

**ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM**

February 2, 2012

SUBJECT: Superior Appalachian
Pipeline, LLC
Kissick Lane
Frazer Township, PA 15084
Allegheny County

Installation Permit No. 0837-I001

TO: Sandra L. Etzel
Chief Engineer

FROM: Michael Dorman
Air Quality Engineer

FACILITY DESCRIPTION:

This permit is for the installation of a natural gas compressor and transmission facility on Kissick Lane, Frazer Township, Allegheny County, PA. Natural gas from area wells enters the facility through an inlet separator. Natural gas fired compressor engines compress the gas received from the inlet separator. Upon exiting the compressors, the natural gas enters the triethylene glycol (TEG) dehydration units. These dehydration units remove any water remaining in the gas through glycol absorption of the water in a contactor vessel. The water rich glycol goes to a glycol dehydrator/reboiler where the water is evaporated to restore the glycol. The emissions from the natural gas fired reboilers exhaust to atmosphere. Water from the inlet separator is stored in two (2) 300 barrel (12,600 gallon) storage tanks pending removal by tanker truck.

The facility is a minor source of particulate matter, particulate matter < 10 microns in diameter (PM-10), particulate matter < 2.5 microns (PM-2.5), sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) as defined in section 2101.20 of Article XXI.

INSTALLATION PERMIT DESCRIPTION

This permit is for the installation of a natural gas compressor and transmission facility comprising five (5) Caterpillar G3516B natural gas fired engines each driving a compressor, three (3) natural gas heated dehydrator/reboilers and two (2) 300 barrel (12,600 gallon) storage tanks. Natural gas from area wells enters the facility through an inlet separator. Natural gas fired compressor engines compress the gas received from the inlet separator. Upon exiting the compressors, the natural gas enters the TEG dehydration units. These dehydration units remove any water remaining in the gas through glycol absorption of the water in a contactor vessel. The water rich glycol goes to a glycol dehydrator/reboiler where the water is evaporated to restore the glycol. The emissions from the natural gas fired reboilers exhaust to atmosphere. Water from the inlet separator is stored in two (2) 300 (12,600 gallon) barrel storage tanks pending removal by tanker truck.

The proposed installation will result in the following potential emissions changes, in tons per year:

PM	PM ₁₀	PM _{2.5}	SO _x	NO _x	CO	VOC	FORMALDEHYDE
3.65	3.65	3.65	0.19	35.04	12.84	16.58	7.05

PERMIT APPLICATION COMPONENTS:

1. Installation Permit Application No. 0837-I001, dated September 21, 2011
2. Correspondence, dated October 4, 2011: BACT analysis
3. Correspondence, dated October 7, 2011: Calculations
4. Correspondence, dated October 11, 2011: Response to questions regarding permit application.

EMISSION SOURCES:

Emissions Sources

I.D.	Source Description	Control Device(s)	Maximum Capacity	Fuel/Raw Material	Stack I.D.
C001	Compressor 1: Caterpillar G3516B	Catalytic Oxidizer	14 MMScf/day	Natural Gas	S001
C002	Compressor 2: Caterpillar G3516B	Catalytic Oxidizer	14 MMScf/day	Natural Gas	S002
C003	Compressor 3: Caterpillar G3516B	Catalytic Oxidizer	14 MMScf/day	Natural Gas	S003
C004	Compressor 4: Caterpillar G3516B	Catalytic Oxidizer	14 MMScf/day	Natural Gas	S004
C005	Compressor 5: Caterpillar G3516B	Catalytic Oxidizer	14 MMScf/day	Natural Gas	S005
H001	Exterran 8 Tray Dehydrator/Reboiler	Condenser and Flash Gas Control	35 MMScf/day	Natural Gas	S006
H002	Exterran 8 Tray Dehydrator/Reboiler	Condenser and Flash Gas Control	35 MMScf/day	Natural Gas	S007
H003	Exterran 8 Tray Dehydrator/Reboiler	Condenser and Flash Gas Control	45 MMScf/day	Natural Gas	S008

