

Technical Support Document  
El Paso Natural Gas Company - Tucson Compressor Station  
(Updated for Renewal 9/03)

GENERAL COMMENTS:

El Paso Natural Gas Company (EPNG) provides natural gas transportation services for natural gas suppliers and end users throughout the southwestern United States. EPNG owns and operates a large pipeline network for which the Tucson Compressor Station serves as one of the gas compression locations. Compression is needed to maintain enough pressure in the pipeline to keep the gas flowing.

The Tucson station operates seventeen Cooper Bessemer, Model GMV-10TF, 1,071 horsepower, internal combustion engines to drive the compression units and four Ingersoll Rand, Model PVG-8, 370 horsepower engines to provide auxiliary power to the facility. Both sets of engines are powered exclusively by the combustion of natural gas. The engine stacks are the primary sources of air pollutant emissions. The primary pollutants present in the stack gases resulting from combustion of natural gas are NO<sub>x</sub> and CO. Hazardous air pollutants (HAPs), VOCs, PM<sub>10</sub>, and SO<sub>2</sub> are other 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. The Tucson station has no glycol dehydration units on site.

This facility is located in a non-attainment area for PM<sub>10</sub>.

REGULATORY HISTORY:

The Tucson station was first permitted in 1973 (Permit # 00017000). There were no substantive conditions associated with this permit. Annual inspections at the site indicate there have been no recorded air quality violations.

EMISSIONS ESTIMATES:

From Table 11-1 of the El Paso Natural Gas Company's (EPNG) air permit application dated January 30, 1995, the seventeen Cooper Bessemer Model GMV-10TF compressor engines are 2 cycle lean burn engines rated at 1,071 horsepower each. The four Ingersoll Rand Model PVG-8 auxiliary engines are 4 cycle rich burn engines rated at 370 horsepower each. Paragraph 10.h. of that same application indicates EPNG "seeks no limitations on compressor and auxiliary engine operation."

AP-42, Table 3.2-2 and 3.2-3 (1/95), lists uncontrolled emission factors for 2-Cycle Lean Burn engines and 4-Cycle Rich Burn engines as follows:

TABLE 1

POLLUTANT	2-CYCLE LEAN BURN FACTOR (LB/HP-HR)	4-CYCLE RICH BURN FACTOR (LB/HP-HR)
NO <sub>x</sub>	0.024	0.022
CO	0.00331	0.019
TNMOC	0.000948	0.000309
FORMALDEHYDE	0.00293	NA
BENZENE	0.00000362	NA
TOLUENE	0.00000362	NA
ETHYLBENZENE	0.00000181	NA
XYLENES	0.00000543	NA

The following potential-to-emit estimates were derived using the factors in Table 1.

$$PTE_{NO_x} = ((0.024 \text{ lb}_{NO_x}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine}) + (0.022 \text{ lb}_{NO_x}/\text{hp-hr} \times 4 \text{ engines} \times 370 \text{ hp/engine})) \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 2056 \text{ TPY}_{NO_x}$$

$$PTE_{CO} = ((0.00331 \text{ lb}_{CO}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine}) + (0.019 \text{ lb}_{CO}/\text{hp-hr} \times 4 \text{ engines} \times 370 \text{ hp/engine})) \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 387 \text{ TPY}_{CO}$$

$$PTE_{TNMOC} = ((0.000948 \text{ lb}_{TNMOC}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine}) + (0.000309 \text{ lb}_{TNMOC}/\text{hp-hr} \times 4 \text{ engines} \times 370 \text{ hp/engine})) \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 77.6 \text{ TPY}_{TNMOC}$$

$$*PTE_{\text{FORMALDEHYDE}} = 0.00293 \text{ lb}_{\text{FORMALDEHYDE}}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine} \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 234 \text{ TPY}_{\text{FORMALDEHYDE}}$$

$$PTE_{\text{BENZENE}} = 0.00000362 \text{ lb}_{\text{BENZENE}}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine} \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 0.3 \text{ TPY}_{\text{BENZENE}}$$

$$PTE_{\text{TOLUENE}} = 0.00000362 \text{ lb}_{\text{TOLUENE}}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine} \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 0.3 \text{ TPY}_{\text{TOLUENE}}$$

$$PTE_{\text{ETHYLBENZENE}} = 0.00000181 \text{ lb}_{\text{ETHYLBENZENE}}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine} \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 0.14 \text{ TPY}_{\text{ETHYLBENZENE}}$$

$$PTE_{\text{XYLENES}} = 0.00000543 \text{ lb}_{\text{XYLENES}}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine} \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 0.43 \text{ TPY}_{\text{XYLENES}}$$

