# TECHNICAL SUPPORT DOCUMENT

## MAY, 2012

## I. GENERAL COMMENTS:

The University of Arizona Bio5 Institute – Oro Valley is a medical research facility located at 1580 E Hanley Boulevard, Oro Valley, Arizona.

A. Company Information

1. Source Name: University of Arizona (Bio5 Institute - Oro Valley)
2. Source Address: 1580 E Hanley Boulevard, Oro Valley, Arizona 85737
3. Mailing Address: (Same as source address)

B. Background

This air quality operating permit is the facilities first operating permit issued to regulate air pollutants generated primarily from the used of fossil fuel fired equipment. The affected emission sources at the facility include one natural gas fired emergency generator and two natural gas boilers.

A Class II, Individual air quality permit application was received on July 15, 2011. The affected sources at the facility to which the air quality operating permit applies are identified in the following categories of the permit:

Category A New and Existing Stationary Source Performance Standards for Fossil-Fuel Fired Industrial and Commercial Equipment (Generator, not subject to NSPS or NESHAP).

Category B New and Existing Stationary Source Performance Standards for Fossil-Fuel Fired Industrial and Commercial Equipment (Boilers, not subject to NSPS or NESHAP).

Since this is the first permit, there are no historical records for this facility

C. Attainment Classification

University of Arizona Bio5 Institute-Oro Valley is located within an area that is in attainment for all pollutants.

## II. SOURCE DESCRIPTION

University of Arizona Bio5 Institute-Oro Valley maintains equipment essential to the research facility operations and in the event of an emergency/ electrical power outage. Specifically, the facility operates a single natural gas fired emergency generator to provide emergency backup power and two natural gas fired boilers to supply steam and hot water.

## III. REGULATORY HISTORY

A. Testing and Inspections

No historical test data or inspection reports available. The facility was built in the 1980's and was purchased by the UA in June 2010. The previous owner did not apply for and obtain an air quality permit.

B. Excess Emissions

N/A. This is a new permit for this facility.

## IV. EMISSIONS ESTIMATES

The following emission rates are for reference purposes only and are not intended to be enforced by direct measurement unless otherwise noted in the Specific Conditions of the permit.

| Pollutant | Potential Emissions (Tons per Year) |
|---|---|
| Nitrogen Oxides ($NO_X$) | 6.33 |
| Carbon Monoxide (CO) | 2.98 |
| Volatile Organic Compounds (VOC) | 0.18 |
| Particulate Matter (as $PM_{10}$) | 0.25 |
| Sulfur Oxides ($SO_X$) | 0.02 |
| Hazardous Air Pollutants (HAPs – total) | 0.06 |

Potential combustion emissions of $NO_X$ and CO are determined from manufacture's published emission data (Appendix 1 of this TSD). Emissions of all other regulated pollutants calculated using EPA EP-42 emission factors.

## V. APPLICABLE REQUIREMENTS

**Code of Federal Regulations (CFR):**

40 CFR Part 63 Subpart ZZZZ — National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines – applicable to the natural gas fired emergency generator. Bio5 Institute is an affected facility under 40 CFR Part 63 Subpart ZZZZ, but the requirements are that the facility comply with 40 CFR Part 60 Subpart JJJJ.

40 CFR Part 60 Subpart JJJJ — New Source Performance Standards (NSPS)
Standards of Performance for Stationary Spark Ignition Internal Combustion Engines - applicable to the natural gas fired emergency generator.
The spark ignition internal combustion engine is **not** subject to 40 CFR Part 60 Subpart JJJJ requirements since it was built prior to any of the applicability dates in 40 CFR 60.4230.

**Pima County Code (PCC)**

This is not meant to be an exhaustive list of every applicable requirement to which the Permittee is subject, but represents those performance standards cited in the permit. It is the responsibility of the Permittee to comply with all applicable regulations.

| | |
|---|---|
| PCC 17.16.040 | Visible Emission Standards – Standards and Applicability (includes NESHAP) |
| PCC 17.16.165 | Standards of Performance for Fossil Fuel Fired Industrial and Commercial Equipment. |
| PCC 17.16.340 | Standards of Performance for Stationary Rotating Machinery. |
| PCC 17.20.010 | Emission Source Testing and Monitoring. |

## VI. PERMIT CONTENTS

**Category A**

**New and Existing Stationary Source Performance Standards for Stationary Rotating Machinery**

**(Locally Enforceable Conditions, unless otherwise stated)**

**Applicability**

Stationary rotating machinery located at a source which is required to obtain a Class III air quality operating permit pursuant to Title 17 of the Pima County Code (PCC) 17.12.140.B.3.b.

