

TECHNICAL SUPPORT DOCUMENT (TSD)

SEPTEMBER 2009

I. GENERAL COMMENTS:

A. Company Information

1. El Paso Natural Gas Company (Tucson Compressor Station)
2. 8787 N. Pump Station Road, Marana, Arizona 85653

B. Background

The Tucson compressor station was first permitted in 1973. There were no substantive conditions associated with this permit.

Historical records indicate that El Paso Natural Gas Company (EPNG) Tucson compressor station has not had any major air quality violations. Past minor enforcement actions worth noting are presented in III.A of the TSD.

This technical support document supports the permit application dated September 9, 2008, received on September 15, 2008.

C. Attainment Classification

This facility is located in an area which is in attainment for all pollutants.

II. SOURCE DESCRIPTION

EPNG provides natural gas transportation services for natural gas suppliers and end users throughout the southwestern United States, and owns and operates a large natural gas pipeline network. The Tucson compressor station is one of several such stations that provide natural gas compression to the pipeline network. Compression is needed to maintain enough pressure in the pipeline to keep the natural gas flowing, and is accomplished at the Tucson compression station by seventeen (17) natural gas-fired reciprocating engines each driving a compressor unit.

EPNG Tucson compressor station also operates four (4) auxiliary, four stroke cycle, lean burn natural gas fired internal combustion engines. The energy released during the combustion process drive generators that are used to provide electrical power to the compressor station.

The Standard Industrial Classification (SIC) code for EPNG Tucson compressor station is 4922. The North American Industry Classification System (NAICS) code for EPNG Tucson compressor station is 48621.

A. Process Description

The natural gas flows into each of the seventeen single stage compressors by way of common suction header from the pipeline. The reciprocating engines are natural gas fueled two cycle engines. The twelve (12) reciprocating engines in Plant A and the five (5) like engines in Plant B work in parallel and operate depending on the amount of natural gas being transported to various customers along the pipeline.

The reciprocating and the auxiliary engines are the primary sources of air pollutant emissions. The primary pollutants present in the stack gases result from the combustion of natural gas and include: Nitrogen Oxide (NO_x) and Carbon Monoxide (CO). Aldehydes, SO₂, and VOCs are other trace pollutants present in the stack gases. Other equipment on site is comprised mainly of valves, compressor seals, connections and associated piping. Emissions from these units are mainly trace amounts of VOCs.

B. Air Pollution Control Equipment

Not applicable to the EPNG Tucson compressor station, as there is no air pollution control equipment at this facility.

III. REGULATORY HISTORY

The EPNG Tucson compressor station was first permitted in 1973 and has undergone regular inspections to date. The facility has been in compliance with applicable regulatory requirements throughout its regulatory history.

The facility is currently in compliance with their permit conditions.

A. Testing & Inspections

There are no emissions limits or standards for the two primary air pollutants Nitrogen Oxide (NO_x) and Carbon Monoxide (CO) that are emitted from the seventeen (17) natural gas fired reciprocating engines and the four (4) auxiliary natural gas fired engines.

On May 14-15, 2003, each of the four (4) Ingersoll Rand IC natural gas fired auxiliary power engines at the EPNG Tucson compressor station were performance tested (Emission Points 17 through 21). The Permittee used EPA approved reference test methods to conduct the performance tests. The primary air pollutants tested include NO_x and CO. The results of the performance test meet compliance with the conditions of the permit.

On December 11, 2007, auxiliary power engine No 4 (Emission Point 21 – GM 3.21.1-2) was performance tested. The Permittee used EPA approved reference test methods to conduct the performance tests. The primary air pollutants tested include NO_x and CO. The results of the performance test meet compliance with the conditions of the permit.

B. Excess Emissions

The facility has submitted no reports of excess emissions.

IV. EMISSIONS ESTIMATES

Primary Pollutants:

NO _x	Nitrogen Oxide	VOC	Volatile Organic Compounds
CO	Carbon Monoxide	H ₂ CO	Formaldehyde (Federally listed Hazardous Air Pollutant)
SO ₂	Sulfur Dioxide		

Hazardous Air Pollutants: (As identified in AP-42, 1/95 (fifth) edition, Table 3.1-3:

1,3-Butadiene, Acetaldehyde, Acrolein, Benzene, Ethylbenzene, Formaldehyde, Naphthalene, PAH, Propylene Oxide, Toluene, Xylenes.

A. Performance Test Data

1. Reciprocating Engines

The following emissions test data was presented in the EPNG Tucson compressor station permit renewal application. Two reciprocating engines, namely B-1 and B-5 were tested on September 6, 2001. No other historical emissions data is available for this type of reciprocating engine at the facility.