\*There seems to be a problem with the emission factor for formaldehyde. AP-42, Table 3.2-3 lists a formaldehyde emission factor for 2-cycle lean burn engines at 0.00293 lb/hp-hr. Table 3.2-2 lists the TNMOC emission factor for 2-cycle lean burn engines at 0.000948. In other words, the emission factor for formaldehyde, which should be a subset of the TNMOC, is actually three times higher than the TNMOC emission factor. I called Dennis Beauregard (USEPA/RTP) and explained the problem. He indicated that EPA is aware of the discrepancy and is working on an update to AP-42 in that area. Dennis referred me to a draft of AP-42 dated 02/97 which provides updated emission factors for these engines. The draft was available on the OAR Website. Dennis also gave me the phone number of Chad Leatherwood (a consultant to EPA that is working that problem). I talked with Chad and he agreed to fax me the emission factors from a February 1996 report prepared by Eastern Research Group which is the basis of the EPA's proposed AP-42 update. The updated information also provided estimates of HAPs and particulate matter which had been previously unavailable.

AP-42, Table 3.2-1 and 3.2-4 (02/97 Draft), lists uncontrolled emission factors for 2-Stroke Lean Burn engines and 4-Stroke Rich Burn engines as follows:

TABLE 2

POLLUTANT	2-STROKE LEAN BURN FACTOR (LB/HP-HR)	4-STROKE RICH BURN FACTOR (LB/HP-HR)
NO <sub>x</sub>	0.027	0.046
CO	0.0027	0.016
SO <sub>2</sub>	0.000005	0.0000055
VOC	0.0021	0.00048
FORMALDEHYDE	0.00058	0.00029
OTHER HAPs	0.0012	0.00019
PM <sub>10</sub>	ND	0.000098

Using the formaldehyde emission factors from Table 2 yields:

$$PTE_{\text{FORMALDEHYDE}} = ((0.00058 \text{ lb}_{\text{FORMALDEHYDE}}/\text{hp-hr} \times 17 \text{ engines} \times 1071 \text{ hp/engine}) + (0.00029 \text{ lb}_{\text{FORMALDEHYDE}}/\text{hp-hr} \times 4 \text{ engines} \times 370 \text{ hp/engine})) \times 8760 \text{ hr/yr} \times 1 \text{ ton}/2000 \text{ lb} = 48 \text{ TPY}_{\text{FORMALDEHYDE}}$$

The 48 TPY<sub>FORMALDEHYDE</sub> would appear to be a more realistic estimate of potential formaldehyde emissions from the facility. The facility would be a major source of both a single HAP and a combination of HAPs (based on the emission factor for OTHER HAPs). Particulate matter and sulfur oxide emissions appear to be insignificant in the natural gas combustion process.

Tab 3, Table 1 of the application included results of tests performed on some of the engines. These

results are summarized as follows:

TABLE 3

ENGINE	NO <sub>x</sub> MEAN (LB/HR)	CO MEAN (LB/HR)	THC MEAN (LB/HR)
AUX-1	6.58	0.40	0.48
AUX-2	13.47	0.18	0.59
AUX-3	12.16	0.27	0.28
A-8	8.99	1.73	15.62
A-10	4.29	1.36	14.39
A-11	5.21	1.46	16.18
A-12	5.33	1.78	12.32
B-2	4.35	1.74	18.34
B-5	13.52	1.41	15.45

After consideration of the above, the facility is a major source of NO<sub>x</sub>, CO. Tab 3, Table 2 of the application indicates the source is major for VOCs and that would be supported by the new emission factor in Table 2. The facility may also be a major source of a single HAP (Formaldehyde and Acetaldehyde) and a combination of HAPs. As yet, EPA has promulgated no MACT standards for this source category. There is a February 9, 1998 proposed MACT for Natural Gas Transmission and Storage Facilities (proposed Part 63, Subpart HHH) but the only HAP consideration for transmission and storage facilities is the glycol dehydration unit reboiler vent. There is no glycol dehydration unit at the Tucson compressor station.

Another consideration is the particulate matter standard associated with the process weight rule at 17.16.340.C.1. This process weight rule is equivalent to the Rule 332 SIP provision and, as such, is federally enforceable. At roughly 2543 BTU(mean)/hr per horsepower, 19,687 horsepower is roughly equivalent to 50.1 million BTU/hr. Applying the process weight rule yields:

$$E = 1.02 \times (50.1)^{0.769} = 20.7 \text{ lb}_{\text{PM}}/\text{hr or } 91 \text{ TPY}_{\text{PM}}$$

Thus the compressor station has an allowable emission rate of 91 TPY of particulate matter. It's probably not unreasonable to anticipate most, if not all, of the PM to be PM<sub>10</sub> since we are considering a combustion source. Of course actual emissions of particulate from natural gas fuel would be insignificant, even for the number of engines at this site.

