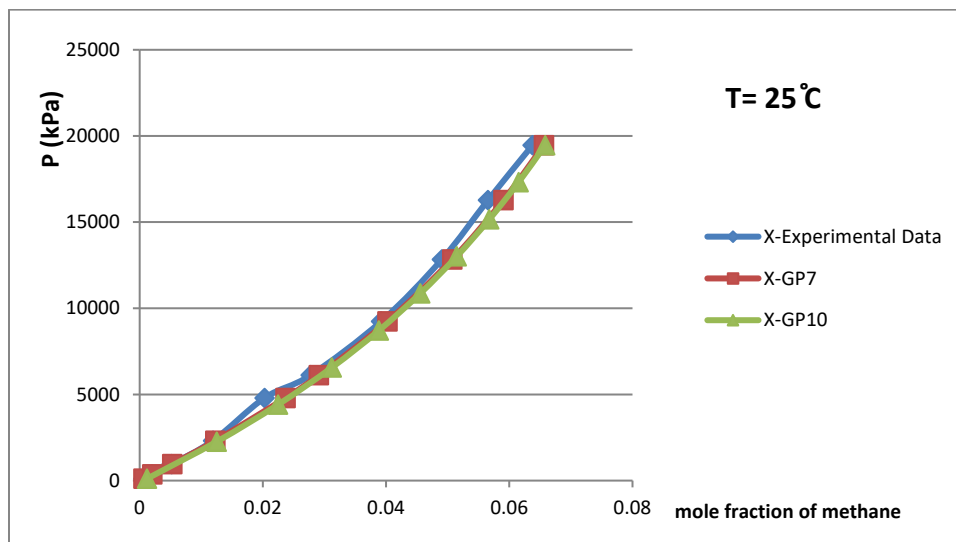
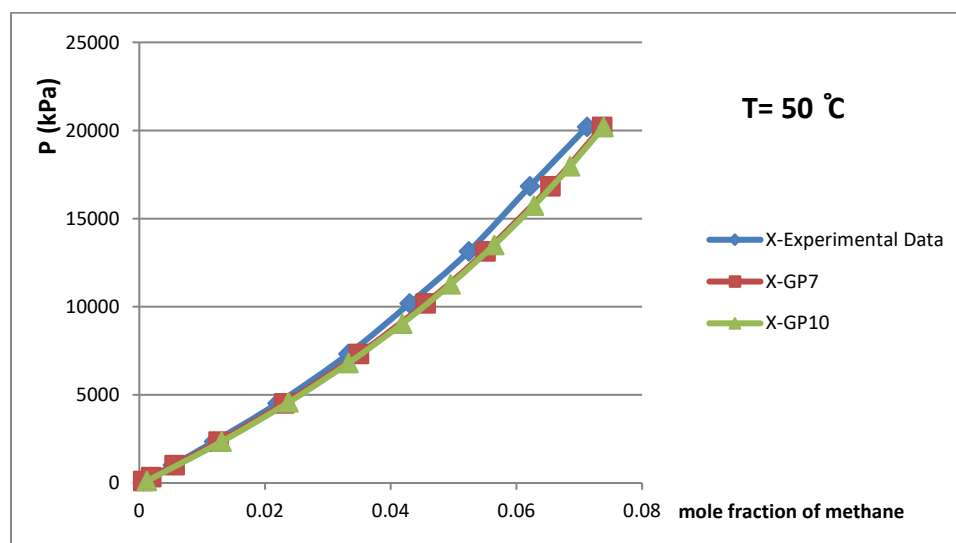


## 8. Appendix A: Figures and Tables



**Figure 32** P-x data comparison for methane-TEG binary system at T = 25 °C



**Figure 33** P-x data comparison for methane-TEG binary system at T = 50 °C

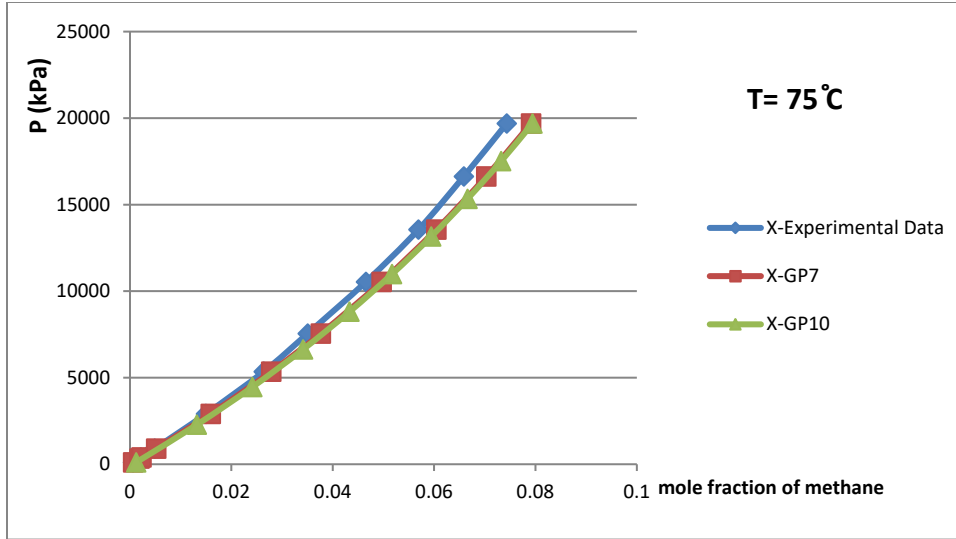


Figure 34 P-x data comparison for methane-TEG binary system at T = 75 °C

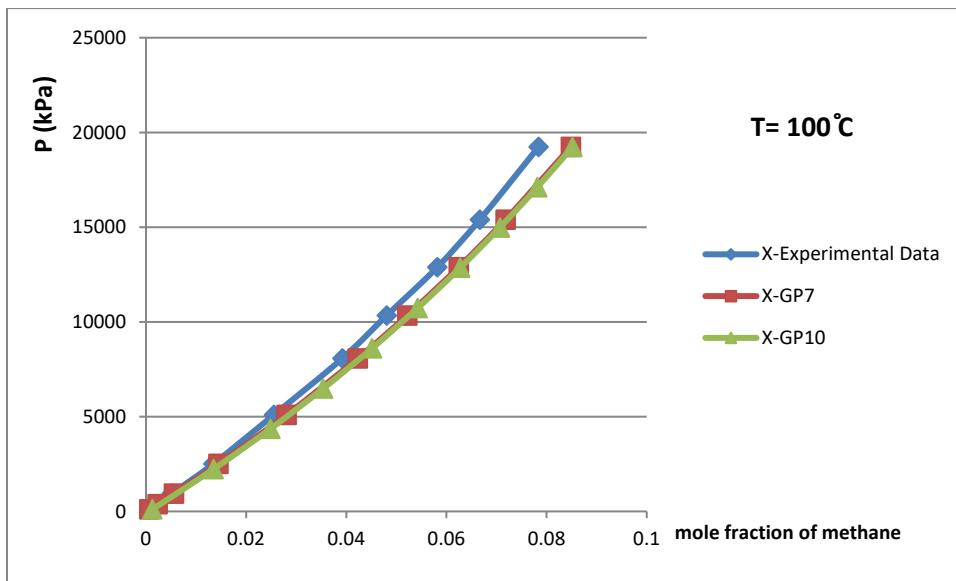
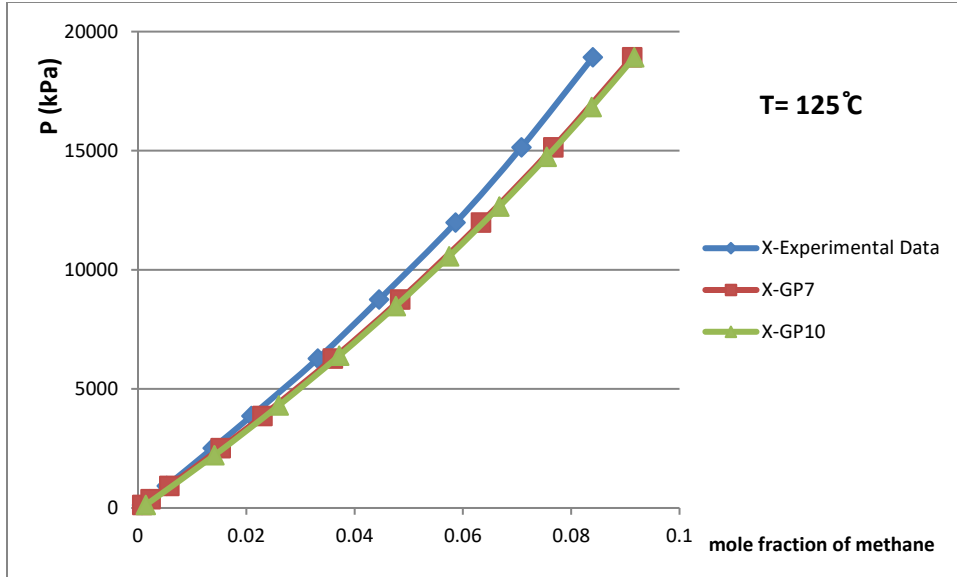


Figure 35 P-x data comparison for methane-TEG binary system at T = 100 °C



**Figure 36** P-x data comparison for methane-TEG binary system at T = 125 °C

**Table 15** Methane emissions comparison for TEG cases

Cases	Total Methane (lb/hr)					Methane- flash (lb/hr)				Methane- still (lb/hr)			
	GP10	GP7	PR	GLYCalc	MEA	GP10	GP7	PR	GLYCalc	GP10	GP7	PR	GLYCalc
Case 1	9.84	9.75	9.76	9.64	9.63	6.53	6.46	6.49	6.30	3.30	3.30	3.27	3.34
Case 2	20.70	20.63	20.32	21.95	18.23	18.07	18.01	17.71	19.30	2.63	2.63	2.61	2.65
Case 3	24.29	24.20	23.42	23.10	23.61	0.00	0.00	0.00	0.00	24.29	24.20	23.42	23.10
Case 4	1.89	1.89	2.00	1.98	1.87	1.88	1.88	1.97	1.96	0.02	0.02	0.03	0.02
Case 5	4.62	4.52	4.58	4.65	4.48	4.59	4.50	4.54	4.62	0.03	0.02	0.04	0.03
Case 6	0.74	0.74	0.74	0.74	0.73	0.00	0.00	0.00	0.00	0.74	0.74	0.74	0.74
Case 7	27.17	26.57	26.99	27.20	26.08	0.00	0.00	0.00	0.00	27.17	26.57	26.99	27.20
Case 8	0.30	0.28	0.30	0.32	0.26	0.00	0.00	0.00	0.00	0.30	0.28	0.30	0.32
Case 9	7.71	7.79	7.34	9.34	7.45	0.00	0.00	0.00	0.00	7.71	7.79	7.34	9.34
Case 10	7.36	7.19	7.19	7.55	7.01	1.14	1.00	1.00	1.25	6.22	6.19	6.19	6.30
Case 11	17.61	16.36	18.56	19.14	16.27	2.61	1.40	3.41	4.03	15.00	14.97	15.15	15.10
Case 12	1.48	1.09	1.74	1.96	1.08	0.00	0.00	0.00	0.00	1.48	1.09	1.74	1.96
Case 13	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Case 14	0.02	0.01	0.02	0.01	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.00	0.00
Case 15	0.78	0.40	0.96	1.09	0.40	0.74	0.37	0.85	1.03	0.04	0.03	0.11	0.06
Case 16	0.78	0.44	0.98	1.22	0.44	0.70	0.39	0.88	1.11	0.08	0.05	0.10	0.10
Case 17	4.92	4.79	5.03	5.07	4.78	0.00	0.00	0.00	0.00	4.92	4.79	5.03	5.07
Case 18	4.74	4.64	4.42	4.78	4.43	0.00	0.00	0.00	0.00	4.74	4.64	4.42	4.78
Case 19	12.55	12.38	12.58	12.69	12.30	0.00	0.00	0.00	0.00	12.55	12.38	12.58	12.69
Case 20	0.09	0.07	0.08	0.10	0.04	0.00	0.00	0.00	0.00	0.09	0.07	0.08	0.10
Case 21	0.93	0.76	0.92	1.07	0.71	0.00	0.00	0.00	0.00	0.93	0.76	0.92	1.07
Case 22	0.26	0.15	0.30	0.35	0.15	0.00	0.00	0.00	0.00	0.26	0.15	0.30	0.35

**Table 16** CO<sub>2</sub> emissions comparison for TEG cases

Cases	Total CO <sub>2</sub> (lb/hr)					CO <sub>2</sub> - flash (lb/hr)				CO <sub>2</sub> - still (lb/hr)			
	GP10	GP7	PR	GLYCalc	MEA	GP10	GP7	PR	GLYCalc	GP10	GP7	PR	GLYCalc
Case 1	0.85	0.74	0.79	0.88	0.90	0.64	0.55	0.60	0.63	0.22	0.19	0.18	0.25
Case 2	2.28	2.32	2.33	2.49	1.41	1.97	2.01	2.01	2.16	0.31	0.30	0.32	0.33
Case 3	2.74	2.44	2.38	2.86	2.40	0.00	0.00	0.00	0.00	2.74	2.44	2.38	2.86
Case 4	0.64	0.47	0.76	0.79	0.68	0.56	0.43	0.64	0.66	0.08	0.04	0.12	0.12
Case 5	0.30	0.21	0.30	0.33	0.26	0.28	0.20	0.28	0.31	0.02	0.01	0.03	0.03
Case 6	0.02	0.02	0.02	0.02	0.11	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
Case 7	0.62	0.45	0.61	0.66	0.29	0.00	0.00	0.00	0.00	0.62	0.45	0.61	0.66
Case 8	0.04	0.02	0.04	0.04	0.15	0.00	0.00	0.00	0.00	0.04	0.02	0.04	0.04
Case 9	0.15	0.15	0.13	0.19	0.11	0.00	0.00	0.00	0.00	0.15	0.15	0.13	0.19
Case 10	1.41	1.18	1.23	1.51	0.86	0.17	0.15	0.14	0.19	1.24	1.03	1.09	1.32
Case 11	1.71	0.87	1.94	1.99	1.01	0.80	0.26	0.78	1.04	0.92	0.60	1.16	0.95
Case 12	0.24	0.13	0.23	0.27	0.11	0.00	0.00	0.00	0.00	0.24	0.13	0.23	0.27
Case 13	5.41	5.26	4.80	5.83	3.79	3.55	3.61	2.90	4.08	1.86	1.66	1.89	1.75
Case 14	31.80	9.92	45.27	30.79	7.12	25.27	7.98	36.29	24.20	6.53	1.93	8.98	6.59
Case 15	0.53	0.20	0.60	0.60	0.11	0.32	0.11	0.27	0.37	0.20	0.09	0.33	0.23
Case 16	1.16	0.46	1.30	1.49	0.29	0.38	0.18	0.45	0.59	0.78	0.28	0.86	0.90
Case 17	0.03	0.02	0.03	0.32	0.15	0.00	0.00	0.00	0.00	0.03	0.02	0.03	0.32
Case 18	0.23	0.20	0.18	0.24	0.36	0.00	0.00	0.00	0.00	0.23	0.20	0.18	0.24
Case 19	0.10	0.08	0.10	0.11	0.33	0.00	0.00	0.00	0.00	0.10	0.08	0.10	0.11
Case 20	0.10	0.06	0.10	0.11	0.27	0.00	0.00	0.00	0.00	0.10	0.06	0.10	0.11
Case 21	3.59	2.40	3.09	3.75	2.58	0.00	0.00	0.00	0.00	3.59	2.40	3.09	3.75
Case 22	0.02	0.01	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.02	0.02