METHOD OF DEMONSTRATING COMPLIANCE:

Compliance with the emission standards set in this permit will be demonstrated by performance testing for PM, PM-10, PM-2.5, SO₂, NO_x, CO, VOCs and HAPs. Additionally, compliance will be demonstrated by maintaining records of inspections of compressor engines and dehydrator/reboiler operations. Compliance with the short-term (lb/hr) limits must be maintained at all times, including startup and shutdown. Any emissions due to startup, shutdown, or malfunction are included in the facility's total annual emissions. See Installation Permit No. 0837-I001 for the specific conditions for determining compliance with the applicable requirements.

REGULATORY APPLICABILITY:

1. **Article XXI Requirements for Issuance:**

See Permit Application No. 0837-I001, Section 5. The requirements of Article XXI, Part B for the issuance of an installation permit has been met for this facility. Article XXI, Part D, Part E and Part H will have the necessary sections addressed individually.

2. **BACT Analysis:**

A top-down BACT analysis was sent as a supplement to Permit Application No. 0837-I001. The analysis identifies ultra lean burn engines combined with an oxidation catalyst as BACT. Ultra lean burn engines

emit 0.5 g/bhp-hr of NOx. An oxidation catalyst reduces CO by 93%, VOCs by 50% and HCOH by 76%. The requirements for SI ICE (40 CFR Part 60 Subpart JJJJ) manufactured after January 1, 2011 is 1.0 g/bhp-hr of NOx.. The Department accepts the permittee's BACT analysis.

3. **Testing Requirements:**

The permittee shall conduct initial testing, upon installation of the facility for PM, PM-10, PM-2.5, SO₂, NOx, CO, VOCs and HAPs. The Department reserves the right to require additional testing if necessary in the future to assure compliance with the terms and conditions of this Installation Permit.

4. **Applicable New Source Performance Standards (NSPS):**

This installation is subject to 40 CFR Part 60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines – SI-RICE).

5. **Non-Applicable New Source Performance Standards (NSPS):**

The installation is not subject to 40 CFR Part 60 Subpart Dc (Standards of Performance for Stationary Small Industrial-commercial-Institutional Steam Generating Units) because the dehydrators/reboilers are all rated at less than 10 MMBtu/hr heat input

This installation is not subject to 40 CFR Part 60 Subpart Kb (Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984) because both tanks, to be constructed, have capacities below the applicability threshold.

The installation is not subject to 40 CFR Part 60 Subpart GG (Standards of Performance for Stationary Gas Turbines) because there are no gas turbines at the site.

The installation is not subject to 40 CFR Part 60 Subpart KKK because the installation is a compressor station **not** located at a natural gas processing plant. A *natural gas processing plant* is defined as 'any processing site engaged in the extraction of natural gas liquids from field gas, fractionation of mixed natural gas liquids to natural gas products, or both'. Such activities do not take place at this site, Therefore, This facility is exempt under 40 CFR §60.630.

The installation is not subject to 40 CFR Part 60 Subpart LLL because this facility does not meet the definition of a natural gas processing plant.

The installation is not subject to 40 CFR Part 60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines – CI-RICE) because there are no CI-RICE at the site. .

6. **Applicable NESHAP and MACT Standards:**

The installation is subject to 40 CFR Part 63, Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines). It meets this requirement by being in compliance with 40 CFR Part 60 Subpart JJJJ. (40 CFR §63.6590(c))

7. **Risk Management Plan; CAA Section 112(r):**

The facility is not required to have a risk management plan at this time because none of the regulated chemicals exceed the thresholds in the regulation.