PERMIT CONTENTS:

The engines were installed between June 1947 and September 1950. The engines pre-date the NSR program and there are no NSPS or MACT standards applicable to the engines. The county rule, from

Title 17 of the Pima County Code, that covers the operation of these engines is 17.16.340 (Standards of performance for existing stationary rotating machinery). This rule contains standards for particulate matter, sulfur dioxide, and an opacity standard. There is no standard for NO<sub>x</sub> or CO emissions.

#### Emission Limits/Standards

### 1. Compressor and Auxiliary Engines

#### 1. Particulate Matter

Natural gas combustion results in small quantities of particulate matter emissions.

The maximum potential particulate emissions from the engines at the Tucson station were estimated to be approximately 10 tpy. The emissions standard in 17.16.340.C.1 imposes a particulate matter emissions limit of 91 tpy.

#### 2. Visible Emissions

The visible emissions standard, 17.16.340.E, imposes a 40% opacity limitation.

#### 3. Sulfur

The operating permit requires EPNG to combust only natural gas for engine operations. The sulfur standard in 17.16.340.F. refers to low sulfur fuel *oils*, therefore this standard is not applicable to natural gas combustion. 17.16.340.I. and 17.16.340.J. require recordkeeping and reporting requirements of fuel sulfur quantity. These requirements support the aforementioned sulfur standard, and as such are not applicable to natural gas combustion.

### 2. Non-point sources

- i. The standards in Title 17, Article III, are applicable requirements for open areas, on-site vehicular traffic, material handling, and storage piles. The EPNG Tucson site is located in a remote area. EPNG sites typically have areas which are graveled, and other areas which are covered by native vegetation. The Tucson site is unlikely to experience continuous activities which are likely to disturb unpaved areas and cause visible emissions. However, the regulations in Article III are applicable requirements and as such, are included in the permit.
- ii. EPNG has indicated in its initial response to comments (letter dated January 5, 1999) that it wishes to add an open burning section to the this permit similar to the section in its Vail permit. EPNG may, on rare occasions, wish to conduct open burning activities. The condition in the permit directs EPNG to obtain a permit from PDEQ when EPNG wishes to conduct open burning activities.

### 3. Other Periodic Activities

#### 1. Abrasive Blasting

EPNG has indicated in the permit application that there might be a few occasions in which abrasive blasting activities are conducted on-site. 17.16.100. is the applicable requirement, and is included in the permit. 17.16.100. Is equivalent to Rule 316 of the SIP and is federally enforceable.

#### 2. Spray Painting

EPNG has indicated in the permit application that there might be a few occasions in which spray painting activities are conducted on-site. 17.16.400. is the applicable requirement, and is included in the permit.

#### 3. Demolition/Renovation

EPNG has indicated in the permit application that there might be a few occasions on which demolition/renovation activities may be conducted. In such instances, the requirements of 40 CFR 61, Subpart M (National Emissions Standards for Hazardous Air Pollutants - Asbestos) may be applicable.

#### 4. Nonvehicle Air Conditioner Maintenance and/or Services

EPNG has indicated in its initial response to comments (letter dated January 5, 1999) that there might be a few occasions on which nonvehicle air conditioner maintenance activities may be conducted and wishes to add this activity to this permit. In such instances, the requirements of 40 CFR 82, Subpart F (Protection of Stratospheric Ozone - Recycling and Emissions Reduction) may be applicable.

### Monitoring and Recordkeeping Requirements

#### a. Compressor and Auxiliary Engines

##### i. Particulate Matter

As noted previously, natural gas combustion results in minimal particulate matter emissions. It was therefore decided that even though an emissions standard exists for particulate matter, it would be unnecessary and impractical to have a rigorous monitoring schedule for the particulate standard.

##### ii. Visible Emissions

As in the case of particulate matter, visible emissions resulting from natural gas

combustion are minimal. It was therefore decided that a rigorous monitoring schedule for opacity would not be required.

iii. Sulfur

"Pipeline-quality" natural gas has to conform to standards approved by the Federal Energy Regulatory Commission (FERC). One of the FERC standards limits the sulfur content in the gas to less than 5 grains/100 scf (which is equivalent to 0.017 weight percent of sulfur). Another standard specifies that the heating value be greater than or equal to 967 Btu per cubic foot. EPNG runs the engines with fuel drawn from their pipeline, and therefore it was decided that maintaining a copy of the relevant portions of the FERC approved Tariff agreement on-site would be an adequate means of complying with the monitoring requirements for the particulate, opacity and fuel use standards.

