

## GRI-GLYCalc VERSION 4.0 - EMISSIONS SUMMARY

Case Name: Springhill - 40 MMscfd Dehy 02 - 04/15/15

File Name: C:\projects2\wfs\LMM\Springhill\GP-5#2\00 - D2b - Springhill - GP5 - 40

Dehy-02 GLYCALCalc - 04.15.15.ddf

Date: May 01, 2015

## UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.8171	19.611	3.5790
Ethane	0.1428	3.426	0.6253
Propane	0.0190	0.456	0.0832
n-Hexane	0.0005	0.013	0.0024
2,2,4-Trimethylpentane	0.0006	0.014	0.0026
Benzene	0.0623	1.496	0.2730
Toluene	0.1105	2.653	0.4841
Ethylbenzene	0.1574	3.778	0.6894
Xylenes	0.2043	4.903	0.8948
Total Emissions	1.5146	36.350	6.6339
Total Hydrocarbon Emissions	1.5146	36.350	6.6339
Total VOC Emissions	0.5547	13.313	2.4296
Total HAP Emissions	0.5357	12.857	2.3464
Total BTEX Emissions	0.5346	12.829	2.3414

## FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	87.9485	2110.765	385.2146
Ethane	4.1238	98.970	18.0621
Propane	0.2578	6.186	1.1290
n-Hexane	0.0013	0.031	0.0056
2,2,4-Trimethylpentane	0.0014	0.032	0.0059
Benzene	0.0049	0.119	0.0216
Toluene	0.0054	0.130	0.0237
Ethylbenzene	0.0043	0.103	0.0188
Xylenes	0.0039	0.093	0.0169
Total Emissions	92.3512	2216.428	404.4981
Total Hydrocarbon Emissions	92.3512	2216.428	404.4981
Total VOC Emissions	0.2789	6.693	1.2215
Total HAP Emissions	0.0211	0.507	0.0925
Total BTEX Emissions	0.0185	0.444	0.0810

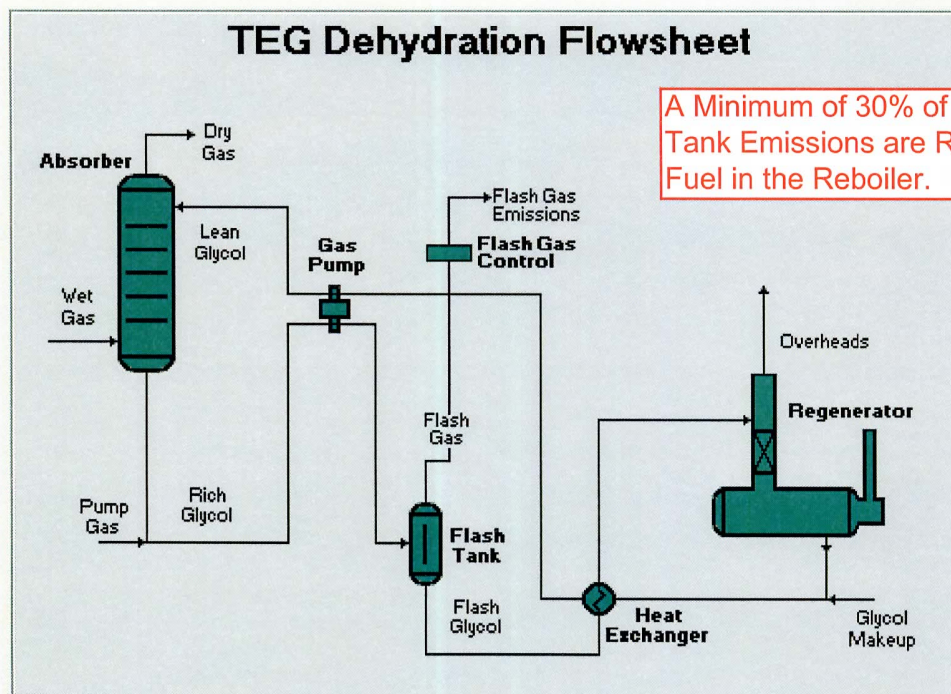
## FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	125.6408	3015.378	550.3065
Ethane	5.8911	141.386	25.8029
Propane	0.3682	8.837	1.6128
n-Hexane	0.0018	0.044	0.0080
2,2,4-Trimethylpentane	0.0019	0.046	0.0085
Benzene	0.0071	0.169	0.0309
Toluene	0.0077	0.185	0.0338
Ethylbenzene	0.0061	0.147	0.0268

