

**TECHNICAL REVIEW AND EVALUATION
OF APPLICATION FOR
AIR QUALITY PERMIT NO. 70386**

Praxair, Inc.

I. INTRODUCTION

This Class II, synthetic minor source air quality control operating permit is issued to Praxair, Inc, the Permittee, for the continued operation of a chemical synthesis and repackaging facility near Kingman in Mohave County, Arizona. This permit is a renewal of Air Quality Permit Number 56187.

A. Company Information

1. Facility Name: Praxair, Inc.
2. Facility Location: Lat 35° 1' 40", Long 114° 8' 36"
Intersection of I-40 and Griffith Road
3. Mailing Address: PO Box 6157
Kingman, Arizona 86401
4. Attainment Classification: This facility is located in an area that is attainment or unclassified for all criteria pollutants.

II. PROCESS DESCRIPTION

A. Process

This source is a chemical synthesis and repackaging facility located near Kingman, Arizona. This facility manufactures arsine and phosphine; fills, processes, tests, and warehouses gaseous products which are used by the semiconductor industry and other industries; and stores in bulk argon, liquid helium, hydrogen, nitrogen, nitrous oxide, and nitrogen trifluoride. Gaseous products include arsine, diborane, disilane, diethyltelluride, phosphine, silane, dichlorosilane, dichloromethane, fluoromethane, methyl bromide, methyl iodide, nitrogen dioxide, trichlorosilane, hexafluoroethane, octafluorocyclobutane, octafluorotetrahydrofuran, perfluoropropane, trifluoromethane, sulfur hexafluoride, silicon tetrafluoride, germanium tetrafluoride, silicon tetrachloride, enriched boron-11 trifluoride, boron trifluoride, mixtures of diborane and either boron trifluoride or enriched boron-11 trifluoride, and mixtures of disilane and silicon tetrafluoride. Fluorine and inert gases are stored on site and are used to mix with other gases to create unique mixture concentrations as specified by the customer.

Arsine production: arsine is synthesized by the reaction of mixing zinc arsenide with sulfuric acid to produce zinc sulfate and pure arsine gas. The synthesis reaction takes place in isolated production rooms using a process that is totally remote-controlled. The isolated



production rooms have vent lines that exhaust to a control device which captures any escaping gas from these rooms.

Cylinder fill, process, and flow tests: returned cylinders are initially purged of residual product. The purged residual product is sent through control device(s) prior to being released into the atmosphere. The emptied cylinders are inspected and reconditioned as necessary (including shot blasting and painting). The Permittee then refills the cylinders with the gas or gas mixture of choice.

B. Control Devices

This facility operates the following equipment to control the emissions of particulate matter: Arsine Baghouse 1, Arsine Baghouse 2, Phosphine Dynawave Wet Scrubber, and Silane Baghouses 1 and 2.

This facility operates the following equipment to control the emissions of hazardous air pollutants: Arsine Guardian 1, Arsine Guardian 2, Phosphine Guardian, and Ventilation Emergency Scrubber 1.

This facility operates the following equipment to control the emissions of non-regulated pollutants: Arsine Guardian 1, Arsine Guardian 2, Silane Guardian, DCS West Scrubbers B and C, TCS Scrubbers A and D, Ventilation Emergency Scrubber 1, Process Caustic Wet Scrubber 1 (PCWS-1), Ventilation Emergency Scrubber 3, Process Dry Scrubber (PDS-1), and Ventilation Emergency Scrubber 2 (VES-2).

III. EMISSIONS

Table 1: Potential Emissions

Pollutant	Emissions (tons per year)
PM	0.109
PM₁₀	0.185
PM_{2.5}	0.000
NO_x	2.64
CO	0.661
SO₂	0.207
VOC	3.13



Pollutant	Emissions (tons per year)
HAPs	0.540

*Note: Emissions from the emergency engines are based on worst case scenario of 200 hours per year.