iv. Operating Schedule

The dates of engine operation are required to determine operating frequency of the engines. The operating frequency determines the testing schedule for the engines. After the performance tests are completed, it will not be required to record the dates of operation.

b. Non-point Sources

As discussed in the emissions limits section, the non-point source standards have been included in the permit because of the existence of applicable requirements. Part "B", Section II.B. lists a set of recordkeeping requirements, directing the source to keep records of all the efforts taken towards mitigating visible emissions from non-point source activity.

c. Other Periodic Activities

Other applicable rules are abrasive blasting, spray painting, and demolition/renovation activities. Monitoring requirements have been established in the permit for these aperiodic activities.

Reporting Requirements

- a. EPNG is required to report any changes in the FERC Tariff agreement related to lower heating value limits and sulfur content limits to PDEQ, within thirty days of such change.
- b. At the time of submission of the semi-annual compliance certifications, EPNG is required to submit a report containing the dates on which each engine was operated. This

information will assist PDEQ in tracking the operating frequency of the engines, and in ensuring compliance with the requirements of the testing section. This report may be discontinued after completion of the performance tests.

### Testing Requirements

- a. There are no emission limits or standards for NO<sub>x</sub>, and CO. The last performance tests conducted on some of the engines was conducted in October 1993. The ADEQ policy on mass emissions testing (Policy 0102.000, June 5, 1996) requires testing internal combustion engines for natural transmission pipeline facilities for NO<sub>x</sub> every third year. Emissions estimates thus far have been made based partially on October 1993 test results and emission factors. The Tucson station is operated on an intermittent basis. Fixing a specific time schedule may result in EPNG operating the engines solely for the purpose of complying with the requirements of the testing section. Therefore, the testing requirement does not have a fixed time schedule. It was decided to word the testing section language in such a way that EPNG would be required to test at the earliest instance when the Tucson station engines are operated beyond fifteen cumulative days (360 cumulative operating hours) during the course of the permit. While designing the aforementioned time schedule, PDEQ understands that pipeline operating conditions fluctuate, and the 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 engine operations.
- b. The permit requires testing at the “normal rated capacity” of each unit (reference Part “A”, Section XVII.A.). The control officer recognizes the capacity of the unit is influenced by the meteorological conditions existing at the site at time of testing. With certain meteorological conditions it may not be possible to operate the unit at its “normal rated capacity” (e.g., the rated horsepower of the engines). The permit also allows testing at a lower rate with prior approval of the control officer. This would allow for those situations where, for example, testing is mandated but there is insufficient raw material available for the test. Allowing testing at a lower rate than “normal” does not preclude the control officer from adjusting appropriate permit conditions accordingly if a test report necessitated such an adjustment.

### Alternate Operating Scenarios

EPNG's application did not request an alternate operating scenario (see page 2, paragraph 3 of the application) and none have been included in the permit.

### List of Special Provisions

In its application, EPNG provided a list of special provisions that they wanted to be addressed in the permit. This list is located in Tab 1 of the application. They have been addressed in the following manner:

Maintenance and Inspection, Emergency Shut Down Systems, Cathodic Protection System, General Maintenance & Construction Activities, Start-up, Shutdown & Maintenance, Insignificant Activities.

It was decided that each of these items qualified for classification as an insignificant activity, and as such was included in the list in Attachment "E".

Hazardous Air Pollutants Refer to Part "A", Section X.

Abrasive Blasting Abrasive blasting activities have an applicable requirement in the Pima County Code. Also, according to the definition in Title 17 of the Pima County Code (17.04.340.A.109.), for an activity to be classified as insignificant, it may not have *any* applicable requirement. All projects have to comply with the requirements of 17.16.100.D. Refer to Part "B", I.C.1.

Spray Painting A similar argument as used in the abrasive blasting issue provides the reason for including 17.16.400. as an applicable requirement. Refer to Part "B", Section I.C.2.

Emissions Trading PDEQ has determined that EPNG should apply for a permit revision (if necessary) in case there are any changes in the permitted equipment.

Location of records Refer Section II.D, Part "B".

Portable Sources Any contractor operating portable sources on site will need to obtain an air permit (if required) to cover the portable source operation. It was decided not to include this in the insignificant activities list as the portable equipment permits will be the responsibility of the contractors, and not of EPNG.

Asbestos Refer to Part "B", Section I.C.4.

Performance Tests Refer to Part "B", Section IV.

### RICE MACT

Permittee is not subject to proposed RICE MACT as drafted. There are no standards for 2 stroke lean burn engines. There are 4 stroke rich burn engines on site, however, they fall under the 500 hp exemption.