8. **Greenhouse Gas Reporting (40 CFR Part 98):**

Greenhouse gases (GHGs) from this facility come from the combustion units. Only three (3) of the six GHG categories apply: CO₂, N₂O (nitrous oxide), and CH₄ (methane). Based on the calculation methodology in 40 CFR Part 98, §98.33(a)(1), potential emissions of CO₂e are 30,456.68 tpy. This is less than the 100,000 tpy major source threshold. Therefore, the facility is not considered a major source of GHG emissions.

Since the highest calculated CO₂e emissions are over 30,000 metric tons per year, which is over the 25,000 metric ton applicability threshold for the reporting rule, the facility will have to submit annual reports in accordance with 40 CFR Part 98.

EMISSION CALCULATIONS

NATURAL GAS FIRED COMPRESSOR ENGINES No. 1, No. 2, No 3, No. 4 and No. 5

The information upon which these emissions are calculated comes from data in the Technical Data Sheet for the Caterpillar Model G3516B ultra lean burn engine which is used at this facility. PM emissions are based on Article XXI. For natural gas, all particulate, filterable and condensable, are assumed to be PM2.5. The rest of the emissions are based on AP-42. Note: 15 percent was added to the AP-42 emissions rates to account for the variance in the AP-42 emission factors.

BTU Calculation:

Fuel Consumption:	8256 Btu/bhp-hr	Fuel Btu Rating:	1020 Btu/scf
HP Rating of Engine:	1380 hp		

$(1380 \text{ bhp} \times 8256 \text{ Btu/bhp-hr}) \div 1,000,000 \text{ Btu/MMBtu} = 11.3932 \text{ MMBtu/hr}$ **round to 11.39 MMBtu/hr**

PM/PM10/PM2.5:

$11.39 \text{ lb/MMBtu} \times 0.012 \text{ MMBtu/hr} = 0.13668 \text{ lb/hr}$ allowable **round to 0.14 lbs/hr per engine**

$0.14 \text{ lbs/hr per engine} \times 5 \text{ engines} = 0.70 \text{ lbs/hr}$ allowable for combined engines

$(0.14 \text{ lb/hr} \times 8760 \text{ hr/yr}) \div 2000 \text{ lb/ton} = 0.6132 \text{ tons/yr}$ **round to 0.61 tons/yr allowable**

$0.61 \text{ tons/yr per engine} \times 5 \text{ engines} = 3.05 \text{ tons/yr}$ allowable for combined engines

SO₂:

$11,390,000 \text{ Btu/hr} \div 1020 \text{ Btu/scf} = \mathbf{11,166.67 \text{ scf/hr}}$

$0.6 \text{ lb/1,000,000 scf} \times 11166.67 \text{ scf/hr} = 0.0067 \text{ lb/hr per unit}$

$0.0067 \text{ lb/hr per unit} \times 1.15 = 0.007705 \text{ lb/hr per unit}$ allowable **round to 0.008 lb/hr per unit**

$0.008 \text{ lb/hr per unit} \times 5 \text{ units} = 0.04 \text{ lb/hr}$ allowable

$(0.04 \text{ lb/hr} \times 8760 \text{ hr/yr}) \div 2000 \text{ lb/ton} = 0.1752 \text{ tons/yr}$ allowable **round to 0.18 tons/yr (5 units)**

NO_x:

$0.50 \text{ g/bhp-hr} \times 1380 \text{ bhp} \times 1\text{kg}/1000\text{g} \times 2.2 \text{ lb/kg} = 1.518 \text{ lb/hr per unit}$ **round to 1.52 lb/hr per unit**

$1.52 \text{ lb/hr per unit allowable} \times 5 \text{ units} = 7.60 \text{ lb/hr}$ allowable (5 units)

$(1.52 \text{ lb/hr} \times 8760 \text{ hr/yr}) \div 2000 \text{ lb/ton} = 6.6576 \text{ tons/yr}$ allowable per unit **round to 6.66 tons/yr**

$6.66 \text{ tons/yr per unit allowable} \times 5 \text{ units} = 33.30 \text{ tons/yr}$ allowable (5 units)

CO:

Note: Each engine has a catalytic oxidizer that reduces CO by 93%. The CO emissions calculations will take this into account.