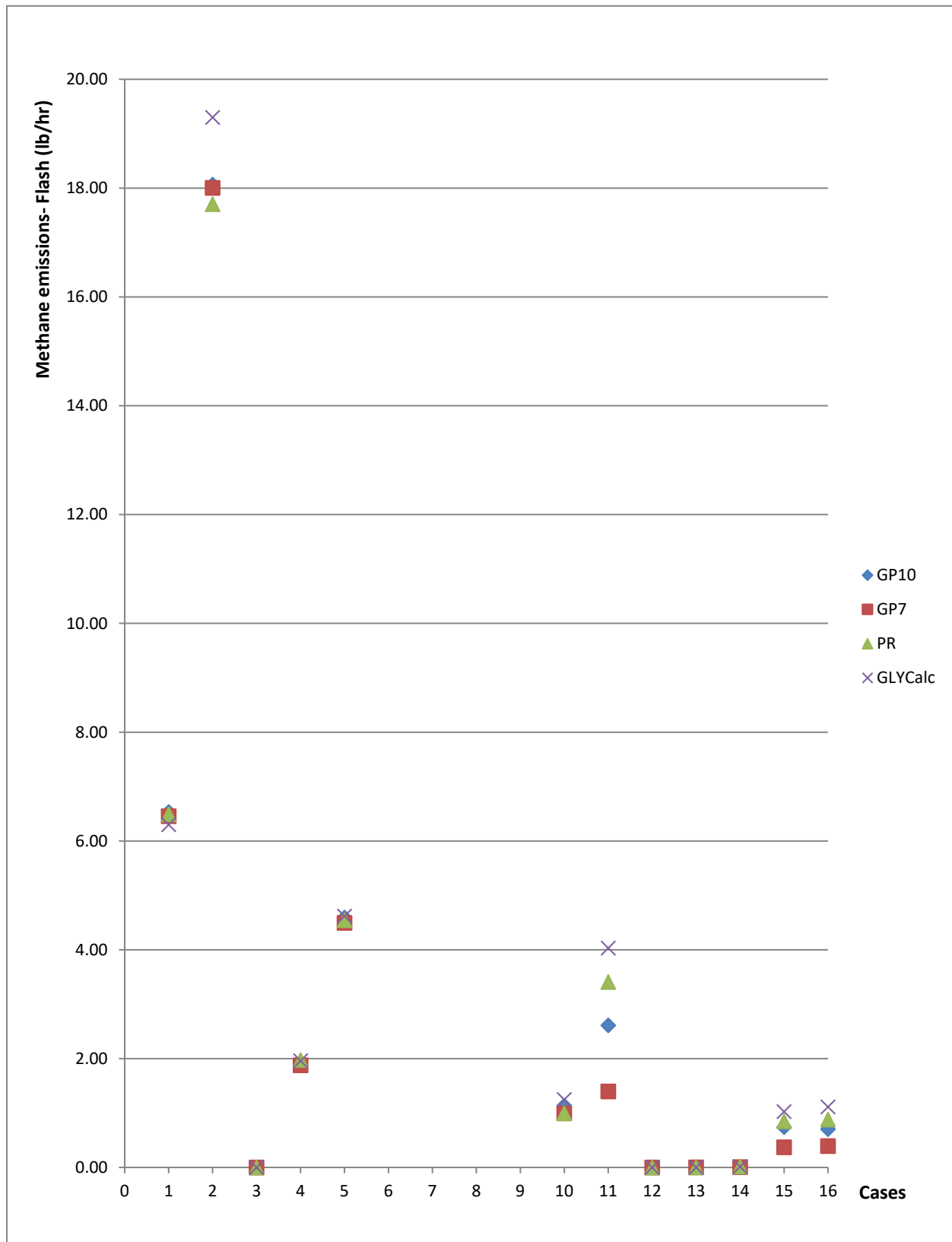


Figure 37 Methane emissions estimate from flash tank- TEG units

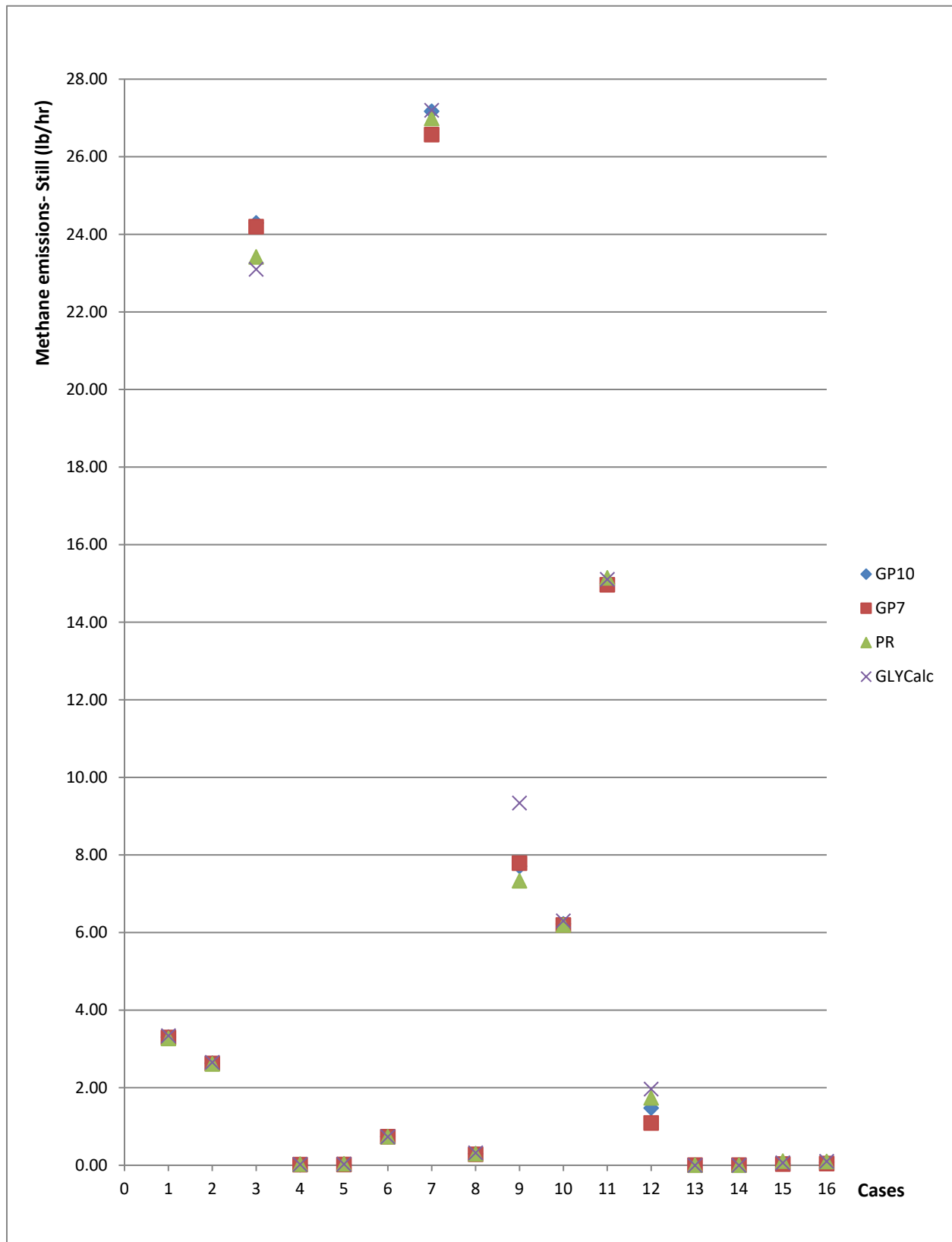


Figure 38 Methane emissions estimate from still- TEG units

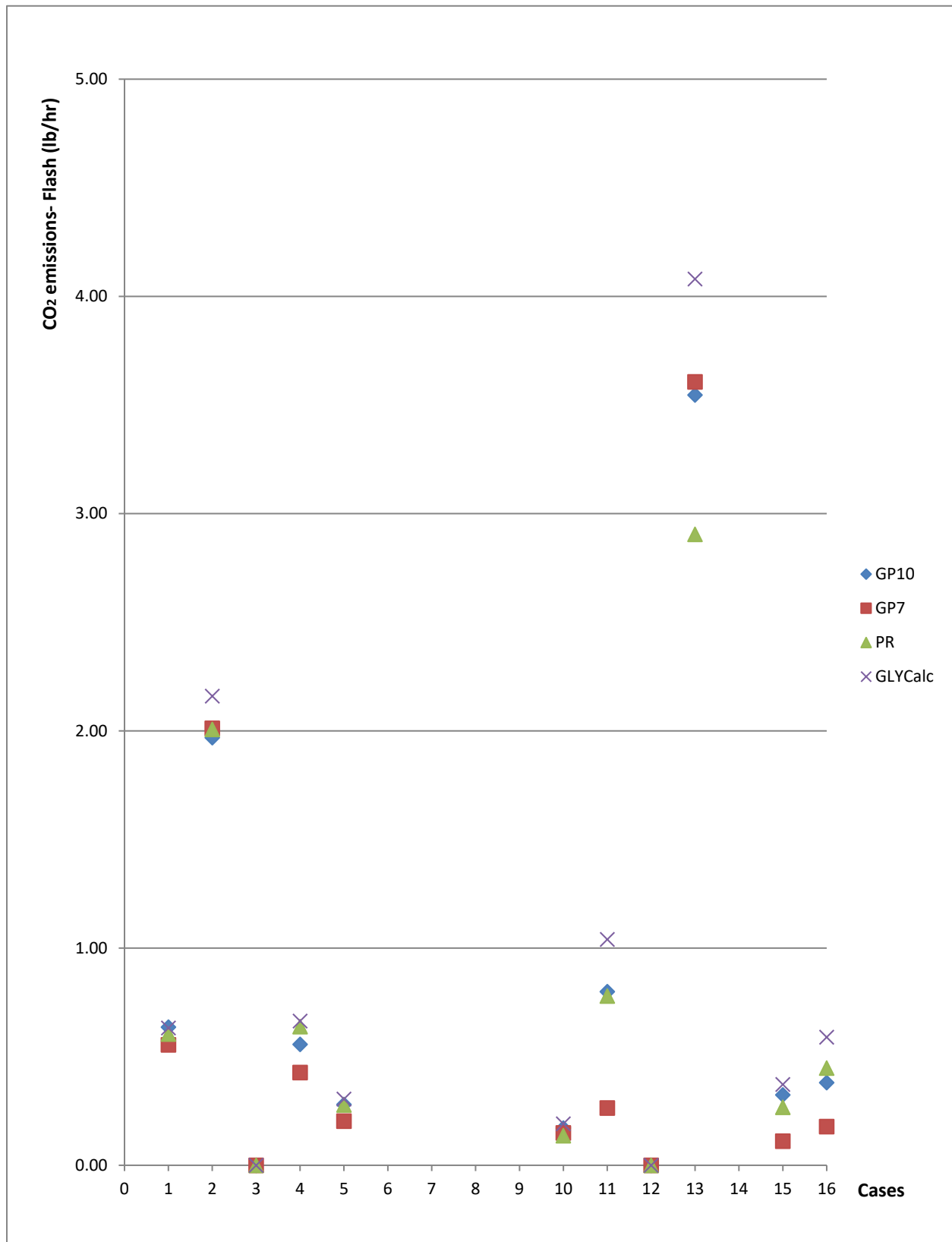


Figure 39 CO2 emissions estimate from flash tank- TEG units



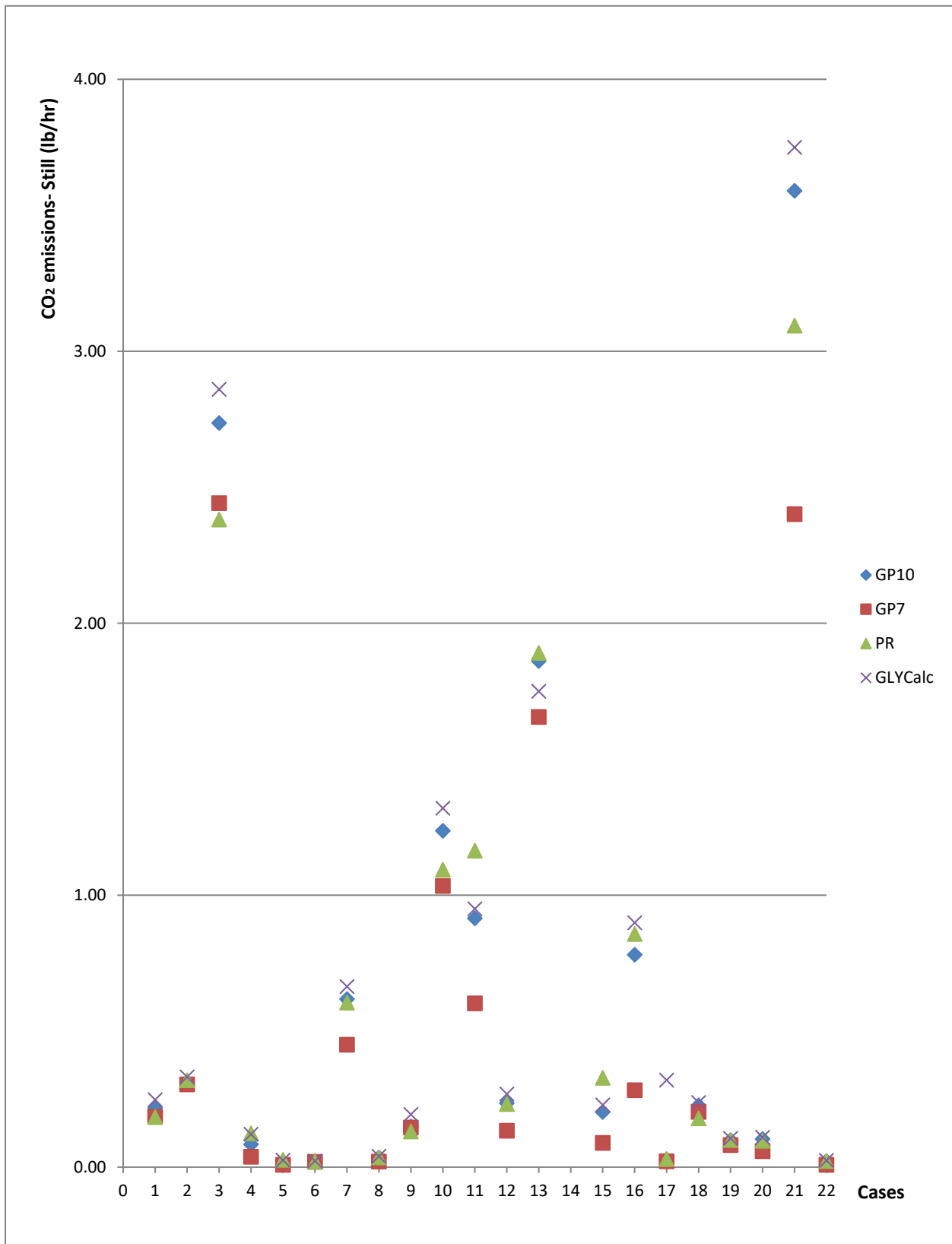


Figure 40 CO2 emissions estimate from still- TEG units

**Table 17** Methane emission comparison for EG cases

Cases	Total Methane (lb/hr)				Methane- flash (lb/hr)			Methane- still (lb/hr)		
	NRTL-PR	GP7	GLYCalc	MEA	NRTL-PR	GP7	GLYCalc	NRTL-PR	GP7	GLYCalc
<b>Case 1</b>	14.35	14.50	11.25	14.29	14.25	14.39	11.11	0.11	0.12	0.14
<b>Case 2</b>	6.39	6.56	6.99	5.40	0.00	0.00	0.00	6.39	6.56	6.99
<b>Case 3</b>	0.10	0.09	0.09	0.11	0.05	0.05	0.04	0.05	0.05	0.05
<b>Case 4</b>	0.26	0.31	0.22	0.31	0.25	0.29	0.20	0.02	0.02	0.02
<b>Case 5</b>	0.88	1.05	0.99	0.90	0.84	1.01	0.95	0.04	0.04	0.04
<b>Case 6</b>	0.06	0.06	0.05	0.04	0.00	0.00	0.00	0.06	0.06	0.05
<b>Case 7</b>	1.48	1.74	1.34	1.30	0.00	0.00	0.00	1.48	1.74	1.34
<b>Case 8</b>	0.75	0.70	0.61	0.66	0.00	0.00	0.00	0.75	0.70	0.61