| Condition in Permit | Discussion | Authority |
|---|---|---|
| I.A | By law, the Permittee cannot allow any equipment under his control to emit effluents (such as exhaust from the generator) that exceed specific values of opacity (the degree to which light cannot pass through the plume of effluent/exhaust.) The value of opacity that cannot be exceeded is stated in the permit for the generator. A demonstration to show compliance with the opacity limitation is not required since the percent of opacity of visible emissions whilst combusting natural gas is inherently low. The Permittee has reported that the applicable generator is fired exclusively by Natural Gas. | PCC 17.16.340.E |
| I.B | Each type of fuel burned in equipment powered by combustion has a unique blend of constituents. When burned, each fuel results in the release of regulated pollutants to the atmosphere at characteristic levels. This provision is written to prohibit the Permittee from firing fuels other than natural gas. This is a Synthetic Emission Limitation as firing alternate fuels may result in an increase in emissions above major source thresholds. | PCC 17.12.190.E |

| Condition in Permit | Discussion | Authority |
|---|---|---|
| I.C | The operation of the emergency generator is expected (under worst-case conditions) to be no greater than 500 hrs per year. http://www.epa.gov/region07/air/title5/t5memos/emgen.pdf | PCC 17.12.190.B |
| II.A | Monitoring - A demonstration to show compliance with the opacity limitation is not required since the percent of opacity of visible emissions whilst combusting natural gas is inherently low. The Permittee has reported that the applicable generator is fired exclusively by Natural Gas. | PCC 17.12.185.A.3 |
| II.B | Monitoring – Fuel Prohibition from firing fuels other than those allowed by the permit. This is a synthetic emission limitation as firing alternate fuels may result in an increase in emissions above major source thresholds. There is also a prohibition from firing high sulfur fuel. This requirement is the basis for not requiring measures to show compliance with 17.16.340.F and H. | PCC 17.12.185.A.3 |
| III.A | Requirement to maintain records of any emissions in excess of the limits established by this permit. All records shall be maintained for five years. | PCC 17.12.185.A.4 |
| III.B | The Permittee demonstrates compliance with the 500 hrs operational restriction to Pima County Department of Environmental Quality (PDEQ) by keeping complete records of the time periods in which the generator is operated. | PCC 17.12.185.A.4 |
| IV | Reporting Requirements to report all excess emissions to the Control Officer. | PCC 17.12.185.A.5 and PCC 17.12.040 |
| V | Testing Requirements – to conduct testing to demonstrate compliance with the applicable standards. Various conversion formulae are provided to determine the mass per unit output emissions. | PCC 17.20.010 |
| V.A | Opacity Testing Requirements - provision for the Control Officer to request that a Method 9 test be conducted by the Permittee | PCC 17.12.050 & PCC 17.20.010 PCC 17.12.040.B |
| V.B | Fuel Testing –guidance for the Permittee to demonstrate compliance that pipeline quality natural gas was fired exclusively in the generator. | PCC 17.12.185.A.3 and PCC 17.20.010 |
| V.C | Provision to allow the Permittee to submit an alternate and equivalent test method(s) that is listed in 40 CFR Subpart 60, Appendix A, to the Control Officer in a test plan, for approval by the Control Officer. | PCC 17.12.045.D |
| VI | Provision for the Permittee to submit the proper notification and follow the required permit revision procedures for facility changes. | PCC 17.12.240, PCC 17.12.255, and PCC 17.12.260 |

## Category B

## New and Existing Stationary Source Performance Standards for Fossil-Fuel Fired Industrial and Commercial Equipment

## (Locally Enforceable Conditions, unless otherwise stated

### Applicability

Fossil fuel fired equipment located at a source which is required to obtain a Class III air quality operating permit pursuant to Title 17 of the Pima County Code (PCC) 17.12.140.B.3.c.