Pollutant	Average Reciprocating Engine Emissions (g/bhp-hr)	
	Unit ID # B-1	Unit ID # B-5
NO _x	11.75	6.14
CO	0.77	1.25

The worst case emissions test data for NO_x was recorded for the B-1 reciprocating engine (Serial Number 41820) The worst case performance data for CO was recorded for the B-5 reciprocating engine (Serial Number 1071).

NO _x = (11.75 g/bhp-hr)(1071 hp)(0.002205 g/lb)(8760/2000) = 121.54 tpy	Facility Wide Emissions*
CO = (1.25 g/bhp-hr)(1071 hp)(0.002205 g/lb) (8760/2000) = 12.930 tpy	2066.14 tpy
SO ₂ = (0.846 E ⁻³ lb/MMBtu) ¹ (2.728 MMBtu/hr)(4.38) = 0.01 tpy	219.80 tpy
VOC = (2.1 E ⁻³ lb/MMBtu)(2.728 MMBtu/hr)(4.38) = 0.03 tpy	0.17 tpy
H ₂ CO = (0.04 g/hp-hr)(1 lb/453.6 g)(1071 hp)(4.38) = 0.414 tpy	0.43 tpy
	7.03 tpy

EPNG has sought a 50% safety factor on the CO emissions within their permit renewal application. Allowing a safety factor would result in the following emissions:

CO = (1.25 g/bhp-hr*150%)(1071 hp)(0.002205 g/lb) (8760/2000) = 19.395 tpy	Facility Wide Emissions*
	329.72 tpy

*** The represented facility wide emissions are shown as a multiple of seventeen to represent the maximum potential emissions from the seventeen reciprocating engines.**

SO₂ and VOC emissions are calculated from EPA AP-42, Table 3.1-2a.

Formaldehyde emissions are calculated using data from Table 18 of EPA-450/4-91-012, assuming an engine power of 370 hp (see Table 11-1, of EPNG's Title V permit application.).

2. Auxiliary Compressor Engines

Historical emissions performance test data is available for the auxiliary power generation engines at the EPNG Tucson compressor station. The reported average emissions were determined in accordance with approved Environment Protection Agency (EPA) test methods.

¹ SO₂ emission factor = 0.94S, where S=0.9

Test Date: Week of June 30, 2008:

Pollutant	Average Auxiliary Engine Emissions (lb/hr)		
	Unit A-1	Unit A-2	Unit A-3
NO _x	13.79	12.89	10.72
CO	0.39	0.49	2.84

Test Date: Week of December 10, 2007:

Pollutant	Average Auxiliary Power Generation Emissions (lb/hr)
	Unit A-1
NO _x	11.03
CO	2.26

Test Date: May 12, 2003:

Pollutant	Average Auxiliary Power Generation Emissions (lb/hr)			
	Unit A-1	Unit A-2	Unit A-3	Unit A-4
NO _x	7.09	9.80	7.99	8.59
CO	11.89	6.21	9.82	13.67

The worst case performance data for NO_x was recorded for the A-1 auxiliary power generation engine (Serial Number 8GP2294) on test date week of June 30, 2008. The worst case performance data for CO was recorded for the A-4 auxiliary power generation engine (Serial Number 8GP2208) on test date week of May 12, 2003.

NO _x = 13.79 lbs/hr = 60.400 tpy	Facility Wide Emissions*
CO = 13.67 lbs/hr = 59.875 tpy	241.60 tpy
SO ₂ = (0.846 E ⁻³ lb/MMBtu) ² (0.942 MMBtu/hr)(4.38) = 0.03 tpy	239.50 tpy
VOC = (2.1 E ⁻³ lb/MMBtu)(0.942 MMBtu/hr)(4.38) = 0.009 tpy	0.14 tpy
H ₂ CO = (0.04 g/hp-hr)(1 lb/453.6 g)(370 hp)(4.38) = 0.143 tpy	0.03 tpy
	0.57 tpy

EPNG has sought a 50% safety factor on the NO_x emissions within their permit renewal application. Allowing a safety factor would result in the following emissions:

NO _x = (13.79 lbs/hr)(150%) = 90.600 tpy	Facility Wide Emissions*
	362.40 tpy

* The represented facility wide emissions are shown as a multiple of four to represent the emissions from the four auxiliary power generation engines.

SO₂ and VOC emissions are calculated from EPA AP-42, Table 3.1-2a.