**Table 18** CO<sub>2</sub> emission comparison for EG cases

Cases	Total CO <sub>2</sub> (lb/hr)				CO <sub>2</sub> - flash (lb/hr)			CO <sub>2</sub> - still (lb/hr)		
	NRTL-PR	GP7	GLYCalc	MEA	NRTL-PR	GP7	GLYCalc	NRTL-PR	GP7	GLYCalc
<b>Case 1</b>	1.68	0.85	1.36	2.18	1.35	0.76	1.19	0.33	0.08	0.17
<b>Case 2</b>	0.22	0.13	0.20	0.33	0.00	0.00	0.00	0.22	0.13	0.20
<b>Case 3</b>	0.10	0.03	0.07	0.26	0.00	0.00	0.00	0.10	0.03	0.07
<b>Case 4</b>	0.16	0.05	0.16	0.15	0.04	0.02	0.06	0.13	0.02	0.10
<b>Case 5</b>	0.29	0.10	0.35	0.42	0.11	0.07	0.21	0.18	0.04	0.14
<b>Case 6</b>	0.21	0.06	0.18	0.53	0.00	0.00	0.00	0.21	0.06	0.18
<b>Case 7</b>	0.70	0.24	0.84	0.73	0.00	0.00	0.00	0.70	0.24	0.84
<b>Case 8</b>	2.03	0.45	2.55	1.83	0.00	0.00	0.00	2.03	0.45	2.55

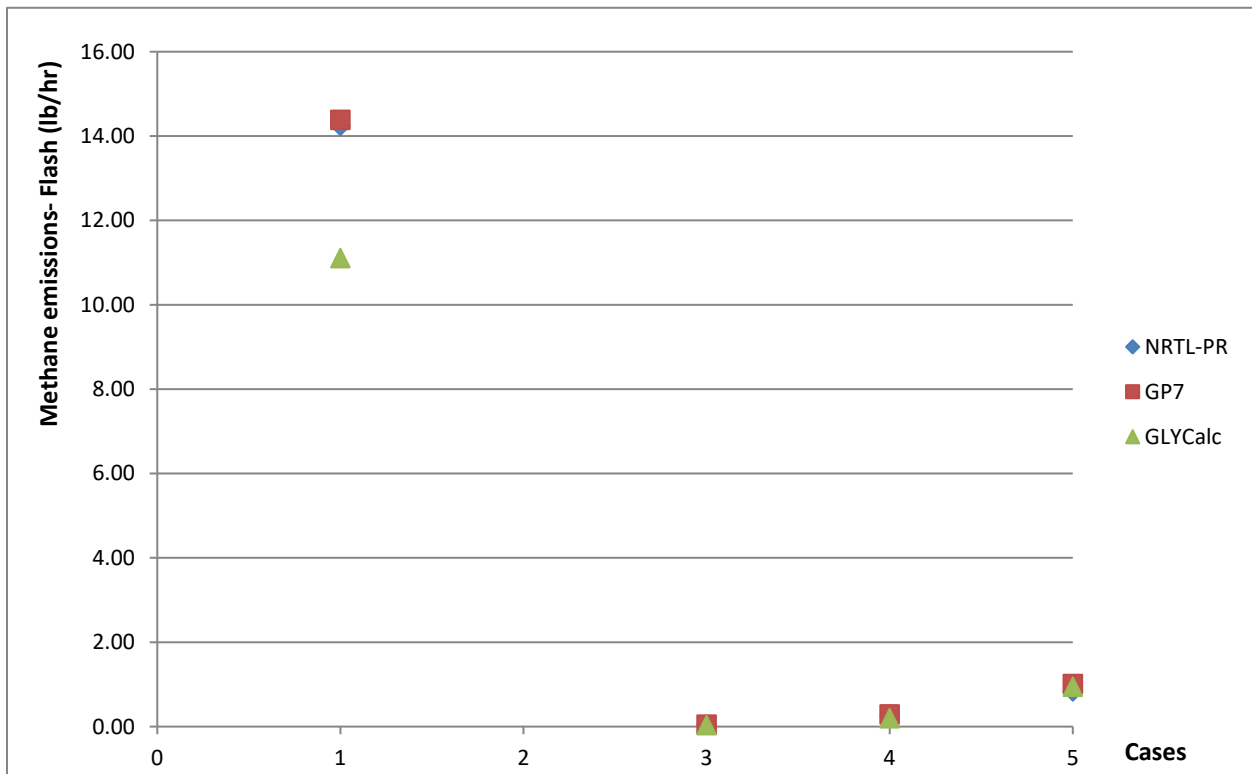


Figure 41 Methane emissions estimate from flash tank- EG units

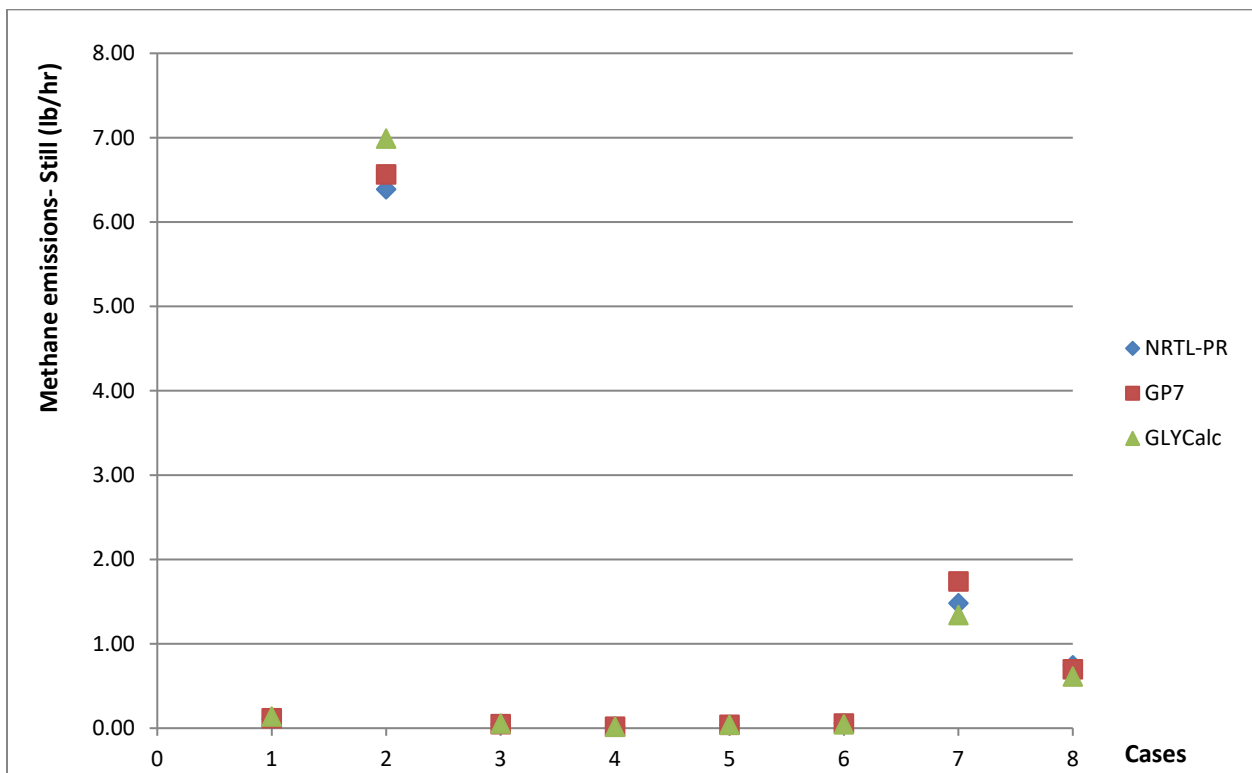


Figure 42 Methane emissions estimate from still- EG units

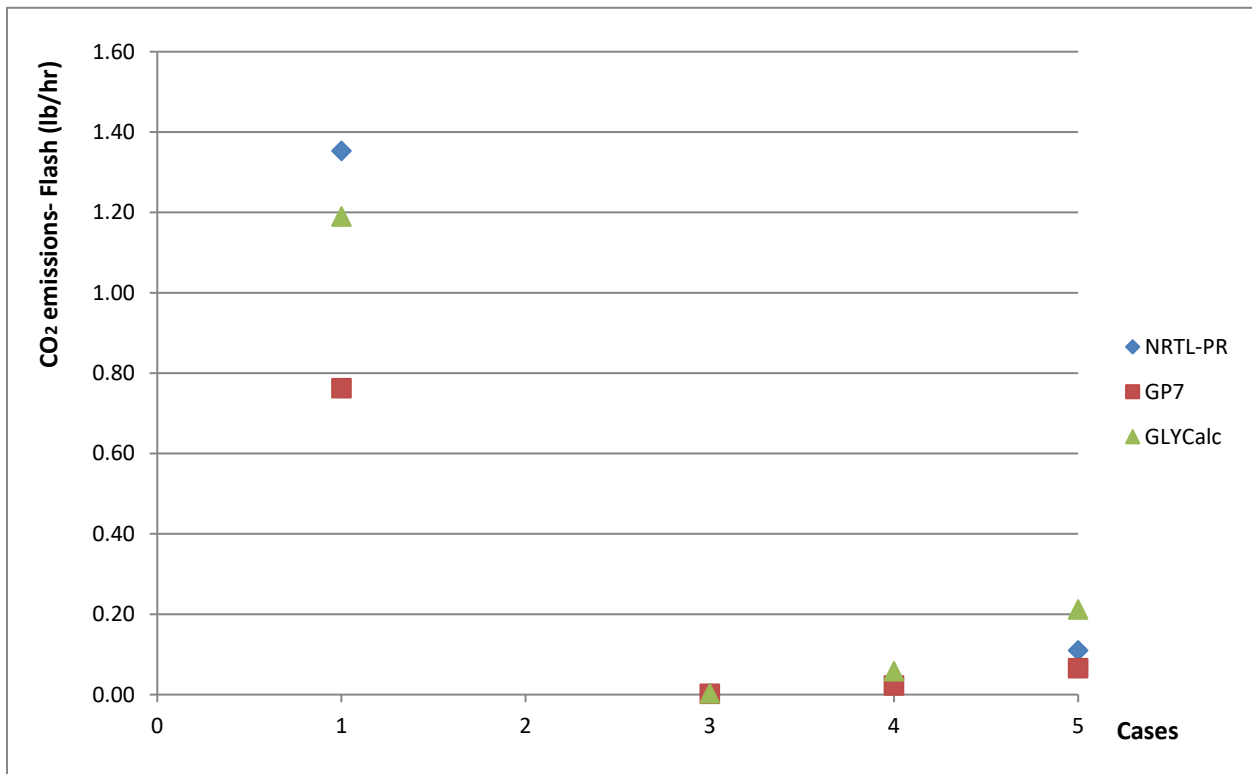


Figure 43 CO2 emissions estimate from flash tank- EG units

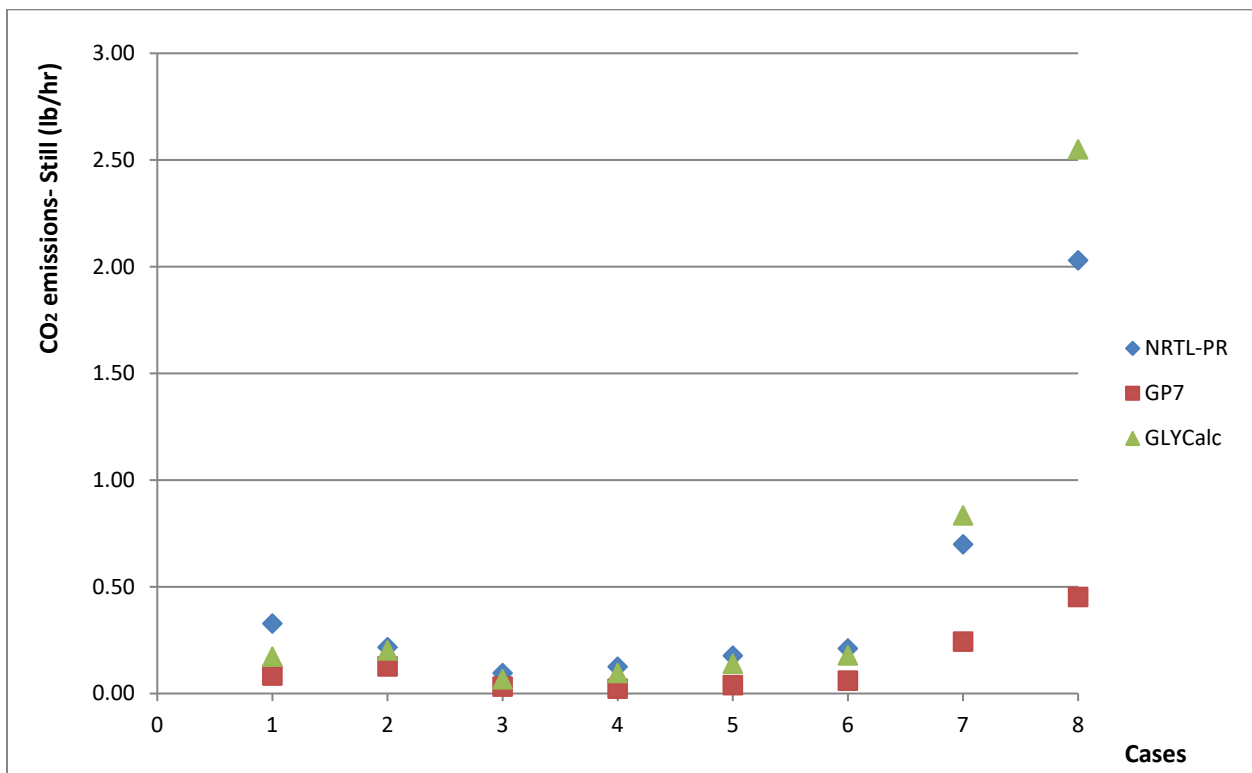


Figure 44 CO2 emissions estimate from still- EG units

**Table 19** Emissions estimation error for different methods compared to TCT results

cases	TCT emissions (m <sup>3</sup> /hr)	Absolute difference between estimated emissions and TCT emissions (m <sup>3</sup> /hr)		
		GP7/NRTL-PR	GLYCalc	GP10
<b>Case 1</b>	29.4	18.53	17.94	18.18
<b>Case 2</b>	15.7	15.59	15.46	15.52
<b>Case 3</b>	1.23	0.59	0.38	0.06
<b>Case 4</b>	1.32	0.07	0.01	0.07
<b>Case 5</b>	6.22	1.26	1.13	1.13
<b>Case 6</b>	0.77	0.55	0.53	0.54
<b>Case 7</b>	0.04	0.00	0.00	-
<b>Case 8</b>	0.03	0.02	0.02	-
<b>Case 9</b>	0.05	0.03	0.03	-
<b>Case 10</b>	0.25	0.13	0.03	0.09
<b>Case 11</b>	0.095	0.13	0.44	0.13
<b>Case 12</b>	0.41	0.26	0.14	0.26