| Condition in Permit | Discussion | Authority |
|---|---|---|
| I.A | Prohibition from emitting smoke from the boilers in excess of 20% opacity. | PCC 17.16.040 |
| I.B | Prohibition from firing fuels other than natural gas. This is a Synthetic Emission Limitation as firing alternate fuels may result in an increase in emissions above major source thresholds. | PCC 17.12.190.E |
| II.A | Monitoring - A demonstration to show compliance with the opacity limitation is not required since the percent of opacity of visible emissions whilst combusting natural gas is inherently low. The Permittee has reported that the applicable boilers are fired exclusively by Natural Gas. | PCC 17.12.185.A.3 |
| II.B | Monitoring – Fuel Prohibition from firing fuels other than those allowed by the permit. This is a synthetic emission limitation as firing alternate fuels may result in an increase in emissions above major source thresholds. There is also a prohibition from firing high sulfur fuel. This requirement is the basis for not requiring measures to show compliance with 17.16.340.F and H. | PCC 17.12.185.A.3 |
| III | Requirement to maintain records of any emissions in excess of the limits established by this permit. All records shall be maintained for five years. | PCC 17.12.185.A.4 |
| IV | Reporting Requirements to report all excess emissions to the Control Officer. | PCC 17.12.185.A.5 and PCC 17.12.040 |
| V | Testing Requirements – to conduct testing to demonstrate compliance with the applicable standards. Various conversion formulae are provided to determine the mass per unit output emissions. | PCC 17.20.010 |
| V.A | Opacity Testing Requirements - provision for the Control Officer to request that a Method 9 test be conducted by the Permittee | PCC 17.12.050 & PCC 17.20.010 PCC 17.12.040.B |
| V.B | Fuel Testing –guidance for the Permittee to demonstrate compliance that pipeline quality natural gas was fired exclusively in the boiler. | PCC 17.12.185.A.3 and PCC 17.20.010 |

| | | |
|---|---|---|
| V.C | Provision to allow the Permittee to submit an alternate and equivalent test method(s) that is listed in 40 CFR Subpart 60, Appendix A, to the Control Officer in a test plan, for approval by the Control Officer. | PCC 17.12.045.D |
| VI | Provision for the Permittee to submit the proper notification and follow the required permit revision procedures for facility changes. | PCC 17.12.240, PCC 17.12.255, and PCC 17.12.260 |

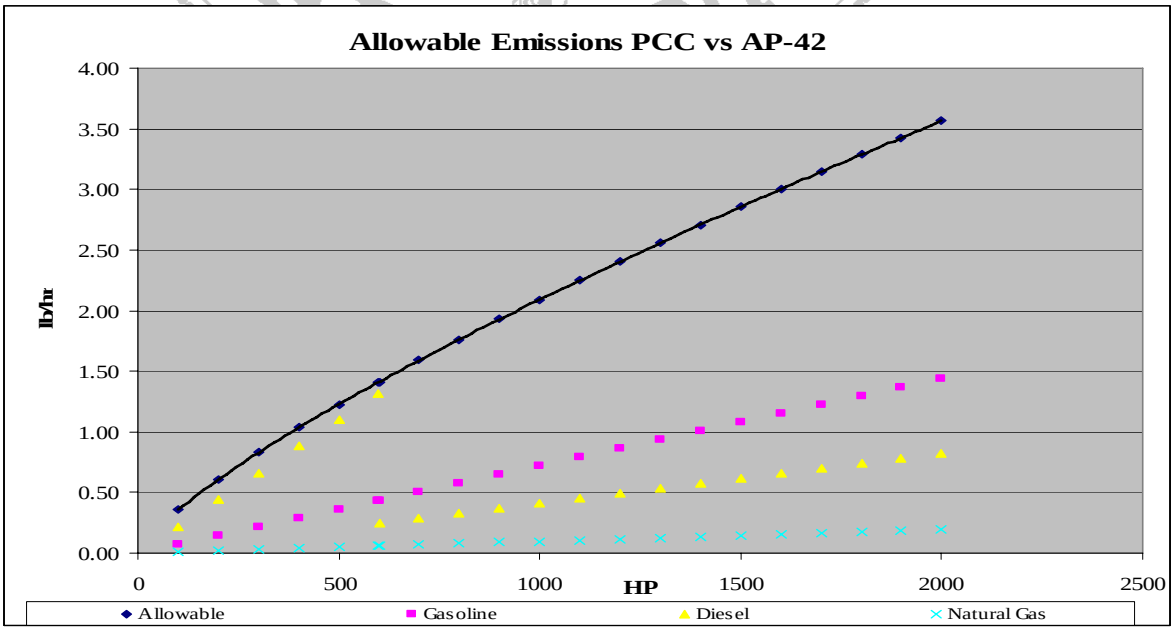
## VII. Miscellaneous Comments

**A.** Pima County Code PCC 17.16.340.H references a condition prohibiting the use of high sulfur oil by the Permittee. It has been accepted that compliance with this sulfur limitation ensures compliance with the Sulfur Dioxide Standard of 17.16.340.F which limits the emission of $SO_2$ to 1.0 pound per million BTU heat input, when burning low sulfur fuel. It is not necessary to include either sulfur limitation in the permit as the applicable stationary rotating machinery (generator) is exclusively fired by natural gas. The Federal Energy Regulatory Commission (FERC) approved Tariff agreement, limits transmission of pipeline quality natural gas to a sulfur content less than 0.8 percent by weight.