Formaldehyde emissions are calculated using data from Table 18 of EPA-450/4-91-012, assuming an engine power of 370 hp (see Table 11-1, of EPNG's Title V permit application.).

² SO₂ emission factor = 0.94S, where S=0.9

B. AP-42 Emission Factors

Criteria pollutant emissions are calculated below using AP-42 factors from the 1/95 (fifth) edition, Table 3.1-1 and 3.1-2a. Formaldehyde (H₂CO) is the largest contributor of the hazardous air pollutants listed in the EPA AP-42, Table 3.1-3. The emissions of H₂CO are provided as an indication of significance only. Emissions for all other listed HAPs are likely to be significantly lower and are therefore omitted in this emission determination. SO₂ and VOC emissions are calculated from EPA AP-42, Table 3.1-2a.

1. Reciprocating Engines

Emission factors were calculated assuming a maximum engine power rating of 1071 hp = 2.728 MMBtu/hr

	Facility Wide Emissions*
NO _x = (3.2 E ⁻¹ lb/MMBtu)(2.728 MMBtu/hr)(4.38) = 3.824 tpy	65.01 tpy
CO = (8.2 E ⁻² lb/MMBtu)(2.728 MMBtu/hr)(4.38) = 0.980 tpy	16.66 tpy
SO ₂ = (0.846 E ⁻³ lb/MMBtu)(2.728 MMBtu/hr)(4.38) = 0.010 tpy	0.17 tpy
VOC = (2.1 E ⁻³ lb/MMBtu)(2.728 MMBtu/hr)(4.38) = 0.025 tpy	0.43 tpy
H ₂ CO = (7.1 E ⁻⁴ lb/MMBtu)(2.728 MMBtu/hr)(4.38) = 0.008 tpy	0.14 tpy

* The represented facility wide emissions are shown as a multiple of seventeen to represent the maximum potential emissions from the seventeen reciprocating engines.

2. Auxiliary Power Generation Engines

Emission factors were calculated assuming a maximum engine power rating of 370 hp = 0.942 MMBtu/hr

	Facility Wide Emissions*
NO _x = (3.2 E ⁻¹ lb/MMBtu)(0.942 MMBtu/hr)(4.38) = 1.320 tpy	5.28 tpy
CO = (8.2 E ⁻² lb/MMBtu)(0.942 MMBtu/hr)(4.38) = 0.338 tpy	1.35 tpy
SO ₂ = (0.846 E ⁻³ lb/MMBtu)(0.942 MMBtu/hr)(4.38) = 0.003 tpy	0.01 tpy
VOC = (2.1 E ⁻³ lb/MMBtu)(0.942 MMBtu/hr)(4.38) = 0.009 tpy	0.03 tpy
H ₂ CO = (7.1 E ⁻⁴ lb/MMBtu)(0.942 MMBtu/hr)(4.38) = 0.003 tpy	0.01 tpy

* The represented facility wide emissions are shown as a multiple of four to represent the emissions from the four auxiliary compression engines.

C. Emissions Summary

Table 1
Potential Emissions Summary – EPNG Tucson Compressor Station

Pollutant	EPNG Title V Application (tpy)	AP-42 (Fifth Edition) Table 3.2-2 (tpy)	Performance Test Data (tpy)
NO _x	2428.54	70.29	2307.74
CO	569.22	18.01	459.30
SO ₂	0.31	0.18	0.31
VOC	0.46	0.46	0.46
H ₂ CO	7.6	0.15	7.03

PTE estimates assume 8760 hrs/yr operation. With the inclusion of the sought 50% safety factor for NO_x and CO, the data in Table 1 indicates that the

emission calculations submitted by EPNG in their Title V permit application for the Tucson Compressor Station, exceed the emission levels measured during performance testing and exceed the emissions calculated with current AP-42 factors.

PDEQ has not approved and therefore not processed the sought increase in NO_x and CO emissions (using a 50% safety factor) for NO_x and CO respectively for the following reason:

Historic records of actual emissions reported in the emissions inventory (EI) are presented below.

Table 2
Actual Emissions (tpy) – EPNG Tucson Compressor Station

Pollutant	Year					
	2002	2003	2004	2005	2006	2007
NO _x	147.2	41.0	31.4	0.2	0.2	0.2
CO	28.1	61.3	40.3	0.0	0.0	0.0
SO ₂	0.0	0.0	0.0	0.0	0.0	0.0
VOC	0.4	0.4	0.3	0.6	0.6	0.6
H ₂ CO	ND	ND	0.3	0.0	0.0	0.0
C ₂ H ₄ O	ND	ND	ND	0.0	0.0	0.0

ND No Data
C₂H₄O Acetaldehyde (Federally listed Hazardous Air Pollutant)
H₂CO Formaldehyde

The data presented in Table 2 indicates that the emissions of the primary pollutants have typically decreased over the years and the source has operated significantly below the potential emission levels presumably since its inception in 1973.