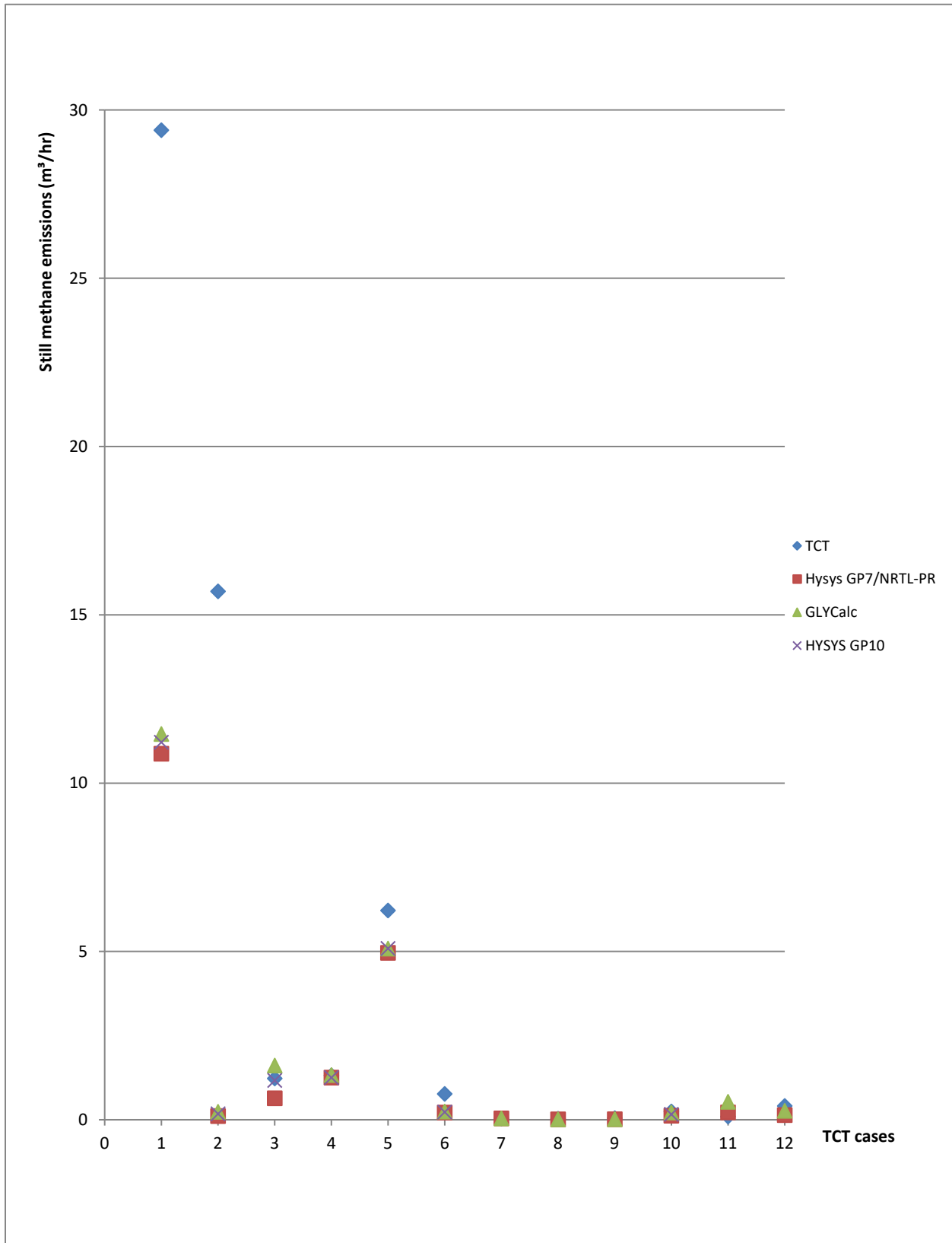
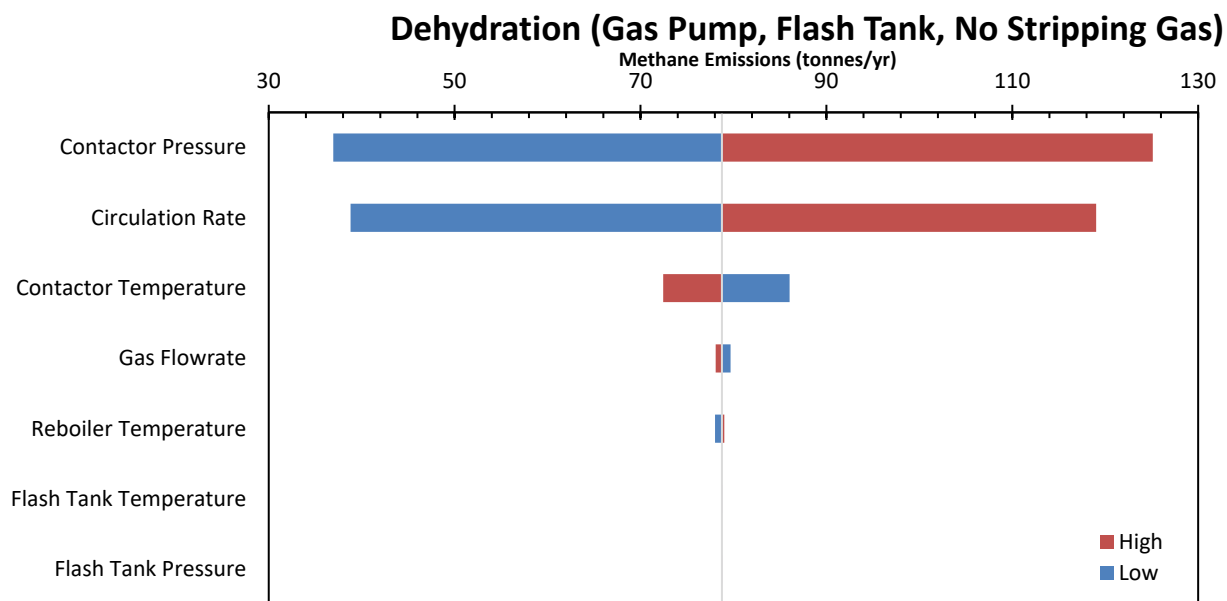
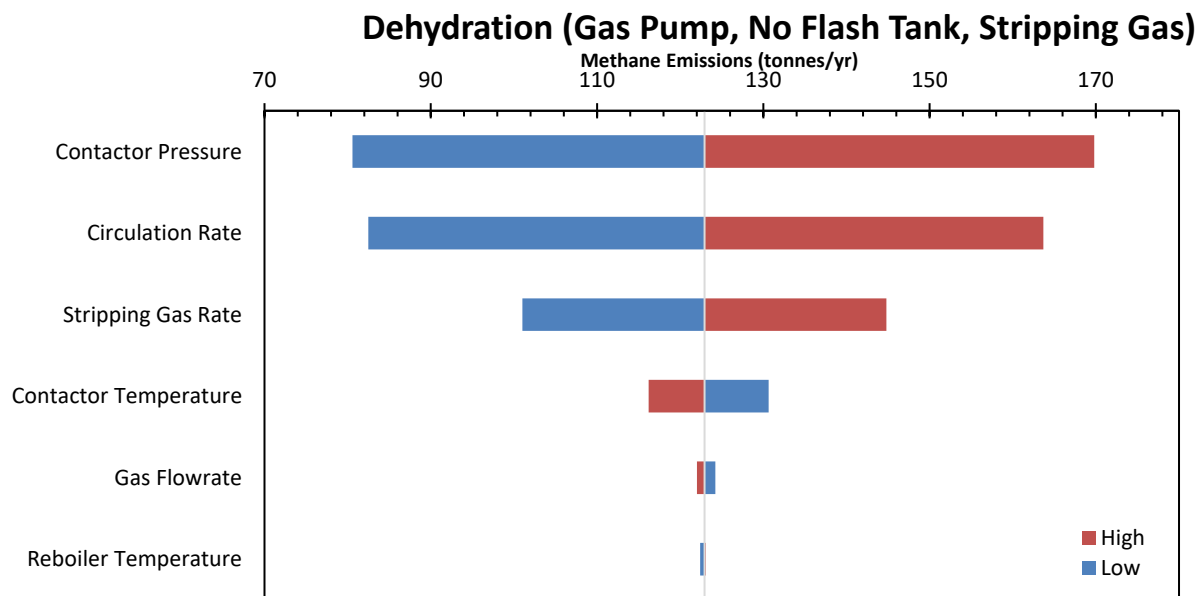


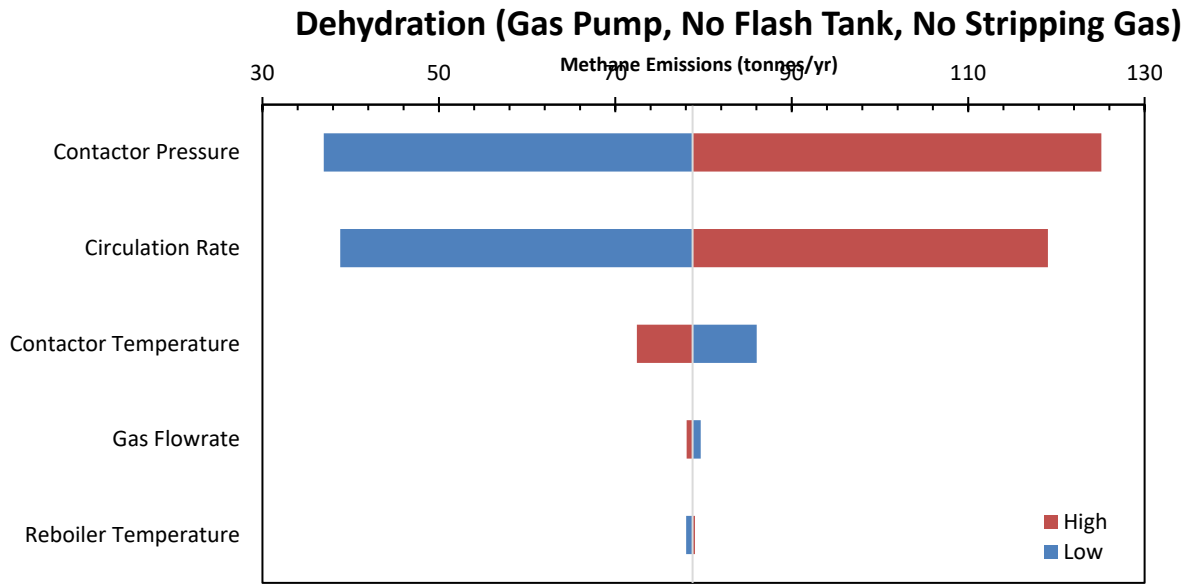
Figure 45 Still methane emissions comparison for TCT cases



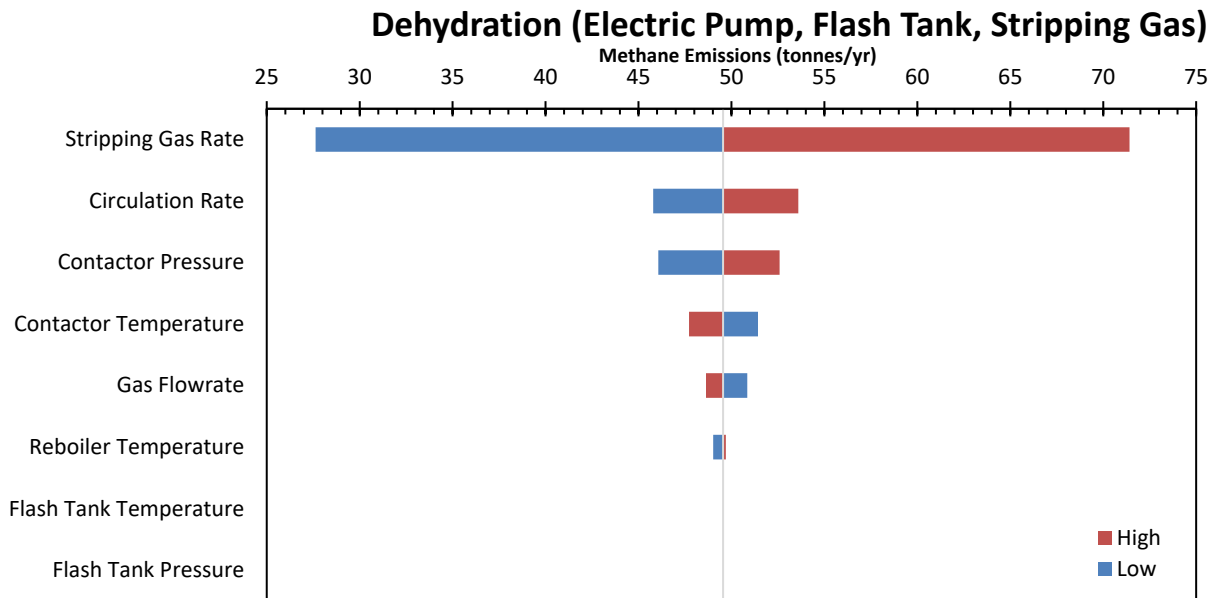
**Figure 46** Sample sensitivity analysis for TEG dehydration unit with gas pump, flash tank and no stripping gas