$2.43 \text{ g/bhp-hr} \times 1380 \text{ bhp} \times 1\text{kg}/1000\text{g} \times 2.2 \text{ lb/kg} \times (1 - 0.93) = 0.516 \text{ lb/hr per unit}$ **round to 0.52 lb/hr per unit**

$0.52 \text{ lb/hr per unit allowable} \times 5 \text{ units} = 2.60 \text{ lb/hr}$ allowable (5 units)

$(0.52 \text{ lb/hr} \times 8760 \text{ hr/yr}) \div 2000 \text{ lb/ton} = 2.2776 \text{ tons/yr}$ allowable **round to 2.28 tons/yr**

$2.28 \text{ tons/yr per unit allowable} \times 5 \text{ units} = 11.40 \text{ tons/yr}$ allowable (5 units)

VOCs:

Note: Each engine has a catalytic oxidizer that reduces VOCs by 50%. The VOC emissions calculations will take this into account.

$0.48 \text{ g/bhp-hr} \times 1380 \text{ bhp} \times 1\text{kg}/1000\text{g} \times 2.2 \text{ lb/kg} \times (1 - 0.50) = 0.728 \text{ lb/hr per unit}$ **round to 0.73 lb/hr per unit**

0.73 lb/hr per unit allowable × 5 units = 3.65 lb/hr allowable (5 units)
 (0.73 lb/hr × 8760 hr/yr) ÷ 2000 lb/ton = 3.1974 tons/yr allowable **round to 3.20 tons/yr**
 3.2 tons/yr per unit allowable × 5 units = 16.00 tons/yr allowable (5 units)

HCHO (Formaldehyde):

Note: Each engine has a catalytic oxidizer that reduces HCHO by 76%. The HCHO emissions calculations will take this into account.

0.44 g/bhp-hr 1380 bhp × 1kg/1000g × 2.2 lb/kg × (1 – 0.76) = 0.3206 lb/hr per unit **round to 0.321 lb/hr per unit**

0.321 lb/hr per unit allowable × 5 units = 1.605 lb/hr allowable (5 units) round to 1.61 lb/hr

(0.321 lb/hr × 8760 hr/yr) ÷ 2000 lb/ton = 1.40598 tons/yr allowable **round to 1.41 tons/yr**

1.41 tons/yr per unit allowable × 5 units = 7.05 tons/yr allowable (5 units)

Natural Gas-fired Engine Emission Limits

POLLUTANT	HOURLY EMISSION LIMIT: SINGLE ENGINE (lbs/hr)	ANNUAL EMISSION LIMIT: COMBINED ENGINES (tons/year) ¹
PARTICULATE MATTER	0.14	3.05
PM-10	0.14	3.05
PM-2.5	0.14	3.05
SULFUR OXIDES	0.008	0.18
NITROGEN OXIDES	1.52	33.30
CARBON MONOXIDE	0.52	11.40
VOLATILE ORGANIC COMPOUNDS	0.73	16.00
FORMALDEHYDE	0.321	7.05

¹ A year is defined as any 12 consecutive months.

DEHYDRATORS/REBOILERS No. 1 and No. 2:

These two (2) devices are rated at 1.0 MMBtu/hr. PM emissions are based on Article XXI. The rest of the emissions calculations are based on data submitted from the permittee and AP-42. Note: 15 percent was added to the AP-42 emissions rates to account for the variance in the AP-42 emission factors.