The potential emissions for the facility shall be taken as those calculated from using the performance test data.

D) Emissions from Insignificant Activities:

The following emission activity is insignificant for the following reason:

Facility Shut Down:

When the reciprocating engines or entire facility is shut down, all emissions from the equipment and piping is vented to the atmosphere. EPNG has presented data in the renewal application that demonstrates this event, referred to as 'blow down', resulting in insignificant emissions of VOCs approximately 0.2 tons of VOCs (EPNG application dated July 2008, Tab E).

Lubricating Oil Tanks:

Any other activity which the Control Officer determines is not necessary, because of its emissions due to size or production rate, to be included in an application in order to determine all applicable requirements and to calculate any fee under this title

V. APPLICABLE REQUIREMENTS

State Implementation Plan, Pima County:

Rule 321	Emissions-Discharge: Opacity Limiting Standards and Applicability
Rule 343	Visibility Limiting Standard
Rule 344	Odor limiting Standard

Non-Federally Enforceable Regulations:

Pima County Code (PCC) Title 17, Chapter 17.16:

17.16.030	Odor Limiting Standards
17.16.040	Standards and Applicability (Visible Emissions)
17.16.050	Visibility Limiting Standards
17.20.010	Source Sampling, Monitoring and Testing
17.28.065	Excess Emissions

Requirements specifically identified as not applicable

The Pima County Code (PCC) that covers reciprocating engine(s) operations is PCC 17.16.340: Standards of performance for existing stationary rotating machinery. This PCC rule considers emissions of the following: particulate matter, visible emissions and sulfur dioxide. There is no reference to NO_x or CO emissions.

Pima County Department of Environmental Quality, (PDEQ) has reviewed your letter sent July 19, 2004 requesting guidance from PDEQ on whether a Permit Revision is required to address the recently published Reciprocating Internal Combustion Engine (RICE) MACT.

EPNG is an affected source that operates existing stationary RICE as specified in §63.6590 (a) and §63.6590 (a)(1).

However, according to §63.6590 (b)(3) and §63.6600 (c) of Subpart ZZZZ, EPNG does not have to comply with the emission limitations in Tables 1a and 2a or the requirements of this subpart since EPNG operates existing spark ignition 4 stroke lean burn (4SLB) stationary RICE. EPNG Tucson compressor station does not need to provide any initial notification and as a result, PDEQ does not require submittal of a permit revision for the facility.

VI. PERMIT CONTENTS

A. Emission Limits/ Standards:

Particulate Matter Standard	SIP Rule 322, PCC 17.16.340.C.1
Visibility Standards	SIP Rule 321 & PCC 17.16.340.E; SIP Rule 343, PCC 17.16.050.D
Fuel Limitation	PCC 17.12.180.A.2
Odor Limiting Standard	SIP 344 & PCC 17.16.030

B. Monitoring and Recordkeeping Requirements: PCC 17.12.180.A.3 & 4

Fuel Sulfur Content Monitoring
Operational Hour Monitoring
Recordkeeping

C. Reporting Requirements: PCC 17.12.180.A.5 & PCC 17.12.210

Semiannual Compliance Certifications
Fuel Sulfur Content
Operational Hours
Performance Test Results
Monitoring Results
Annual Emissions Inventory

D. Testing Requirements: PCC 17.20.010

There are no emission limits or standards for NO_x, and CO. The last performance test conducted on the reciprocating engines was in September, 2001. The ADEQ policy on mass emissions testing (Policy 0102.000, June 5, 1996) requires testing the reciprocating engines for NO_x every third year. Since the Tucson compressor station is operated on an intermittent basis, fixing a specific time schedule may result in EPNG operating the reciprocating engines solely for the purpose of complying with the requirements of the testing section. Therefore, the testing requirement of the reciprocating engines is based on an agreed upon trigger between EPA Region 9, PDEQ and EPNG. EPNG will be required to test when the Tucson station reciprocating engines are operated beyond 360 cumulative hours during the permit term. While designing the aforementioned time schedule, PDEQ understands that pipeline operating conditions fluctuate, and the reciprocating engines may have to be fired on short notice. In order to be prepared to test on short notice, it may be advisable for EPNG to submit any required test plans well in advance of any anticipated dates of reciprocating engine(s) operations.