**Figure 47** Sample sensitivity analysis for TEG dehydration unit with gas pump, no flash tank and stripping gas

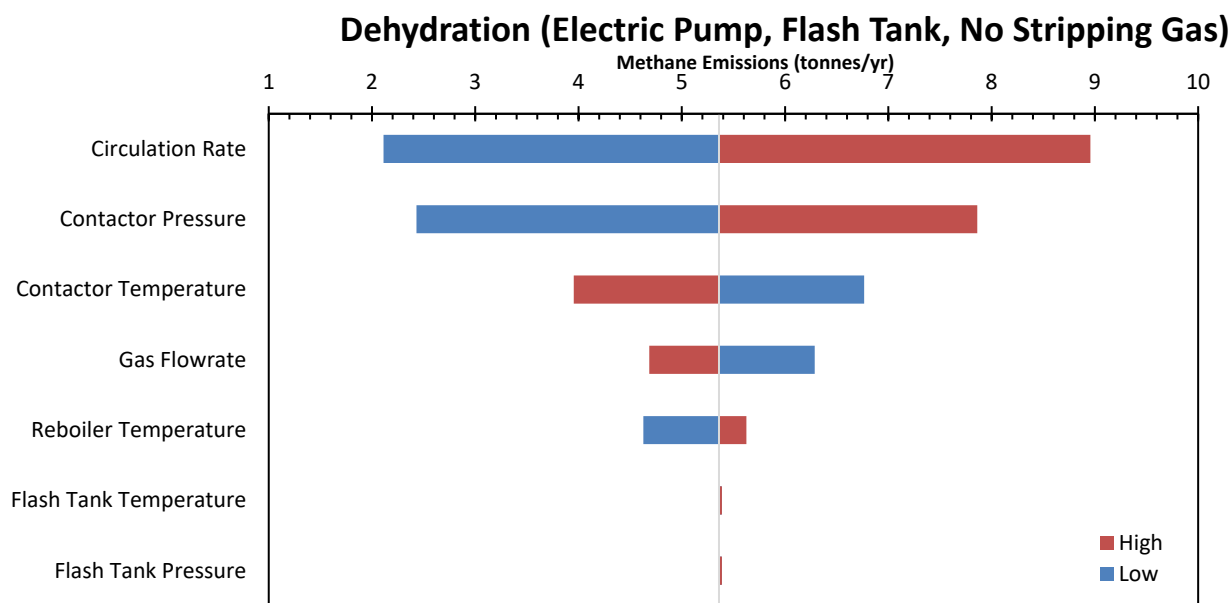


**Figure 48** Sample sensitivity analysis for TEG dehydration unit with gas pump, no flash tank and no stripping gas

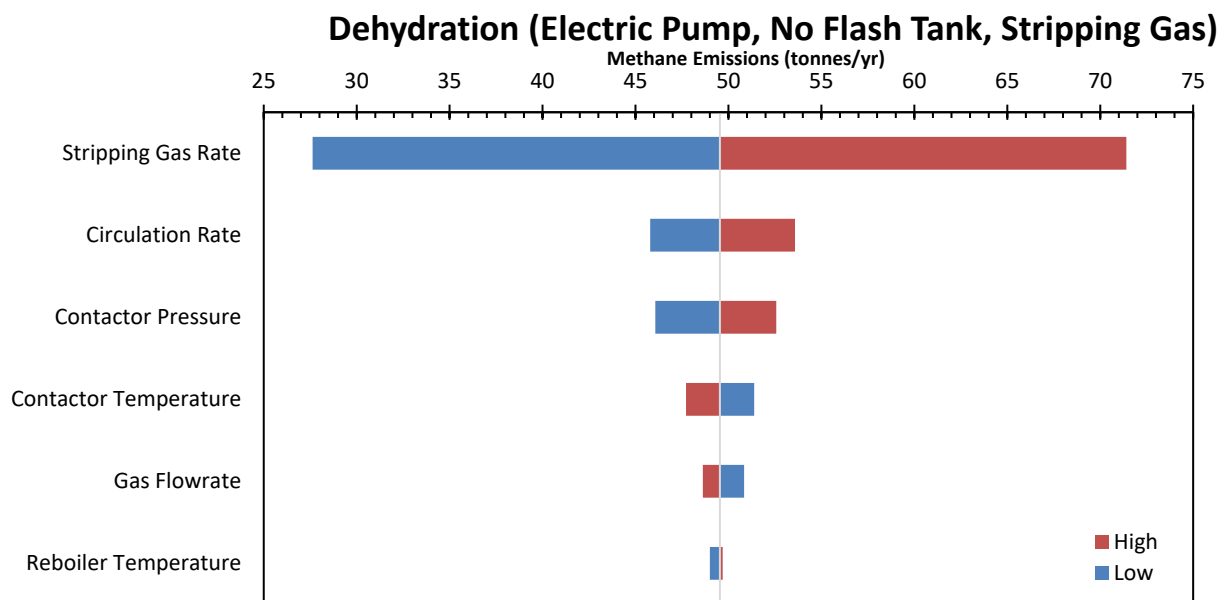


**Figure 49** Sample sensitivity analysis for TEG dehydration unit with electric pump, flash tank and stripping gas

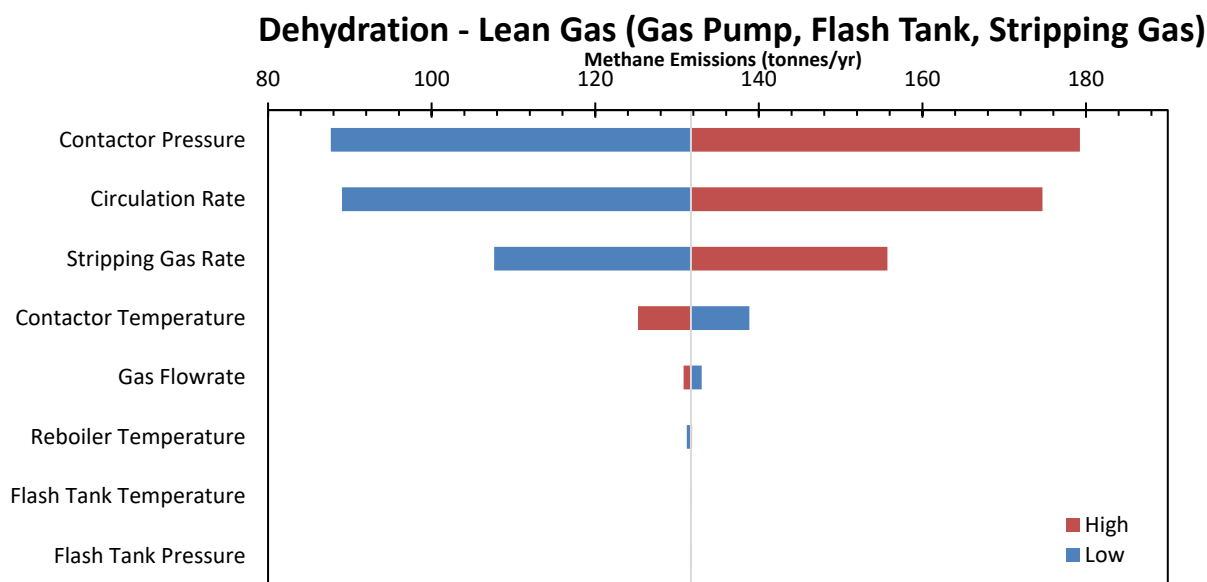




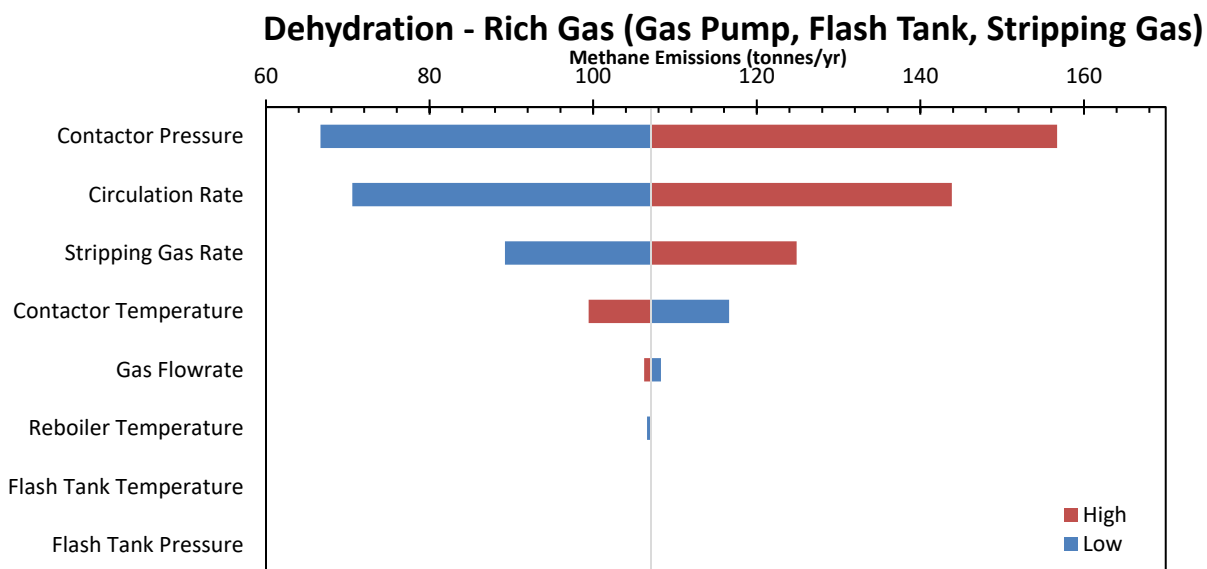
**Figure 50** Sample sensitivity analysis for TEG dehydration unit with electric pump, flash tank and no stripping gas



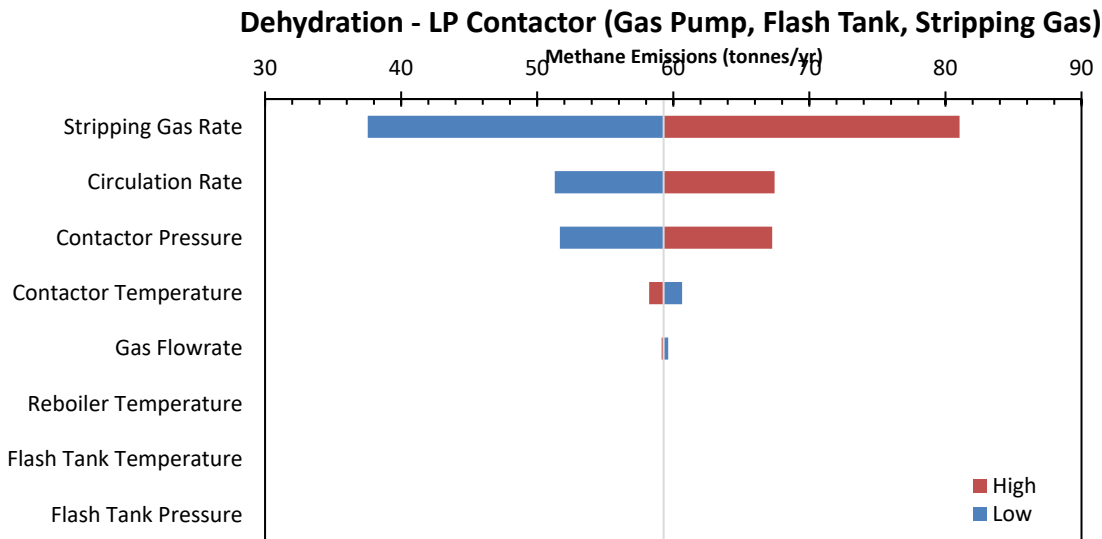
**Figure 51** Sample sensitivity analysis for TEG dehydration unit with gas pump, flash tank and no stripping gas



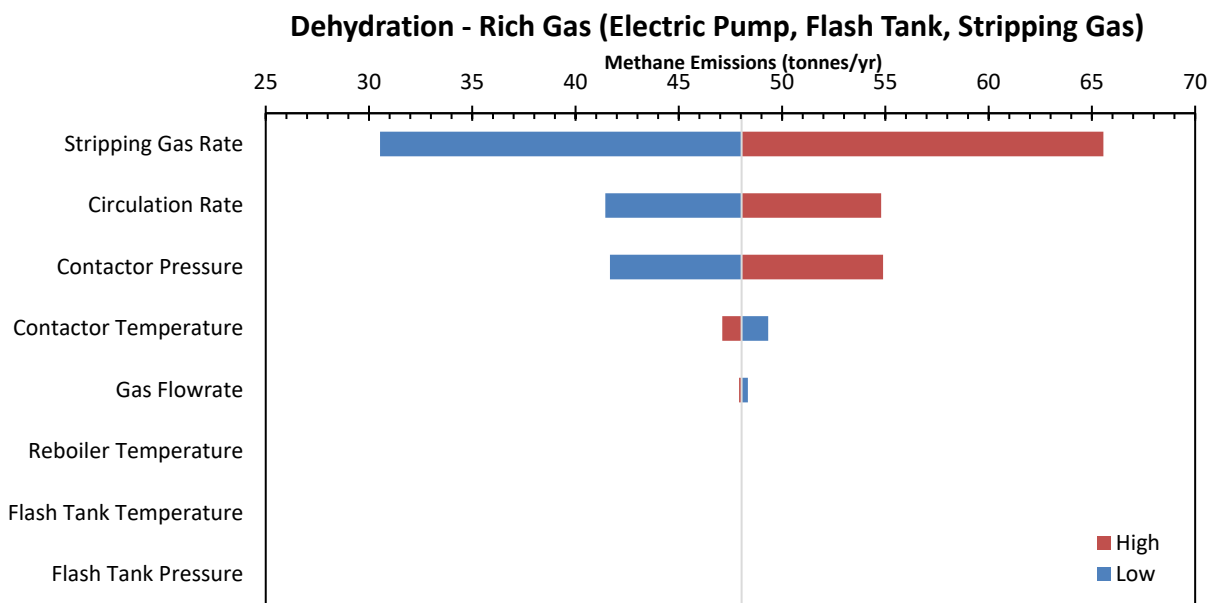
**Figure 52** Sample sensitivity analysis for TEG dehydration unit with lean gas, gas pump, flash tank and stripping gas



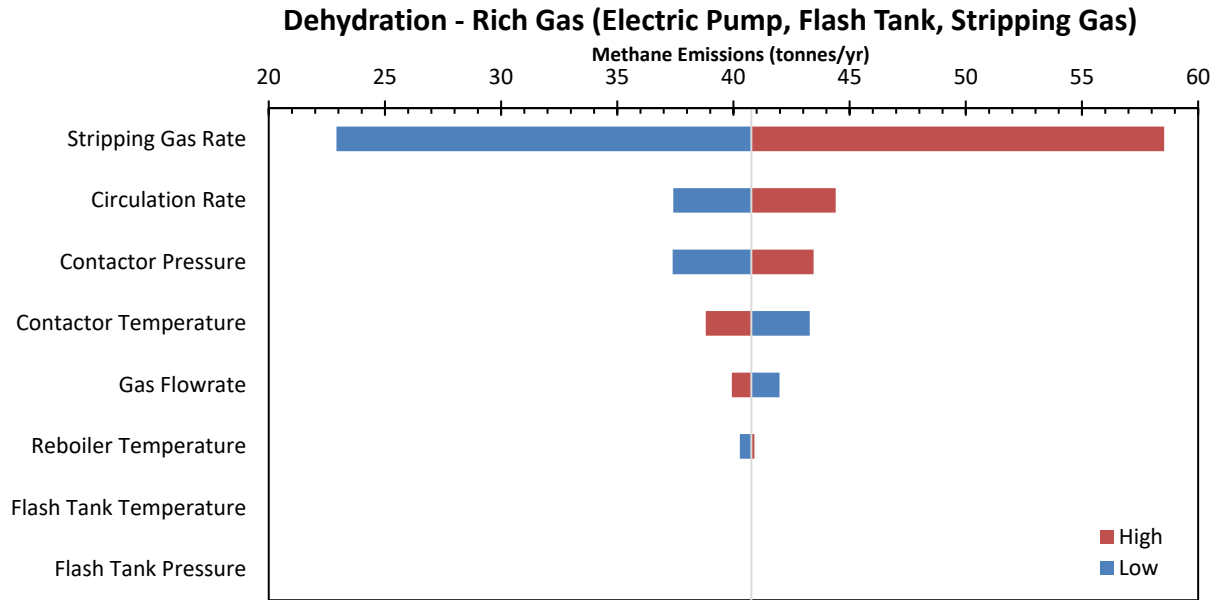
**Figure 53** Sample sensitivity analysis for TEG dehydration unit with rich gas, gas pump, flash tank and stripping gas



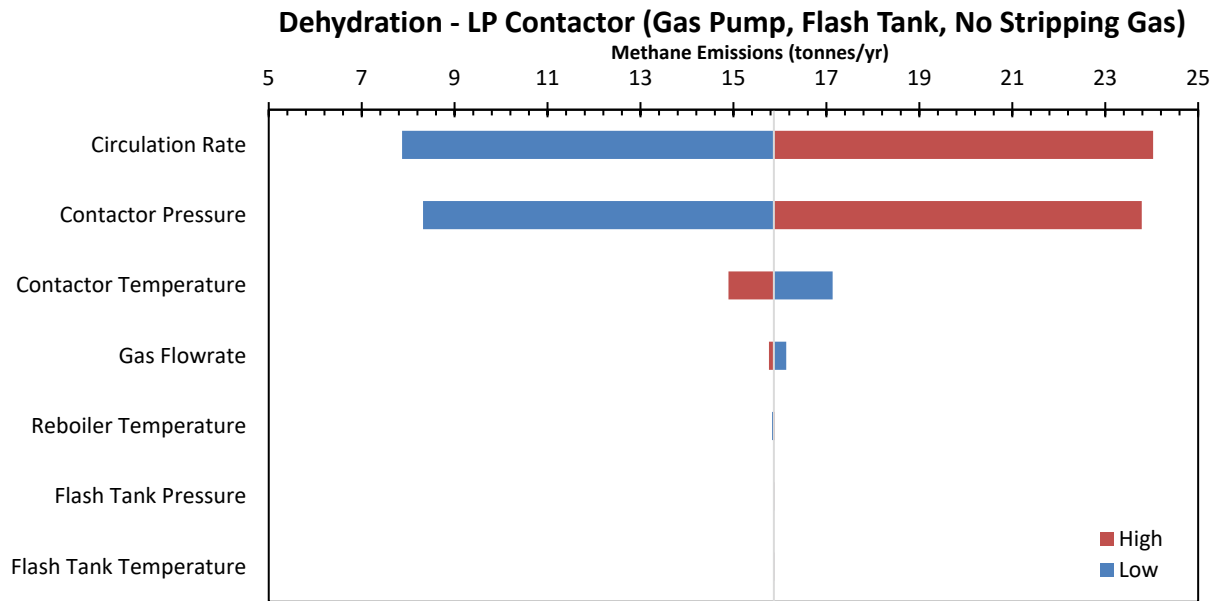
**Figure 54** Sample sensitivity analysis for TEG dehydration unit with LP Contactor, gas pump, flash tank and stripping gas



