**TECHNICAL REVIEW AND EVALUATION
OF APPLICATION FOR
AIR QUALITY SIGNIFICANT PERMIT REVISION No. 77315**

I. INTRODUCTION

This significant permit revision is issued to Praxair, Inc., the Permittee, for the rerouting of Scrubbers A, B, C, and D downstream emissions of chlorosilanes (dichlorosilane and trichlorosilane) from Ventilation Emergency Scrubber (VES-1) to Ventilation Emergency Scrubber (VES-3). According to Arizona Administrative Code R18-2-320.6.b, a significant permit revision is required for a change that requires a source-specific determination of ambient impacts. Because the location in which the emissions of chlorosilanes will be changing from the exhaust of VES-1 to the exhaust of VES-3, the emissions were modeled to ensure compliance with the Arizona Ambient Air Quality Guidelines.

A. Company Information

Facility Name:	Praxair, Inc. – Kingman Facility
Mailing Address:	P.O. Box 6157 Kingman, AZ 86401
Facility Location:	3426 W Griffith Road Kingman, AZ 86401

B. Attainment Classification (Source: 40 CFR §81.303)

Praxair, Inc. – Kingman Facility is located in an area that is attainment or unclassified for all criteria pollutants.

II. PROCESS DESCRIPTION

A. 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, geranium 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.

This permit revision addresses only the emissions of cholorosilane; more specifically the secondary control device that is used to control emissions of chlorosilanes and the location in which the emissions of chlorosilanes are released into the atmosphere.

B. Control Devices

Process emissions generated by the Praxair facility are generally routed through two control devices: a primary control device and a secondary control device. These control devices operate in series with emissions first passing through the primary control device and then passing through the secondary control device to minimize emissions released to the atmosphere.

For this revision, chlorosilanes are the pollutants of concern. Emissions of chlorosilanes generated during processing are first routed through Scrubbers A, B, C, or D for primary control. Any emissions that are not captured by the primary control are then sent to a secondary control device. Currently the secondary control device is VES-1. However, this revision authorizes the Permittee to reroute emissions of chlorosilane from Scrubbers A, B, C, and D to VES-3.

There will be no change in the quantity of any emissions from the facility. The only change will be the secondary control device that is used to control emissions of chlorosilanes and the location where the emissions of chlorosilanes are released into the atmosphere.

III. COMPLIANCE HISTORY

Since the issuance of Permit No. 70386 on July 26, 2018, Praxair, Inc. has submitted: two (2) semi-annual compliance certifications, four (4) quarterly monitoring reports, and eight (8) deviation reports. Since July 26, 2018, there has been one (1) physical inspection of the facility.

On September 21, 2018, the facility was issued a Notice of Correction for failure to continuously record the baghouse pressure differential in Arsine Baghouse 1. The pressure differential for Baghouse 1 was not monitored from approximately 2:00 P.M. on September 7, 2018 until 7:28 A.M. on September 11, 2018, at which time the data collection node for Baghouse 1 was updated, after which the monitoring of baghouse pressure differential resumed. The Notice of Correction was closed on October 1, 2018.

IV. EMISSIONS

The facility's potential-to-emit (PTE) pre-revision and post-revision are summarized in Table 1 below. Because no process change is occurring, there is no change in facility wide PTE. Furthermore, since there is no increase in PTE for any regulated minor NSR pollutant, minor NSR

requirements are not triggered.

Table 1: Potential to Emit

Pollutant	Pre-Revision Emissions (tpy)	Post-Revision Emissions (tpy)	Difference	Minor NSR Thresholds	Minor NSR Triggered?
NO_x	1.50	1.50	0	20	No
PM_{10}	0.079	0.079	0	7.5	No
$PM_{2.5}$	0.000	0.000	0	5	No
CO	0.45	0.45	0	50	No
SO_2	0.21	0.21	0	20	No
VOC	3.10	3.10	0	20	No
Pb	0.00	0.00	0	0.3	No
HAPs	0.54	0.54	0	N/A	No

V. MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

The routing of chlorosilane emissions to VES-3 does not trigger any change in the existing monitoring, recordkeeping, and reporting requirements, nor does it require any new monitoring, recordkeeping, or reporting requirements.

VI. TESTING REQUIREMENTS

Routing chlorosilane emissions to VES-3 does not trigger any testing requirements for VES-3 as chlorosilane (dichlorosilane and trichlorosilane) is neither a criteria pollutant nor a hazardous air pollutant.

VII. AMBIENT AIR IMPACT ANALYSIS

ADEQ performed dispersion modeling to estimate ambient concentration of Dichlorosilane (DCS) and compared it against Arizona Ambient Air Quality Guidelines (AAAQG). AAAQGs are residential screening values that are protective of human health.

ADEQ used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) model for the ambient impact analysis. AERMOD is the EPA-preferred model for estimating impacts at receptors located in simple terrain and complex terrain (within 50 km of a source) due to emissions from industrial sources. Detailed model setups are shown as follows.

- ADEQ modeled the VES-3 scrubber stack as a point source.
- ADEQ used the most recent version of AERMET meteorological preprocessor (v18081) to process five years of the Kingman Airport data along with concurrent upper air radiosonde data obtained from the Las Vegas Airport.
- ADEQ used the facility fenceline as the ambient air boundary. ADEQ set up a nested grid receptor network to determine areas of maximum predicted concentrations. ADEQ used

the AERMAP terrain processor (v18081) to process the National Elevation Data (NED) data to generate the receptor elevations and hill heights.

- ADEQ evaluated building downwash effects based on building and stack location and dimensions, and the EPA's Building Profile Input Program Plume Rise Model Enhancements (BPIP-PRME).
- ADEQ determined the project site area as "Rural" based on the land use method.

Table 2 summaries the modeled result for DCS. As shown in Table 2, the modeled concentration of DCS due to the emissions released from the VES-3 scrubber is below the AAAQG.

Table 2: Modeled Results for Dichlorosilane

HAP	Averaging Period	Modeled Concentration ($\mu g/m^3$)	AAAQG ($\mu g/m^3$)
Dichlorosilane	24-hour	0.924	5.3

VIII. LIST OF ABBREVIATIONS

AAAQG ..... Arizona Ambient Air Quality Guidelines
CO ..... Carbon Monoxide
DCS ..... Dichlorosilane
EPA ..... Environmental Protection Agency
HAPs ..... Hazardous Air Pollutants
NSR ..... New Source Review
NO_x ..... Nitrogen Oxides
Pb ..... Lead
$PM_{2.5}$ ..... Particulate Matter Nominally less than 2.5 Micrometers
PM_{10} ..... Particulate Matter Nominally less than 10 Micrometers
PTE ..... Potential to Emit
SO_2 ..... Sulfur Dioxide
tpy. ..... Tons per Year
VES-1 ..... Ventilation Emergency Scrubber 1
VES-3 ..... Ventilation Emergency Scrubber 3
VOC ..... Volatile Organic Compound