Conditional NO_x and CO Testing (when the cumulative hours of operation of all reciprocating engines during the permit term exceed 360 cumulative operating hours).

Odor testing if requested by Control Officer.

E. Alternate Operating Scenarios:

None, EPNG retains the capacity to operate its reciprocating engines at maximum capacity for the maximum number of available hours.

F. Miscellaneous Comments:

Permitting History:

February 1973: Source submitted first permit application for the facility (1 yr Renewal).
April 1974: Source submitted renewal application.
January 1995: Source submitted renewal application.
September 2008: Source submitted renewal application for 5-year permit.

Particulate matter:

It can be demonstrated that the particulate emissions standard cannot be exceeded by showing that the particulate matter potential to emit (PTE) is less than the maximum allowable particulate matter standard.

The maximum allowable particulate matter standard for the Tucson compressor station is determined using the process weight rate equations of PCC 17.16.340.C.1 and the total heat input of the reciprocating engines.

The particulate matter standard in PCC 17.16.340.C.1 is equivalent to Rule 332 of the SIP provisions and, as such, is federally enforceable. 1,071 horsepower is roughly equivalent to 2.728 million BTU/ hr or 46.368 million BTU/ hr for the seventeen reciprocating engines. 370 horsepower is roughly equivalent to 0.942 million BTU/ hr or 3.77 million BTU/ hr for the four auxiliary power generation engines.

Applying the process weight rate rule yields:

$$\begin{aligned} E &= [1.02 \times (46.368)^{0.769}] + [1.02 \times (3.77)^{0.769}] \\ &= 19.495 \text{ lb}_{\text{PM}}/\text{hr} + 2.830 \text{ lb}_{\text{PM}}/\text{hr} \\ &= 22.325 \text{ lb}_{\text{PM}}/\text{hr} \\ &= 97.78 \text{ tpy}_{\text{PM}} \end{aligned}$$

Thus the compressor station has an allowable emission rate of 97.78 tpy of particulate matter. It's probably not unreasonable to anticipate most, if not all, of the PM to be PM₁₀ since we are considering a combustion source; however to be conservative, the PTE calculation below presents the total PM emissions. The particulate matter PTE is calculated using AP-42 emission factor, Table 3.1-2a:

$$\text{PM}_{(\text{TOTAL})} = (6.6 \text{ E}^{-3} \text{ lb/MMBtu})(46.368 + 3.77 \text{ MMBtu/hr})(4.38) = 1.45 \text{ tpy}$$

Since the facility wide PTE is less than the maximum allowable particulate matter standard, the particulate matter standard will not be exceeded and hence monitoring, recordkeeping and testing of particulate matter emissions are not required in the permit.

Fuel Limitation:

"Pipeline-quality" natural gas has to conform to standards approved by the Federal Energy Regulatory Commission (FERC). The Tucson compressor station which is supplied with pipeline quality natural gas is subject to the FERC standards for sulfur content and heating value of fuel³. The FERC standard is more stringent than the Pima County Code with respect to sulfur content. One of the FERC standards limits the sulfur content in the gas to less than 0.75 grains/100 scf (equivalent to 0.0026 weight percent of sulfur). Another standard specifies that the heating value be greater than or equal to 970 Btu per cubic foot. Pima County Code (PCC) 17.16.340.I requires recording the daily sulfur content and the lower heating value of the fuel being fired. EPNG Tucson compressor station runs the reciprocating engines with fuel drawn from their pipeline. Maintaining a copy of FERC approved Tariff agreement on-site shall be considered and accepted as compliance with PCC 17.16.340.I.

PCC 17.16.340.J requires reporting cases when the sulfur content of the fuel being fired exceeds 0.8 percent by weight. FERC approved tariff assures sulfur content less than 0.0026 percent by weight. This is 0.325% of the allowable (reporting) limit in the PCC 17.16.340.J. Thus maintaining a copy of the FERC approved Tariff agreement on-site would be an adequate means of complying with the monitoring requirements for the particulate and fuel use standards.

VII. IMPACTS TO AMBIENT AIR QUALITY

None required, as the source is not subject to PSD or NSR.

³ Interstate Natural Gas-Quality: Specifications & Interchangeability. Center for Energy Economics (December2004).

VIII. CONTROL TECHNOLOGY DETERMINATION

No control technologies needed to be determined. This facility is in an area of attainment and is not a new source.

IX. PREVIOUS PERMIT CONDITIONS

No previous permit conditions that need to be included in this permit.