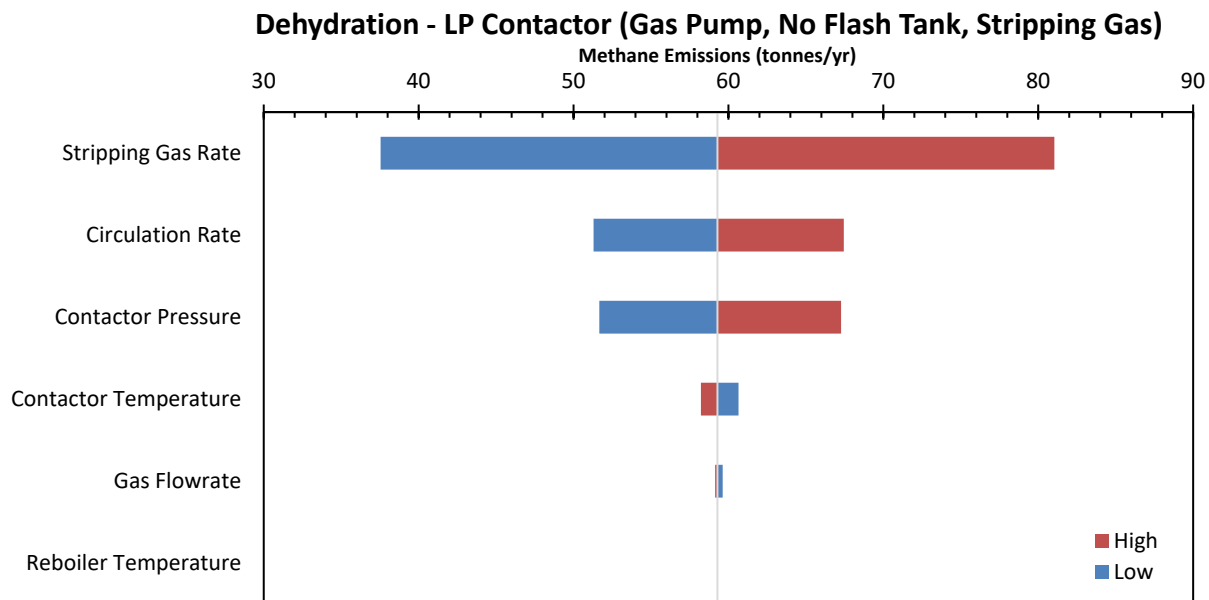
**Figure 55** Sample sensitivity analysis for TEG dehydration unit with rich gas, electric pump, flash tank and stripping gas



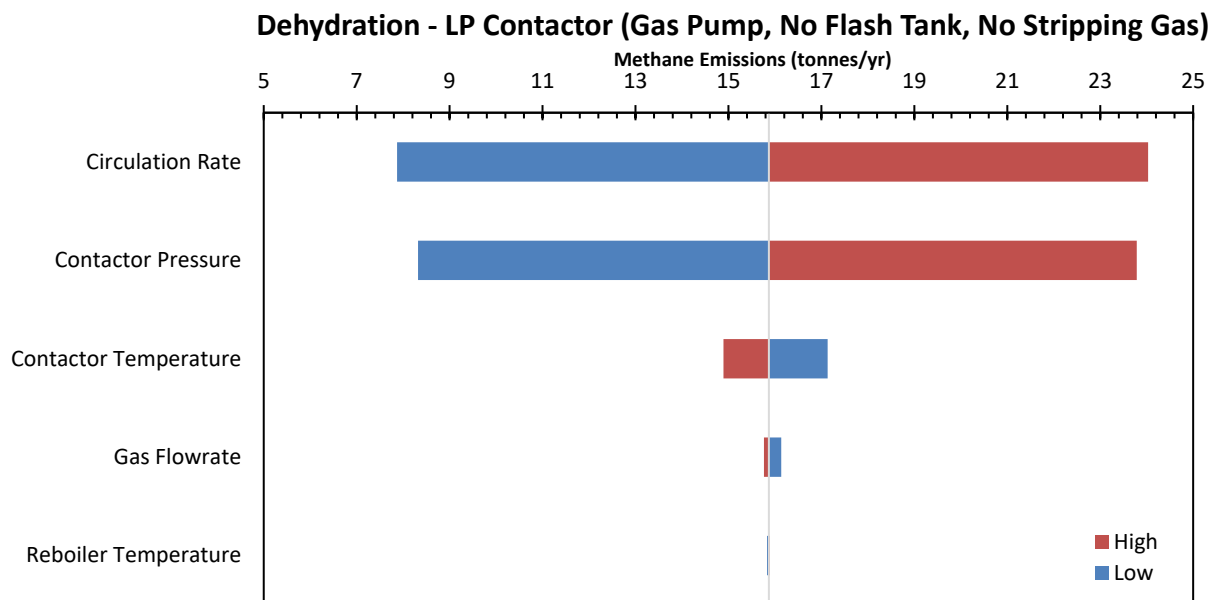
**Figure 56** Sample sensitivity analysis for TEG dehydration unit with rich gas, electric pump, flash tank and stripping gas



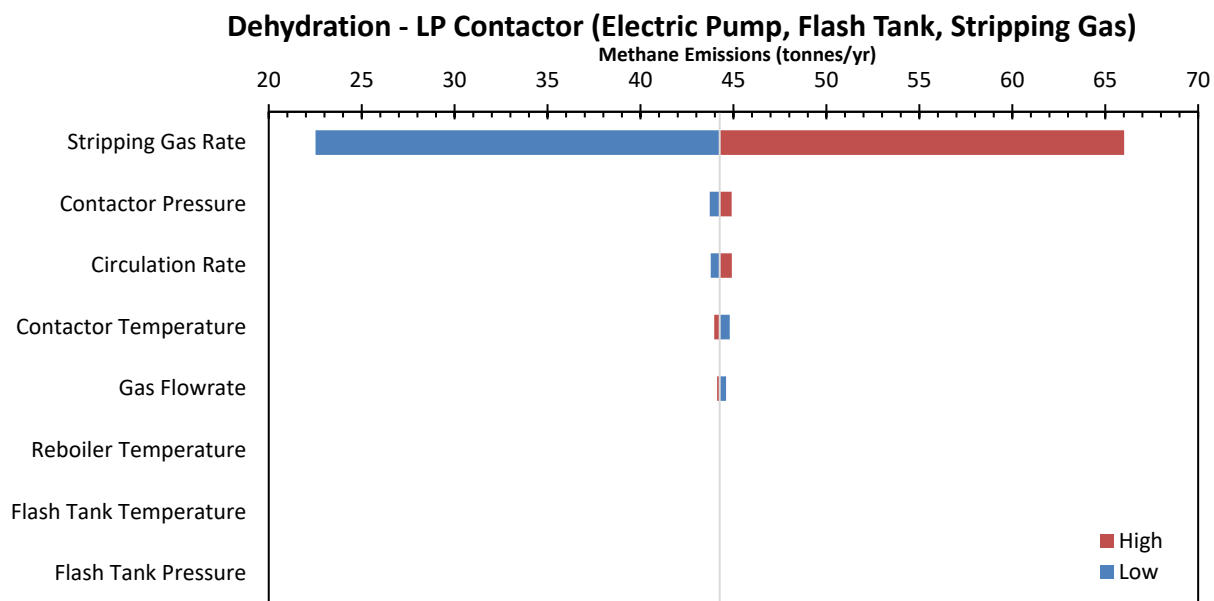
**Figure 57** Sample sensitivity analysis for TEG dehydration unit with LP contactor, gas pump, flash tank and no stripping gas



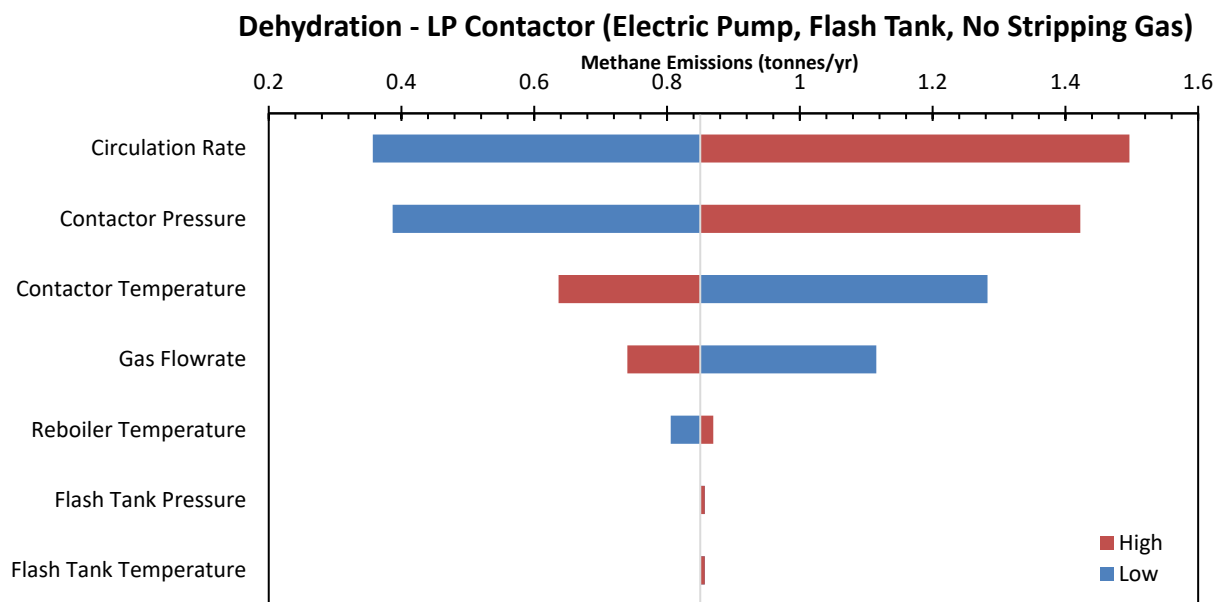
**Figure 58** Sample sensitivity analysis for TEG dehydration unit with LP contactor, gas pump, no flash tank and stripping gas



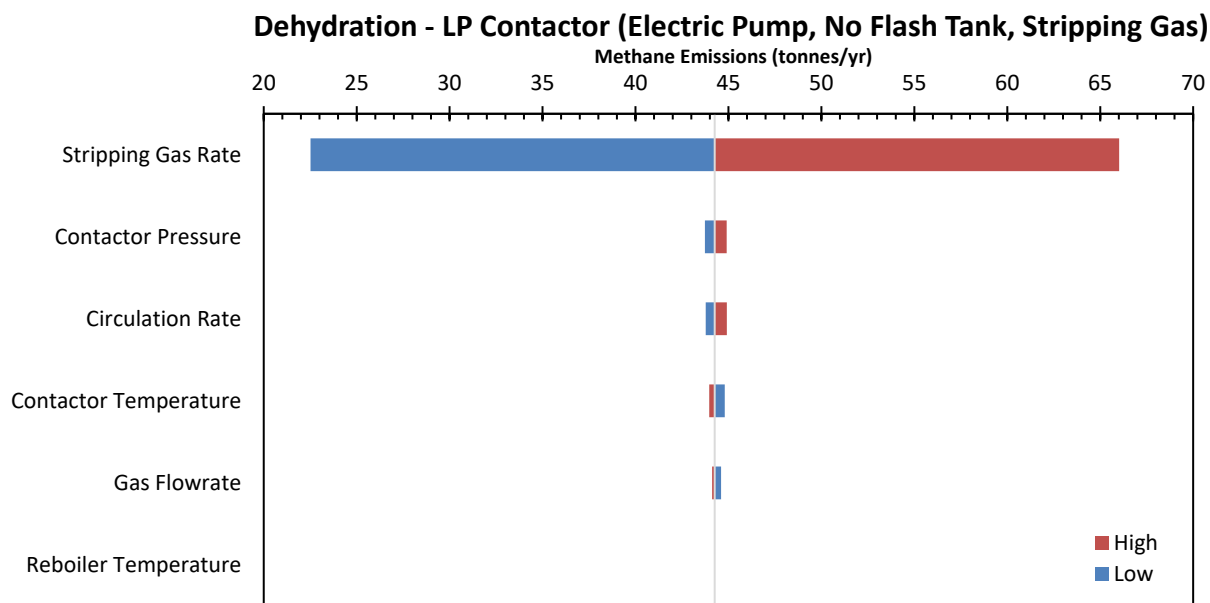
**Figure 59** Sample sensitivity analysis for TEG dehydration unit with LP contactor, gas pump, no flash tank and no stripping gas



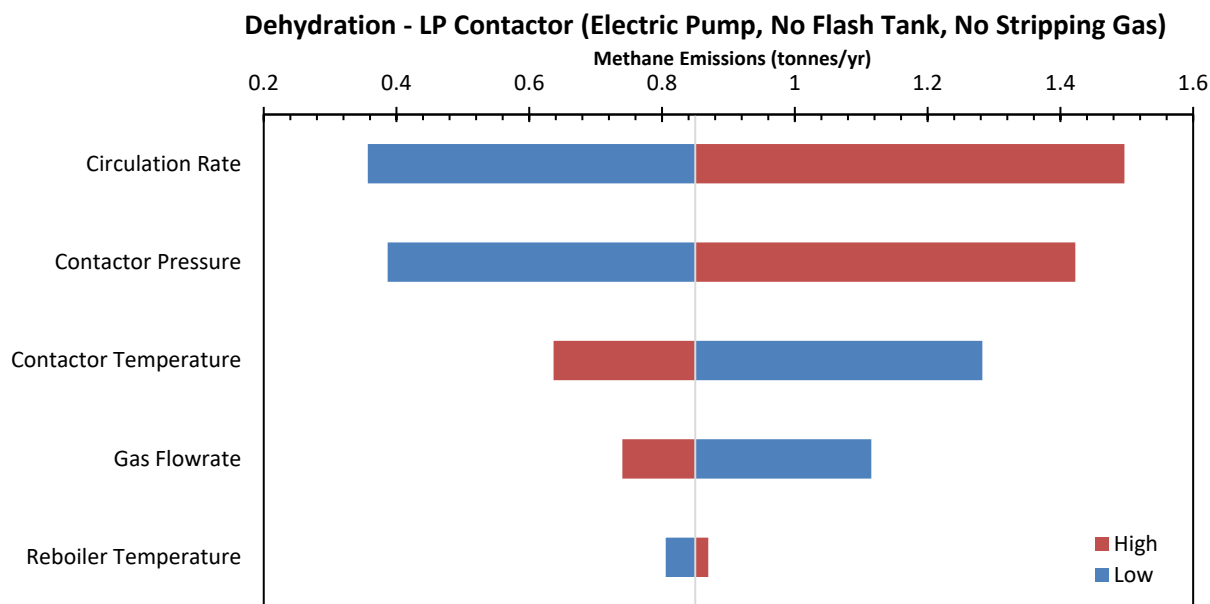
**Figure 60** Sample sensitivity analysis for TEG dehydration unit with LP contactor, electric pump, flash tank and stripping gas



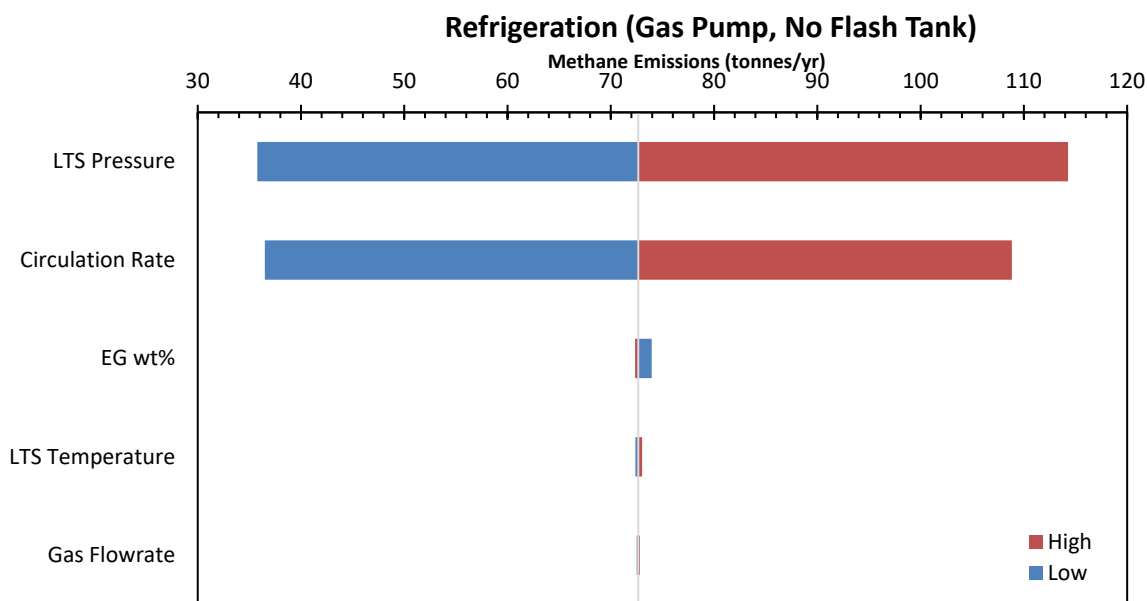
**Figure 61** Sample sensitivity analysis for TEG dehydration unit with LP contactor, electric pump, flash tank and no stripping gas