PM/PM10/PM2.5:

0.008 lb/MMBtu × 1.0 MMBtu/hr = **0.008 lb/hr per unit allowable**

0.008 lb/hr per unit × 2 units = 0.016 lb/hr

(0.008 lb/hr × 8760 hr/yr) ÷ 2000 lb/ton = 0.035 tons/yr per unit

0.035 tons/yr per unit × 2 units = **0.07 tons/yr allowable**

SO₂:

1,000,000 btu/hr ÷ 1020 btu/scf = **980.39 scf/hr**

0.6 lb/1,000,000 scf × 980.39 scf/hr = 0.000588 lb/hr per unit

0.000588 lb/hr per unit × 1.15 = **0.000676 lb/hr per unit allowable**

0.000676 lb/hr per unit × 2 units = 0.001353 lb/hr allowable

(0.001353 lb/hr × 8760 hr/yr) ÷ 2000 lb/ton = 0.005926 tons/yr allowable **round to 0.006 tons/yr (2 units)**

NO_x:

100 lb/1,000,000 scf × 980.39 scf/hr = 0.098 lb/hr per unit
 0.098 × 1.15 = **0.1127 lb/hr per unit allowable**
 0.1127 lb/hr per unit allowable × 2 units = 0.2254 lb/hr allowable
 (0.2254 lb/hr × 8760 hr/yr) ÷ 2000 lb/ton = 0.987252 tons/yr allowable **round to 1.0 tons/yr**

CO:

84 lb/1,000,000 scf × 980.39 scf/hr = 0.082353 lb/hr per unit
 0.082353 × 1.15 = **0.094706 lb/hr per unit allowable**
 0.094706 lb/hr per unit allowable × 2 units = 0.189412 lb/hr allowable
 (0.189412 lb/hr × 8760 hr/yr) ÷ 2000 lb/ton = 0.829625 tons/yr allowable **round to 0.83 tons/yr**

VOCs, Reboiler:

5.5 lb/1,000,000 scf × 980.39 scf/hr = 0.005392 lb/hr per unit
 0.005392 × 1.15 = 0.006201 lb/hr per unit allowable **round to 0.006 lb/hr**
 0.006201 lb/hr per unit allowable × 2 units = 0.012402 lb/hr allowable
 (0.012402 lb/hr × 8760 hr/yr) ÷ 2000 lb/ton = 0.054321 tons/yr allowable **round to 0.054 tons/yr**

VOCs, Dehydrators:

The VOCs attributable to the TEC dehydrators were calculated by the permittee using GRI-GLYCalc™ software. The results are shown below.

Dehydrator/Reboiler No. 1 and No. 2

POLLUTANT	HOURLY EMISSION LIMIT: SINGLE DEHYDRATOR/REBOILER (lbs/hr)	ANNUAL EMISSION LIMIT: COMBINED DEHYDRATOR/REBOILER (tons/year) ¹
PARTICULATE MATTER	0.008	0.07
PM-10	0.008	0.07
PM-2.5	0.008	0.07
SULFUR OXIDES	0.000676	0.006
NITROGEN OXIDES	0.11	1.0
CARBON MONOXIDE	0.09	0.83
VOLATILE ORGANIC COMPOUNDS, REBOILER	0.006	0.054
VOLATILE ORGANIC COMPOUNDS, DEHYDRATOR	0.0642	0.5622

DEHYDRATOR/REBOILER No. 3:

This device is rated at 1.5 MMBtu/hr. PM calculations are based on Article XXI. The rest of the emissions calculations are based on data submitted from the permittee and AP-42. Note: 15 percent was added to the AP-42 calculations to account for the variance in the AP-42 emission factors.