Xylenes	0.0055	0.132	0.0241
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Total Emissions	131.9302	3166.326	577.8545
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Total Hydrocarbon Emissions	131.9302	3166.326	577.8545
Total VOC Emissions	0.3984	9.562	1.7450
Total HAP Emissions	0.0302	0.724	0.1322
Total BTEX Emissions	0.0264	0.634	0.1157

## COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
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Methane	88.7656	2130.376	388.7935
Ethane	4.2665	102.397	18.6874
Propane	0.2768	6.642	1.2122
n-Hexane	0.0018	0.044	0.0080
2,2,4-Trimethylpentane	0.0019	0.047	0.0085
Benzene	0.0673	1.614	0.2946
Toluene	0.1159	2.782	0.5078
Ethylbenzene	0.1617	3.881	0.7082
Xylenes	0.2081	4.996	0.9117
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Total Emissions	93.8658	2252.778	411.1320
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Total Hydrocarbon Emissions	93.8658	2252.778	411.1320
Total VOC Emissions	0.8336	20.006	3.6511
Total HAP Emissions	0.5568	13.364	2.4389
Total BTEX Emissions	0.5530	13.273	2.4224



## GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Springhill - 40 MMscfd Dehy 02 - 04/15/15  
 File Name: C:\projects2\wfs\LMM\Springhill\GP-5#2\00 - D2b - Springhill - GP5 - 40  
 Dehy-02 GLYCALCalc - 04.15.15.ddf  
 Date: May 01, 2015

## DESCRIPTION:

Description: Wet Gas: 70 oF, 1000 psig  
 Flash Tank: 120oF, 40 psig  
 Pump: Kimray 45020PV; 7.5 gpm  
 30% Recycle of Flash Gas in Reboiler

Annual Hours of Operation: 8760.0 hours/yr

## WET GAS:

Temperature: 70.00 deg. F  
 Pressure: 1000.00 psig  
 Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.3320
Nitrogen	0.2620
Methane	97.3540
Ethane	1.9750
Propane	0.0740
n-Hexane	0.0001
2,2,4-Trimethylpentane	0.0001
Benzene	0.0001
Toluene	0.0001
Ethylbenzene	0.0001
Xylenes	0.0001

## DRY GAS:

Flow Rate: 40.0 MMSCF/day  
 Water Content: 7.0 lbs. H2O/MMSCF

## LEAN GLYCOL:

Glycol Type: TEG  
 Water Content: 1.5 wt% H2O  
 Flow Rate: 7.5 gpm

## PUMP:

Glycol Pump Type: Gas Injection  
 Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

## FLASH TANK:

Flash Control: Combustion device

Flash Control Efficiency: 30.00 %

Temperature: 120.0 deg. F

Pressure: 40.0 psig

A Minimum of 30% of the Flash  
Tank Emissions are Recycled as  
Fuel in the Reboiler.

## GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Springhill - 40 MMscfd Dehy 02 - 04/15/15

File Name: C:\projects2\wfs\MM\Springhill\GP-5#2\00 - D2b - Springhill - GP5 - 40

Dehy-02 GLYCALCalc - 04.15.15.ddf

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Total HAP Emissions	0.5568	13.364	2.4389
Total BTEX Emissions	0.5530	13.273	2.4224

## COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	553.8855	388.7935	29.81
Ethane	26.4283	18.6874	29.29
Propane	1.6961	1.2122	28.53
n-Hexane	0.0104	0.0080	23.17
2,2,4-Trimethylpentane	0.0111	0.0085	22.93
Benzene	0.3039	0.2946	3.05
Toluene	0.5179	0.5078	1.96
Ethylbenzene	0.7163	0.7082	1.12
Xylenes	0.9189	0.9117	0.79
Total Emissions	584.4883	411.1320	29.66
Total Hydrocarbon Emissions	584.4883	411.1320	29.66

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Total VOC Emissions	4.1746	3.6511	12.54
Total HAP Emissions	2.4785	2.4389	1.60
Total BTEX Emissions	2.4571	2.4224	1.41