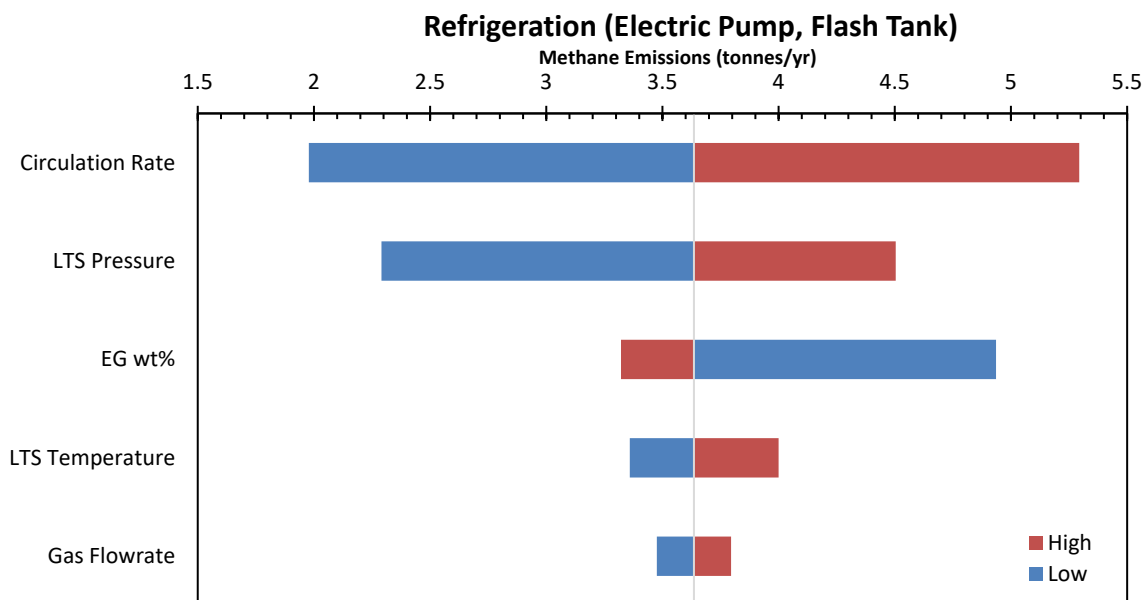
**Figure 62** Sample sensitivity analysis for TEG dehydration unit with LP contactor, electric pump, no flash tank and stripping gas



**Figure 63** Sample sensitivity analysis for TEG dehydration unit with LP contactor, electric pump, no flash tank and no stripping gas

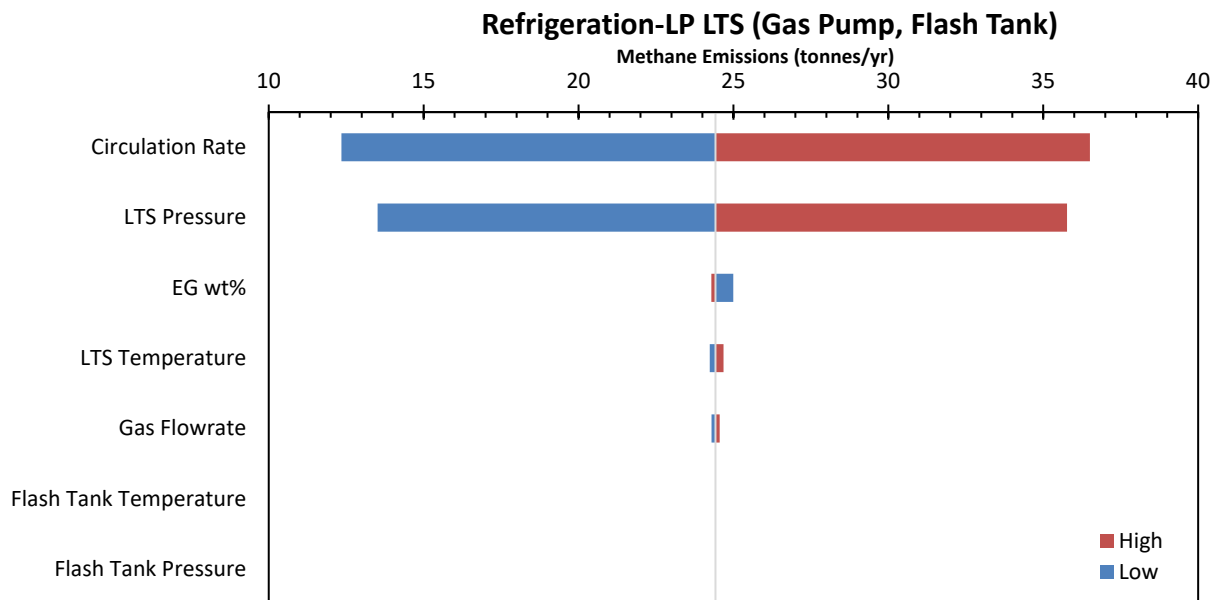


**Figure 64** Sample sensitivity analysis for EG refrigeration unit with gas pump, no flash tank

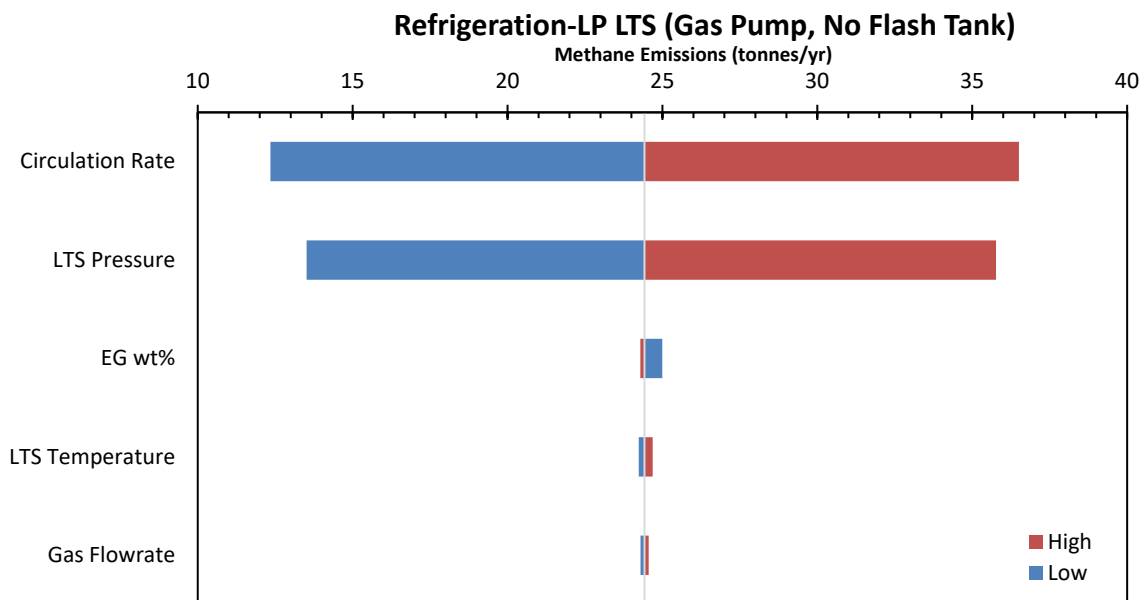


**Figure 65** Sample sensitivity analysis for EG refrigeration unit with electric pump, flash tank

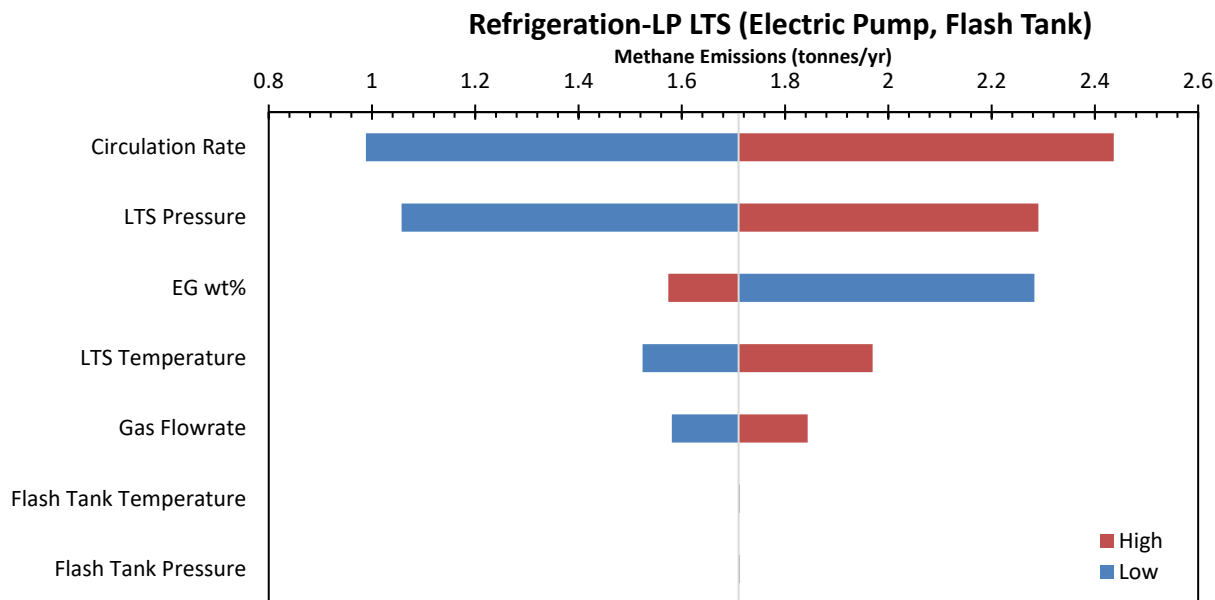




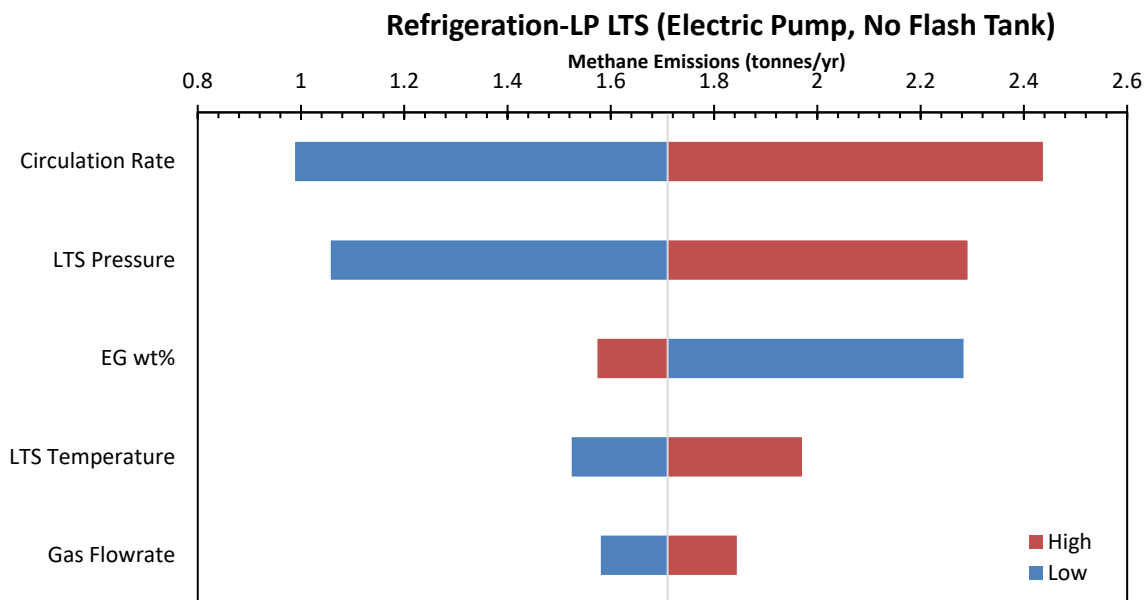
**Figure 66** Sample sensitivity analysis for EG refrigeration unit with LP LTS, gas pump, flash tank



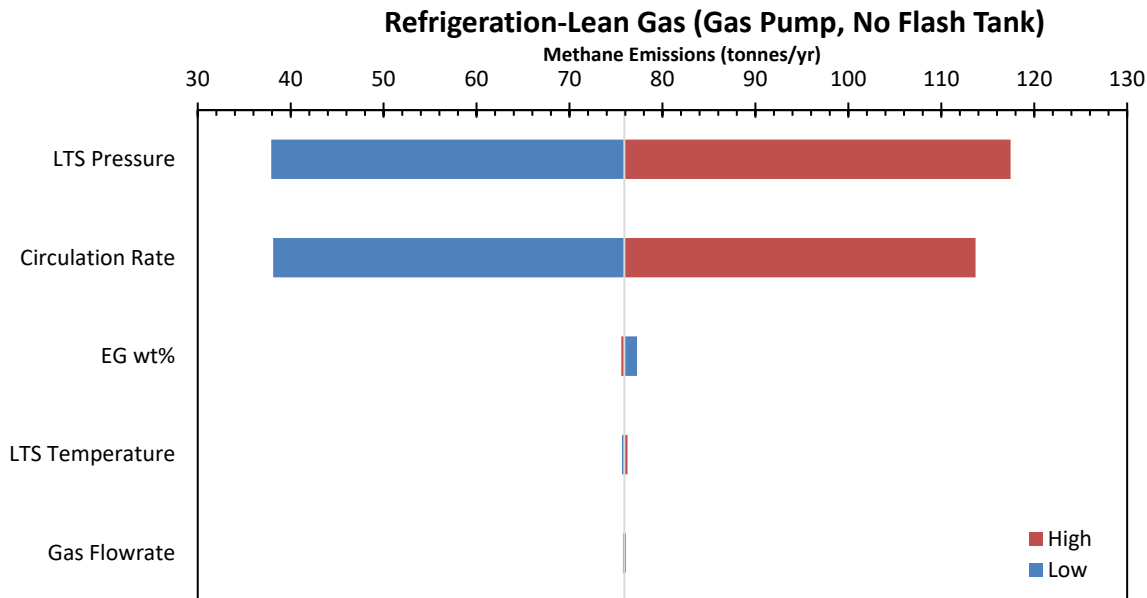
**Figure 67** Sample sensitivity analysis for EG refrigeration unit with LP LTS, gas pump, no flash tank



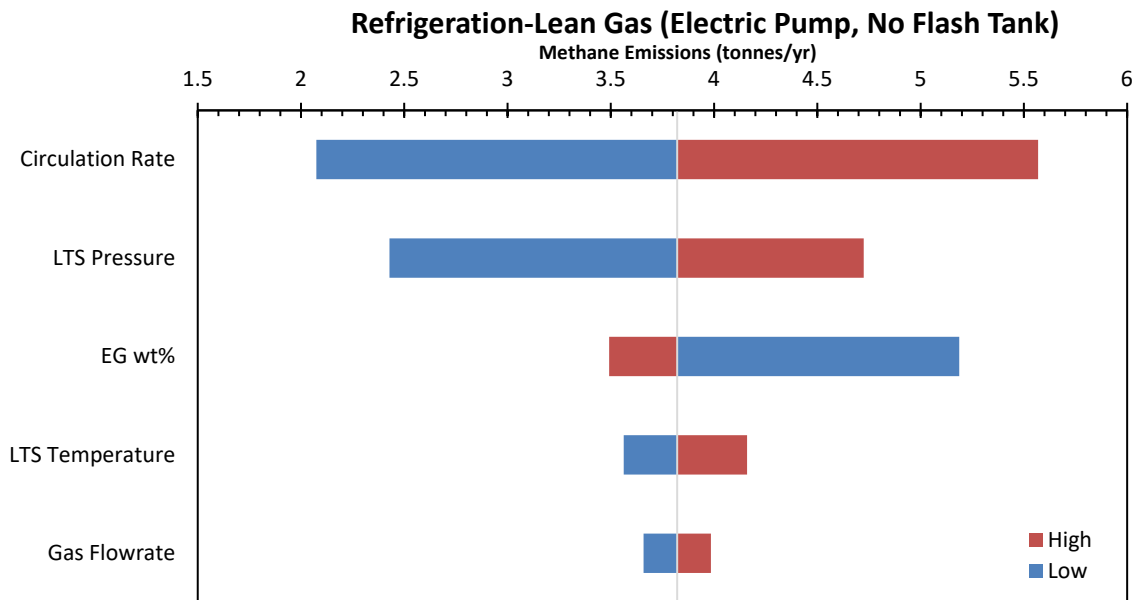
**Figure 68** Sample sensitivity analysis for EG refrigeration unit with LP LTS, electric pump, flash tank