**B.** The requirement in PCC 17.16.340.J to report daily periods when the fuel sulfur content of the fuel being fired exceeds 0.8% by weight has not been included in the permit as all fuel that is delivered to Pima County has an enforceable limit of 0.9% by weight. Any fuel over 0.8% but below 0.9% would not be an exceedance of any standard or limitation and so it would be burdensome for sources to report every time the fuel had a sulfur content above 0.8%. Moreover, even though the sulfur content limit is 0.9% by weight, natural gas delivered to Pima County consistently shows sulfur levels below this limit as shown in past records of fuel supplier specifications which verify sulfur content of the fuel fired.

**C. Particulate Matter:**

PCC 17.16.340.C.1 limits the emissions of particulate matter from stationary rotating machinery. This rule has not been included in the permit as allowable emissions are well above potential emissions. The following Chart illustrates this fact:



AP-42 estimated natural gas emissions are demonstrably less than allowable emissions; therefore, it is not necessary to include the standard in the permit explicitly but, by reference in Attachment 1.

## VIII. IMPACTS TO AMBIENT AIR QUALITY

Not a major source so no impact studies are required.

## IV. CONTROL TECHNOLOGY DETERMINATION

No control technologies needed to be determined; source is not subject to BACT or LAER.

## X. PREVIOUS PERMIT CONDITIONS

None

# APPENDIX 1

## NATURAL GAS FIRED EMERGENCY GENERATOR MANUFACTURE PUBLISHED EMISSION DATA

**GTA855A is a discontinued product.**

**Natural Gas Engines** **This document is for product support only.**

# GTA855A

**EMISSION DATA**
**Sheet #ES8760A**

| | | | |
|---|---|---|---|
| **Model:** | GTA855A | **Application:** | Generator Drive |
| **Type:** | 4 Stroke, In-line, 6 Cylinder | **Rating:** | 330 HP at 1800 RPM |
| **Aspiration:** | Turbocharged & Aftercooled | **Bore:** | 5.5 in. |
| **Compression Ratio:** | 10:1 | **Stroke:** | 6.0 in. |
| **Fuel:** | Natural Gas | **Displacement:** | 855 cu. in. (14L) |

| **Performance Data** | **Standby** | **Prime** | **Continuous** |
|---|---|---|---|
| BHP @ 1800 RPM | 330 | 275 | 234 |
| Torque (ft-lbs) | 963 | 802 | 683 |
| Fuel Flow (SCFH) | 2625 | 2181 | 1935 |
| Fuel Consumption (BTU/Hp-hr) | 7199 | 7177 | 7484 |
| Intake Air Flow (SCFM) | 703 | 688 | 673 |
| Exhaust Mass Flow (lb/hr) | 3234 | 3145 | 3069 |
| Exhaust Flow (SCFM) | 2070 | 2013 | 1964 |
| Exhaust Temperature (°F) | 999 | 989 | 964 |

| **Exhaust Emissions Data** | | | | |
|---|---|---|---|---|
| THC | Total Hydrocarbons (gr/hp-hr) | 2.99 | 2.64 | 2.49 |
| NMHC | Non-Methane Hydrocarbons (gr/hp-hr) | 0.63 | 0.55 | 0.52 |
| NEHC | Non-Ethane Hydrocarbons (gr/hp-hr) | 0.22 | 0.19 | 0.18 |
| NOx | Oxides of Nitrogen (gr/hp-hr) | 14.23 | 15.06 | 16.35 |
| CO | Carbon Monoxide (gr/hp-hr) | 1.07 | 1.04 | 1.01 |
| CO2 | Carbon Dioxide (%) | 9.20 | 9.20 | 9.40 |
| O2 | Oxygen (%) | 4.40 | 4.10 | 4.20 |

**Test Conditions**

Data was recorded during steady-state rated engine RPM (± 25) with full load (± 2 %) and standardized to the following conditions:

| | |
|---|---|
| **Fuel Specification:** | Dry processed natural gas with a 905 BTU per standard cubic foot LHV |
| **Fuel Temperature:** | 60°F ± 9° at Flow Transmitter |
| **Fuel Pressure:** | 14.73 PSIA ±.5 PSIA at Flow Transmitter |
| **Intake Air Temp:** | 77°F ± 9° at inlet |
| **Barometric Pressure:** | 29.92 In. Hg ±1 In. Hg |

All emissions data is a calculated average of engines tested under the conditions shown above. This data is subject to instrumentation, measurement, and engine-to-engine variability. Engine operation with excessive air intake or exhaust restrictions beyond published maximum limits, or with improper maintenance may result in elevated emission levels.

*Specifications May Change Without Notice.*

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