#### EQUIPMENT REPORTS:

#### ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages: 1.25  
 Calculated Dry Gas Dew Point: 0.86 lbs. H2O/MMSCF

Temperature: 70.0 deg. F  
 Pressure: 1000.0 psig  
 Dry Gas Flow Rate: 40.0000 MMSCF/day  
 Glycol Losses with Dry Gas: 0.1447 lb/hr  
 Wet Gas Water Content: Saturated  
 Calculated Wet Gas Water Content: 23.23 lbs. H2O/MMSCF  
 Calculated Lean Glycol Recirc. Ratio: 12.07 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	3.70%	96.30%
Carbon Dioxide	99.67%	0.33%
Nitrogen	99.98%	0.02%
Methane	99.98%	0.02%
Ethane	99.93%	0.07%
Propane	99.89%	0.11%
n-Hexane	99.54%	0.46%
2,2,4-Trimethylpentane	99.66%	0.34%
Benzene	79.95%	20.05%
Toluene	70.96%	29.04%
Ethylbenzene	65.13%	34.87%
Xylenes	55.24%	44.76%

#### FLASH TANK

Flash Control: Combustion device  
 Flash Control Efficiency: 30.00 %  
 Flash Temperature: 120.0 deg. F  
 Flash Pressure: 40.0 psig

A Minimum of 30% of the Flash Tank Emissions are Recycled as Fuel in the Reboiler.

Component	Left in Glycol	Removed in Flash Gas
Water	99.75%	0.25%
Carbon Dioxide	7.56%	92.44%
Nitrogen	0.63%	99.37%
Methane	0.65%	99.35%
Ethane	2.37%	97.63%
Propane	4.91%	95.09%
n-Hexane	23.06%	76.94%

2,2,4-Trimethylpentane	24.36%	75.64%
Benzene	90.33%	9.67%
Toluene	93.98%	6.02%
Ethylbenzene	96.64%	3.36%
Xylenes	97.71%	2.29%

# REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	63.05%	36.95%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
n-Hexane	1.60%	98.40%
2,2,4-Trimethylpentane	4.17%	95.83%
Benzene	5.48%	94.52%
Toluene	8.33%	91.67%
Ethylbenzene	10.64%	89.36%
Xylenes	13.05%	86.95%

# STREAM REPORTS:

## WET GAS STREAM

Temperature: 70.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 1.67e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	4.89e-002	3.87e+001
Carbon Dioxide	3.32e-001	6.42e+002
Nitrogen	2.62e-001	3.22e+002
Methane	9.73e+001	6.86e+004
Ethane	1.97e+000	2.61e+003
Propane	7.40e-002	1.43e+002
n-Hexane	1.00e-004	3.79e-001
2,2,4-Trimethylpentane	1.00e-004	5.02e-001
Benzene	1.00e-004	3.43e-001
Toluene	1.00e-004	4.05e-001
Ethylbenzene	1.00e-004	4.66e-001
Xylenes	1.00e-004	4.66e-001
Total Components	100.00	7.24e+004

## DRY GAS STREAM



Temperature: 70.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 1.67e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.81e-003	1.43e+000
Carbon Dioxide	3.31e-001	6.40e+002
Nitrogen	2.62e-001	3.22e+002
Methane	9.74e+001	6.86e+004
Ethane	1.97e+000	2.61e+003
Propane	7.39e-002	1.43e+002
n-Hexane	9.96e-005	3.77e-001
2,2,4-Trimethylpentane	9.97e-005	5.00e-001
Benzene	8.00e-005	2.74e-001
Toluene	7.10e-005	2.87e-001
Ethylbenzene	6.51e-005	3.04e-001
Xylenes	5.53e-005	2.58e-001
Total Components	100.00	7.23e+004

## LEAN GLYCOL STREAM

Temperature: 70.00 deg. F  
 Flow Rate: 7.50e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	4.16e+003
Water	1.50e+000	6.33e+001
Carbon Dioxide	5.01e-012	2.11e-010
Nitrogen	1.76e-013	7.42e-012
Methane	1.08e-017	4.57e-016
Ethane	1.95e-008	8.22e-007
Propane	1.46e-010	6.17e-009
n-Hexane	2.09e-007	8.82e-006
2,2,4-Trimethylpentane	6.14e-007	2.59e-005
Benzene	8.56e-005	3.62e-003
Toluene	2.38e-004	1.00e-002
Ethylbenzene	4.44e-004	1.87e-002
Xylenes	7.26e-004	3.07e-002
Total Components	100.00	4.22e+003