IV. MINOR NEW SOURCE REVIEW

As part of the renewal application, the Permittee requested that the facility be allowed to handle and process five gaseous chemicals that are not already included in the permit. Those chemicals include deuterium, germane, tungsten hexafluoride, nitrous oxide, and nitrogen trifluoride.

Deuterium (CAS 7782-39-0), germane (CAS 7782-65-2), and tungsten hexafluoride (CAS 7783-82-6) are all compounds that have not been identified as greenhouse gases, criteria pollutants, or Federal Hazardous Air Pollutants. Additionally, they are not recognized as Arizona State HAPs nor have there been any Arizona Ambient Air Quality Guideline adopted for them. As such, these compounds can be handled and processed at the facility without being included in the permit. Considering these chemicals are not regulated minor NSR pollutants, they have no impact on potential to emit.

Nitrous oxide (CAS 10024-97-2) is regulated as a greenhouse gas. Praxair will obtain bulk nitrous oxide from offsite, store it at the facility, and repackage it into smaller containers. The repackaging process will produce modest emissions. However, because nitrous oxide is not a regulated minor NSR pollutant, these modest emissions have no impact on potential to emit.

Nitrogen trifluoride (CAS 7783-54-2) is also regulated as a greenhouse gas. Praxair will obtain bulk nitrous oxide from offsite and store bulk quantities at the facility. The nitrogen trifluoride will not be handled other than storage and as such, will result in the generation of no emissions.

The handling and processing of the above chemicals have no impact on the facility's potential to emit of any regulated minor NSR pollutant and as such do not trigger minor NSR review.

V. APPLICABLE REGULATIONS

Table 2 displays the applicable requirements for each permitted piece of equipment along with an explanation of why the requirement is applicable.

**Table 2: Verification of Applicable Regulations**

Unit	Control Device	Rule	Discussion
Synthesis and Handling Operations	Combustion Units, Baghouses, and Scrubbers	AAC R18-2-702 AAC R18-2-730	These particulate matter, opacity, volatile organic compound, hazardous air pollutants, and gaseous emissions standards apply to the synthesis and handling operations.
Ammonia Operations	Scrubber	AAC R18-2-702 AAC R18-2-730	These particulate matter, opacity, gaseous and odor standards apply to the ammonia operations.
Emergency Generators	N/A	AAC R18-2-719 40 CFR 63 Subpart ZZZZ 40 CFR 60 Subpart IIII	These particulate matter, opacity, sulfur dioxide, and hazardous air pollutant standards apply to the internal combustion engines.
Fugitive Dust Sources	Water Trucks and Dust Suppressants	A.A.C. R18-2 Article 6 A.A.C. R18-2-702	These standards are applicable to all fugitive dust sources at the facility.
Abrasive Blasting	Wet blasting; Dust collecting equipment; Other approved methods	A.A.C. R-18-2-702 A.A.C. R-18-2-726	These standards are applicable to any abrasive blasting operation.
Spray Painting	Enclosures	A.A.C. R18-2-702 A.A.C. R-18-2-727	This standard is applicable to any spray painting operation.
Demolition/Renovation Operations	N/A	A.A.C. R18-2-1101.A.8	This standard is applicable to any asbestos related demolition or renovation operations.

VI. PREVIOUS PERMIT CONDITIONS

Permit No. 56187 was issued on September 4, 2013, for the continued operation of this facility. Table 3 below illustrates if a section in Permit No. 56187 was revised or deleted.

**Table 3: Permit No. 56187**

Section No.	Determination		Comments
	Revised	Delete	
Att. A.	X		General Provisions - Revised to represent most recent template language.
Att. B. Section I	X		Facility Wide Limitations - Updated to include Alternative Method ALT-082 as an option for opacity surveys and observations.
Att. B. Section IV	X		Internal Combustion Engine Requirements - Removed peak shaving and emergency demand response to reflect current 40 CFR 60 Subpart ZZZZ language.
Att. C.	X		Operation and Maintenance Plan – Removed all target operating parameters for the control equipment but retained all maximum and minimum operating parameters for the control equipment.
Att. D.	X		Equipment List – Updated to reflect complete identifying information associated with the VES-1 Diesel Generator.