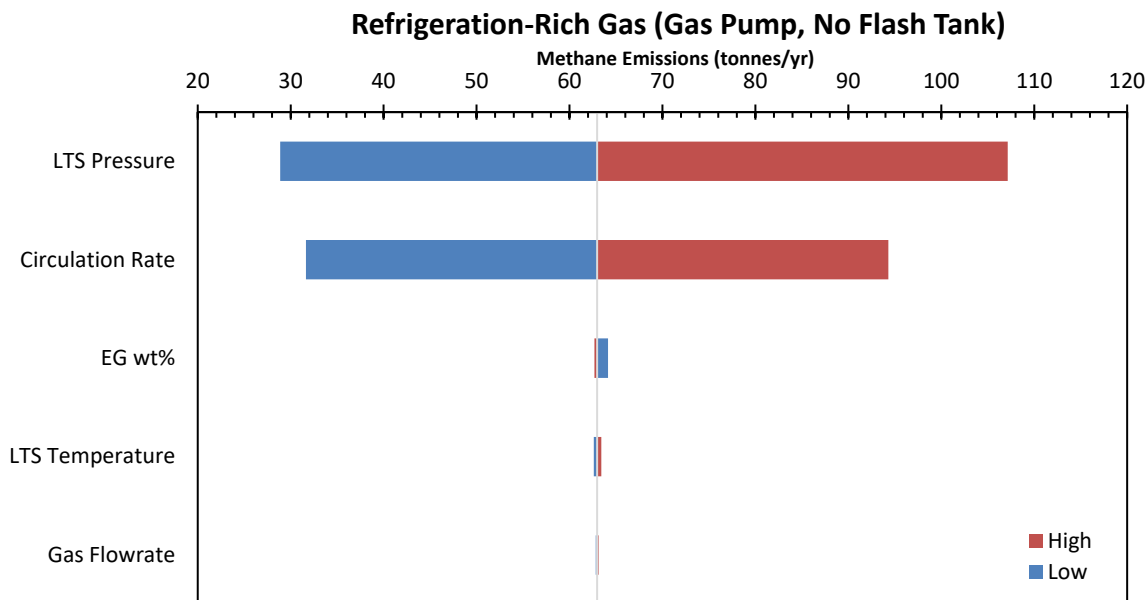
**Figure 69** Sample sensitivity analysis for EG refrigeration unit with LP LTS, electric pump, no flash tank



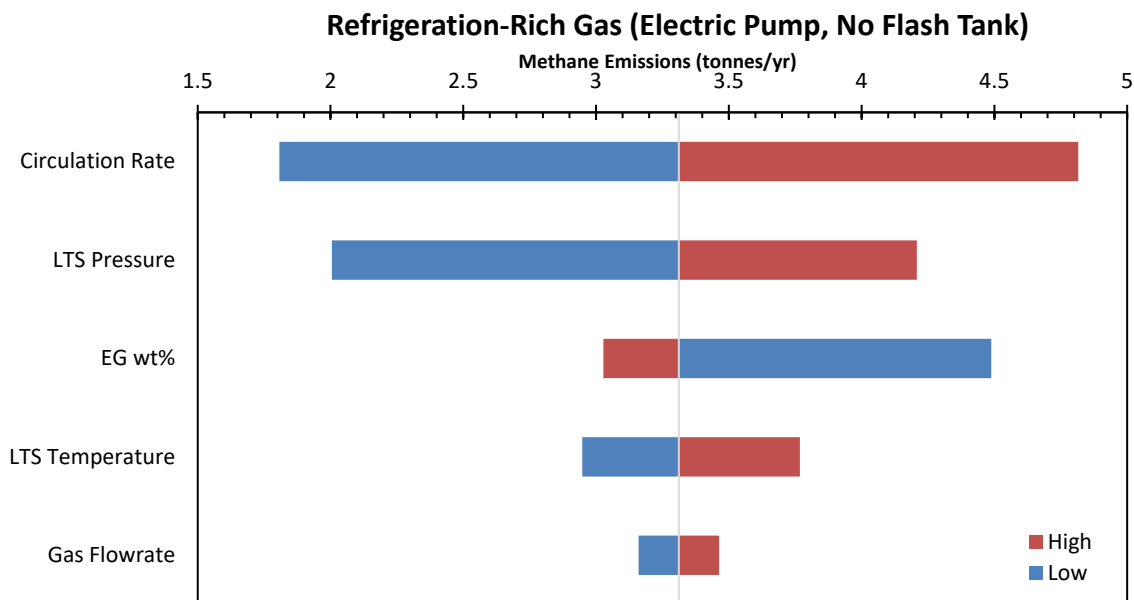
**Figure 70** Sample sensitivity analysis for EG refrigeration unit with lean gas, gas pump, no flash tank



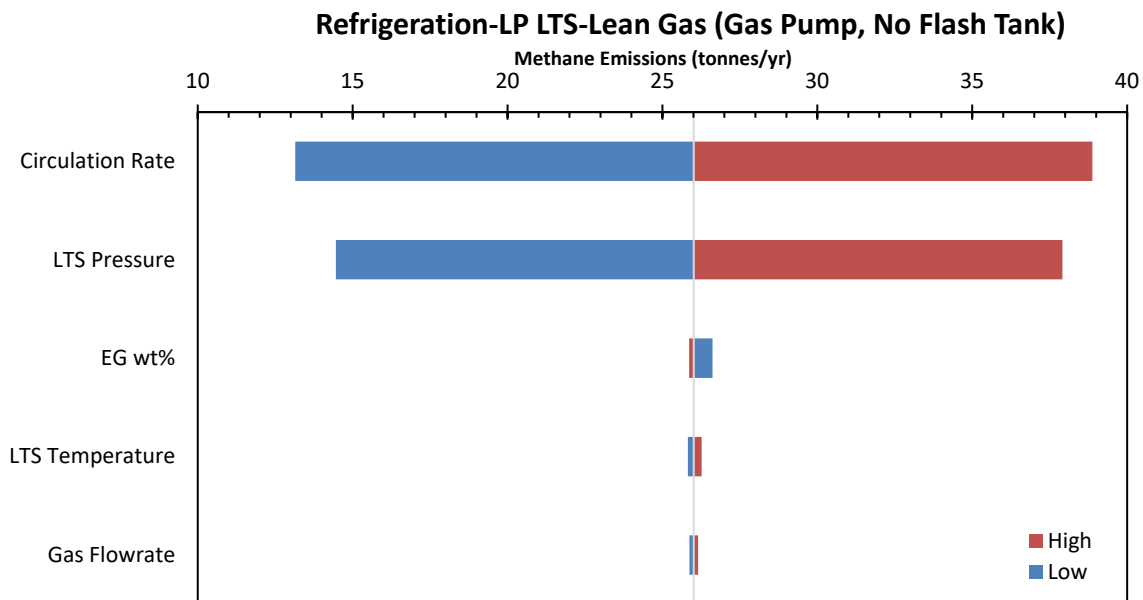
**Figure 71** Sample sensitivity analysis for EG refrigeration unit with lean gas, electric pump, no flash tank



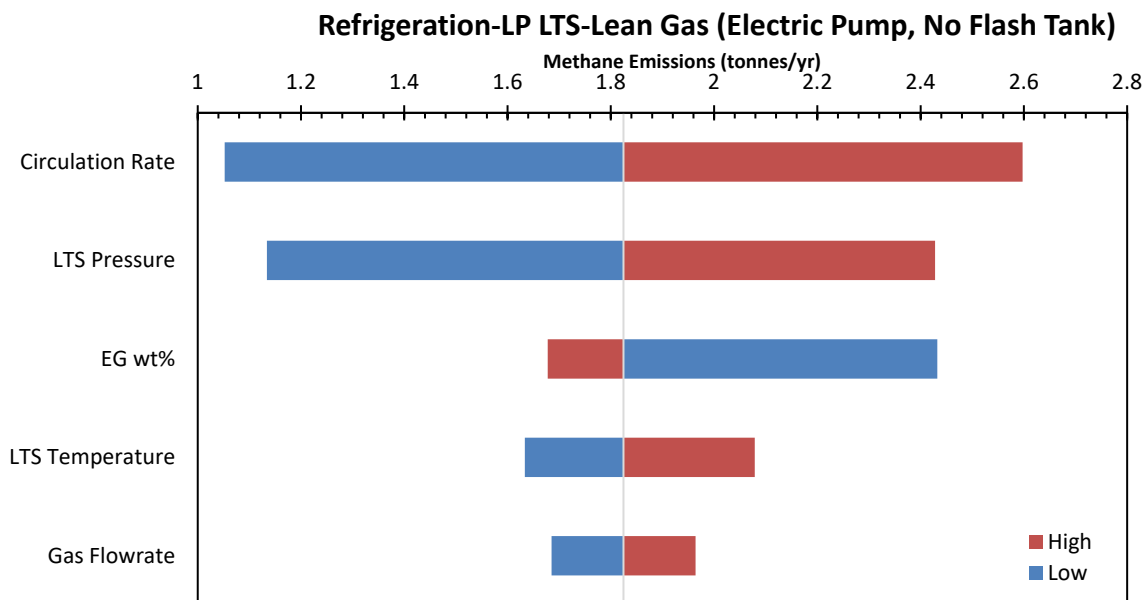
**Figure 72** Sample sensitivity analysis for EG refrigeration unit with rich gas, gas pump, no flash tank



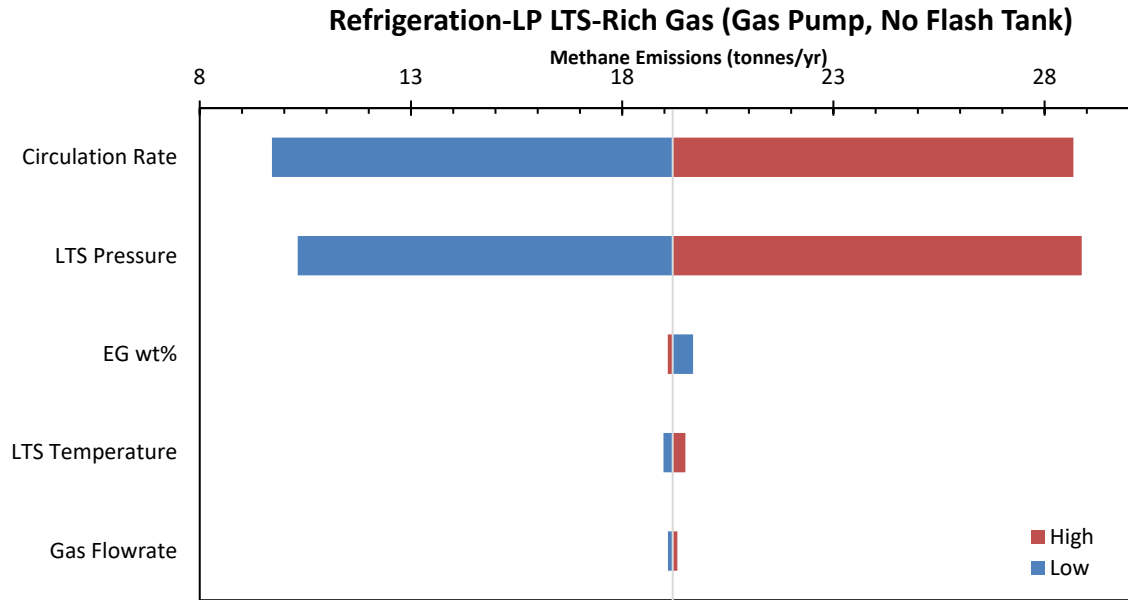
**Figure 73** Sample sensitivity analysis for EG refrigeration unit with rich gas, electric pump, no flash tank



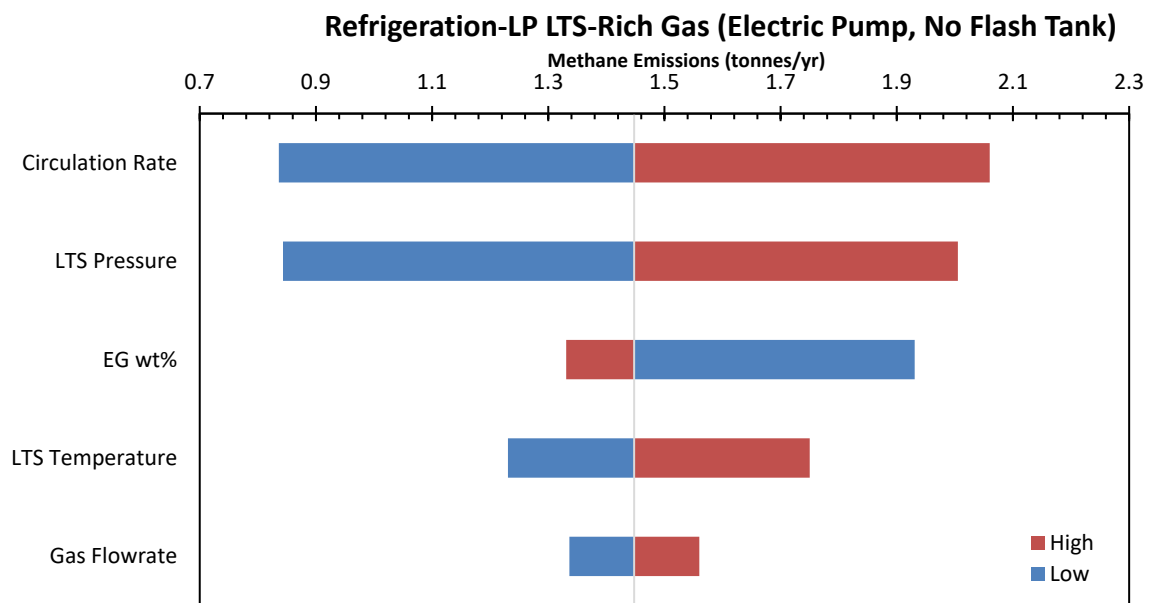
**Figure 74** Sample sensitivity analysis for EG refrigeration unit with LP LTS, lean gas, gas pump, no flash tank



**Figure 75** Sample sensitivity analysis for EG refrigeration unit with LP LTS, lean gas, electric pump, no flash tank



**Figure 76** Sample sensitivity analysis for EG refrigeration unit with LP LTS, rich gas, gas pump, no flash tank



**Figure 77** Sample sensitivity analysis for EG refrigeration unit with LP LTS, rich gas, electric pump, no flash tank

## 9. Appendix B: Average Gas Composition

Components	Mole %	Mol frac	Mole Fraction
Hydrogen	0.01	0.00	0.00006100
Helium	0.03		0.00029400
Nitrogen	1.06		0.01057600
CO2	1.13		0.01134300
H2S	0.11		0.00110100
Methane	89.82		0.89818200
Ethane	4.68		0.04684000
Propane	1.85		0.01848000
i-Butane	0.34		0.00339300
n-Butane	0.50		0.00499600
i-Pentane	0.14		0.00142700
n-Pentane	0.12		0.00124800
n-Hexane	0.06		0.00058600
n-Heptane	0.05		0.00045100
n-Octane	0.03		0.00028000
n-Nonane	0.01		0.00005000
n-Decane	0.00		0.00002500
Cyclopentane	0.01		0.00008700
Benzene	0.01		0.00007600
Cyclohexane	0.01		0.00011400
224-Mpentane	0.00		0.00001400
Mcyclohexane	0.01		0.00011900
Toluene	0.01		0.00010100
E-Benzene	0.00		0.00001100
o-Xylene	0.00		0.00000500
Mcyclopentan	0.01		0.00012000
H2O	0.00		0.00000000
TEGlycol	0.00		0.00000000



EGlycol	0.00			0.00000000
m-Xylene	0.00			0.00001500
124-MBenzene	0.00			0.00000500
22-Mbutane	0.00			0.00000000