## RICH GLYCOL AND PUMP GAS STREAM

Temperature: 70.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 7.88e+000 gpm  
 NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.46e+001	4.16e+003
Water	2.29e+000	1.01e+002
Carbon Dioxide	7.21e-002	3.17e+000
Nitrogen	1.37e-002	6.04e-001
Methane	2.88e+000	1.26e+002

Ethane	1.37e-001	6.03e+000
Propane	8.81e-003	3.87e-001
n-Hexane	5.42e-005	2.38e-003
2,2,4-Trimethylpentane	5.80e-005	2.55e-003
Benzene	1.66e-003	7.30e-002

Toluene	2.92e-003	1.28e-001
Ethylbenzene	4.15e-003	1.82e-001
Xylenes	5.47e-003	2.40e-001

Total Components	100.00	4.40e+003
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## FLASH TANK OFF GAS STREAM

Temperature: 120.00 deg. F  
 Pressure: 54.70 psia  
 Flow Rate: 3.09e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.69e-001	2.48e-001
Carbon Dioxide	8.18e-001	2.93e+000
Nitrogen	2.63e-001	6.01e-001
Methane	9.62e+001	1.26e+002
Ethane	2.41e+000	5.89e+000
Propane	1.03e-001	3.68e-001
n-Hexane	2.62e-004	1.83e-003
2,2,4-Trimethylpentane	2.08e-004	1.93e-003
Benzene	1.11e-003	7.06e-003
Toluene	1.03e-003	7.72e-003
Ethylbenzene	7.09e-004	6.13e-003
Xylenes	6.38e-004	5.51e-003
Total Components	100.00	1.36e+002

## FLASH TANK GLYCOL STREAM

Temperature: 120.00 deg. F  
 Flow Rate: 7.58e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.76e+001	4.16e+003
Water	2.36e+000	1.00e+002
Carbon Dioxide	5.63e-003	2.40e-001
Nitrogen	8.95e-005	3.81e-003
Methane	1.92e-002	8.17e-001
Ethane	3.35e-003	1.43e-001
Propane	4.46e-004	1.90e-002
n-Hexane	1.29e-005	5.50e-004
2,2,4-Trimethylpentane	1.46e-005	6.22e-004
Benzene	1.55e-003	6.59e-002
Toluene	2.83e-003	1.21e-001
Ethylbenzene	4.13e-003	1.76e-001
Xylenes	5.51e-003	2.35e-001
Total Components	100.00	4.26e+003

## FLASH GAS EMISSIONS

Flow Rate: 4.97e+003 scfh  
 Control Method: Combustion Device  
 Control Efficiency: 30.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	3.74e+001	8.83e+001
Carbon Dioxide	1.94e+001	1.12e+002
Nitrogen	1.64e-001	6.01e-001
Methane	4.19e+001	8.79e+001
Ethane	1.05e+000	4.12e+000
Propane	4.47e-002	2.58e-001
n-Hexane	1.14e-004	1.28e-003
2,2,4-Trimethylpentane	9.04e-005	1.35e-003
Benzene	4.83e-004	4.94e-003
Toluene	4.48e-004	5.40e-003
Ethylbenzene	3.09e-004	4.29e-003
Xylenes	2.78e-004	3.86e-003
Total Components	100.00	2.93e+002

## REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 8.07e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.68e+001	3.71e+001
Carbon Dioxide	2.56e-001	2.40e-001
Nitrogen	6.40e-003	3.81e-003
Methane	2.39e+000	8.17e-001
Ethane	2.23e-001	1.43e-001
Propane	2.02e-002	1.90e-002
n-Hexane	2.95e-004	5.41e-004
2,2,4-Trimethylpentane	2.45e-004	5.96e-004
Benzene	3.75e-002	6.23e-002
Toluene	5.64e-002	1.11e-001
Ethylbenzene	6.97e-002	1.57e-001
Xylenes	9.04e-002	2.04e-001
Total Components	100.00	3.89e+001