VII. MONITORING REQUIREMENTS

A. VOC, HAPs and Gaseous Emissions

- The Permittee is required to continuously monitor for hydrides at the VES-1 stack. The facility uses a Vertex system for the purpose of demonstrating compliance with the arsine emission limits in the permit. In addition, the Permittee is required to monitor and record operating parameters specific to each emission control equipment.
- The Permittee is also required to continuously monitor for total hydrides at two fencelines (Northeast corner and Southwest corner), using the same Vertex system that monitors hydride concentrations at the VES-1 stack and other locations inside buildings and outside the facility. Alarms and automatic shutdowns occur at predetermined concentrations, depending on the location. Alarms from the fenceline monitors or the VES-1 stack monitor are to be reported to ADEQ.

B. Opacity Requirements

The permit specifies opacity limitations for the various emission sources found within the facility. The permit requires the source to perform monthly observations of fugitive dust emission plumes, and if a plume appears to exceed the opacity standard, then a Method 9 observation is to be conducted.

The Permittee is to keep records of the date, time, and results of any Method 9 observation made, as well as the name of the observer who conducted the test. Any corrective action taken to lower the opacity of an emission point shall be documented.

C. Other Periodic Activities



1. The Permittee is required to record the date, duration, and pollution control measures taken for each abrasive blasting project.
2. The Permittee is required to record the date, duration, quantity of paint used, any applicable Safety Data Sheets (SDS), and pollution control measures of any spray painting project.
3. The Permittee is required to maintain records of all asbestos related demolition or renovation projects. The required records include the “NESHAP Notification for Renovation and Demolition Activities” form and all supporting documents.

VIII. TESTING REQUIREMENTS

The Permittee is required to schedule and conduct an annual performance test for arsine emissions from the stack of VES-1.

IX. COMPLIANCE HISTORY

This facility was inspected three times during the five year term of Permit No. 56187: March 5, 2014, October 27, 2015, and March 5, 2018 all of which were unannounced periodic inspections. All inspections resulted in no ADEQ agency action.

X. AMBIENT AIR IMPACT ANALYSIS

During the permitting process to obtain Permit No. 31094 (the permit held by Praxair prior to Permit No. 56187), Praxair conducted an Ambient Air Impact Analysis. ADEQ reviewed the analysis and determined that the modeling approach was acceptable. It was determined that the estimated impacts associated with the permitted emission rates are not anticipated to result in adverse impacts to public health. Emission limits are included in the permit for arsine to ensure that the facility operates as a synthetic minor source of HAPs and also to ensure that predicted concentrations of arsine in the ambient air will not exceed the corresponding Ambient Air Concentration (AAC) thresholds. Table 4 below compares the maximum predicted impacts of arsine to the AAC thresholds.

Table 4 – Comparison of Arsine Modeled Impacts to AACs

Arsine	Maximum Predicted Concentration ($\mu\text{g}/\text{m}^3$)	Ambient Air Concentrations Threshold ($\mu\text{g}/\text{m}^3$)
1-hr impact	0.28	2500
Annual impact	1.8×10^{-4}	4.41×10^{-4}

XI. LIST OF ABBREVIATIONS

ADEQArizona Department of Environmental Quality
 CO..... Carbon Monoxide
 GHG..... Green House Gas
 HAPs..... Hazardous Air Pollutants
 NO_x Nitrogen Oxide
 PM_{2.5}..... Particulate Matter Nominally less than 2.5 Micrometers



PM₁₀ Particulate Matter Nominally less than 10 Micrometers
SO₂ Sulfur Dioxide
ton/yr Tons per year
VOC Volatile Organic Compound