PM/PM10/PM2.5:

0.008 lb/MMBtu × 1.5 MMBtu/hr = **0.012 lb/hr allowable**
 (0.012 lb/hr × 8760 hr/yr) ÷ 2000 lb/ton = 0.05256 tons/yr **round to 0.053 tons/yr allowable**

SO₂:

1,500,000 btu/hr ÷ 1020 btu/scf = 1,470.59 scf/hr

$0.6 \text{ lb}/1,000,000 \text{ scf} \times 1470.59 \text{ scf/hr} = 0.000882 \text{ lb/hr}$
 $0.000882 \text{ lb/hr per unit} \times 1.15 = 0.001014 \text{ lb/hr allowable round to } \mathbf{0.001 \text{ lb/hr}}$
 $(0.001014 \text{ lb/hr} \times 8760 \text{ hr/yr}) \div 2000 \text{ lb/ton} = 0.004441 \text{ tons/yr allowable round to } \mathbf{0.0044 \text{ tons/yr}}$

NO_x:

$100 \text{ lb}/1,000,000 \text{ scf} \times 1470.59 \text{ scf/hr} = 0.147059 \text{ lb/hr}$
 $0.147059 \times 1.15 = 0.169118 \text{ lb/hr allowable round to } \mathbf{0.17 \text{ lb/hr}}$
 $(0.17 \text{ lb/hr} \times 8760 \text{ hr/yr}) \div 2000 \text{ lb/ton} = 0.7446 \text{ tons/yr allowable round to } \mathbf{0.74 \text{ tons/yr}}$

CO:

$84 \text{ lb}/1,000,000 \text{ scf} \times 1470.59 \text{ scf/hr} = 0.12353 \text{ lb/hr}$
 $0.12353 \times 1.15 = 0.142060 \text{ lb/hr allowable round to } \mathbf{0.14 \text{ lb/hr}}$
 $(0.14 \text{ lb/hr} \times 8760 \text{ hr/yr}) \div 2000 \text{ lb/ton} = 0.6132 \text{ tons/yr allowable round to } \mathbf{0.61 \text{ tons/yr}}$

VOCs, Reboiler:

$5.5 \text{ lb}/1,000,000 \text{ scf} \times 1470.59 \text{ scf/hr} = 0.008088 \text{ lb/hr}$
 $0.008088 \times 1.15 = 0.009301 \text{ lb/hr allowable round to } \mathbf{0.0093 \text{ lb/hr}}$
 $(0.0093 \text{ lb/hr} \times 8760 \text{ hr/yr}) \div 2000 \text{ lb/ton} = 0.040734 \text{ tons/yr allowable round to } \mathbf{0.041 \text{ tons/yr}}$

VOCs, Dehydrators:

The VOCs attributable to the TEC dehydrators were calculated by the permittee using GRI-GLYCalc™ software. The results are shown below.

Dehydrator/Reboiler No. 3

POLLUTANT	HOURLY EMISSION LIMIT: DEHYDRATOR/REBOILER (lbs/hr)	ANNUAL EMISSION LIMIT: DEHYDRATOR/REBOILER (tons/year) ¹
PARTICULATE MATTER	0.012	0.053
PM-10	0.012	0.053
PM-2.5	0.012	0.053
SULFUR OXIDES	0.001	0.0044
NITROGEN OXIDES	0.17	0.74
CARBON MONOXIDE	0.14	0.61
VOLATILE ORGANIC COMPOUNDS, REBOILER	0.0093	0.041
VOLATILE ORGANIC COMPOUNDS, DEHYDRATOR	0.0825	0.3614

EMISSIONS SUMMARY:

Emissions Summary for Superior Appalachian Pipeline, LLC

POLLUTANT	TOTAL (tons/year *)
PARTICULATE MATTER	3.65
PM ₁₀	3.65
PM _{2.5}	3.65
SULFUR OXIDES (SO _x)	0.19
NITROGEN OXIDES (NO _x)	35.04
CARBON MONOXIDE (CO)	12.84
VOLATILE ORGANIC COMPOUNDS (VOCs)	17.02
FORMALDEHYDE	7.05

* A year is defined as any consecutive 12-month period.

RECOMMENDATION:

All applicable Federal, State, and County regulations have been addressed in the permit application. The Installation Permit for Superior Appalachian Pipeline, LLC should be approved with the emission limitations, terms and conditions in Installation Permit No. 0837-I001.