



Air Products and Chemicals, Inc.
1940 Air Products Boulevard
Allentown, PA 18106-5500
Telephone (610) 481-4911

Submitted to KYDAQ via the EEC eForms Online Submission System

March 1, 2023

Kentucky Division for Air Quality
Attn: Permit Support Section
300 Sower Boulevard
Frankfort, KY 40601

RE: Title V Permit Renewal Application

**Air Products and Chemicals, Inc.
Catlettsburg, KY Hydrogen Plant
11631 US Route 23
Catlettsburg, KY 41129**

**Title V Permit Operating Number: V-18-004-R1
Agency Interest Number: 83915
Activity: APE2022001
Source ID: 21-019-00117
Permit Expiration Date: September 10, 2023**

Dear Sir or Madam:

Enclosed please find a Title V Permit Renewal Application for the Air Products and Chemicals, Inc. (APCI) facility referenced above.

In accordance with 401 KAR 52:020, the original signed copy and two copies of the permit application are included in the hardcopy submission to the address noted above.

If you have any questions regarding the contents of the application or require additional information, please contact me via phone at 610.481.5909 or via email at klingspm@airproducts.com.

Sincerely,

Preston Klingseis

Signed Electronically on 3/1/23 at 11:12
Preston Klingseis, PE, CHMM
Principal Environmental Specialist
Air Products and Chemicals, Inc.



Air Products and Chemicals, Inc.
1940 Air Products Boulevard
Allentown, PA 18106-5500
Telephone (610) 481-4911

Title V Air Permit Renewal Application

Permittee Name

Air Products and Chemicals, Inc.

Permittee Mailing Address

1940 Air Products Boulevard
Attn: Preston Klingseis, Mail Code A8F04-4
Allentown, PA 18106-5500

Source Name

Air Products and Chemicals, Inc.
Catlettsburg, KY Hydrogen Plant

NAICS Code: 325120
Primary SIC Number: 2813

Source Location

11631 US Route 23
Catlettsburg, KY 41129

Existing Permit Information

Title V Operating Permit Number: V-18-004 R1
Agency Interest Number: 83915
Activity: APE2022001
Source ID: 21-019-00117
Permit Expiration Date: September 10, 2023

Prepared By

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Submission Date

March 1, 2023 (1 Original and 2 Copies)

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1. INTRODUCTION

Air Products and Chemicals, Inc. (Air Products) owns and operates a hydrogen (H₂) gas production facility within the Marathon Petroleum Company refinery in Catlettsburg, KY. The Air Products facility operates under Title V Permit V-18-004 R1. The permit was last revised on September 2, 2022 in response to an administrative update submitted by Air Products to update the name of the technical contact listed on the permit.

Permit V-18-004 R1 expires on September 10, 2023. Regulation 401 Kentucky Administrative Regulation (KAR) 52:020 Section 12 states that applications for permit renewal are due at least six months prior to the permit expiration date. This renewal application, therefore, is submitted in a timely manner to comply with KAR 52:020 Section 12. This application contains information required for Title V renewal applications, including a process description and emissions summary, regulatory review, DEP7007 application forms, emission calculations, emission references, and map and site plans.

The following table lists the changes to information submitted in the last sourcewide renewal application submitted on February 15, 2018.

Table 1. Changes from February 15, 2018 Permit Renewal Application

Change	Renewal Application Section(s) Affected
Increase maximum volume of hydrogen product combusted in the flare (Emission Unit 03) based on a review of annual volumes of hydrogen product flared from 2013 to 2021. Maximum volume of hydrogen product combusted in the flare conservatively changed from 3,383.47 MMscf (2015 calendar year) to 3,916.65 MMscf (2019 calendar year). Consistent with the prior renewal application, customer demand for hydrogen product has continued to decrease, which increases the volume of hydrogen product is being flared if annual operating hours generally remain consistent.	• Emission calculations • DEP7007N – Source Emissions Profile • No significant changes to permit; no explicit limits on annual or daily volumes of hydrogen product combusted in the flare.
Increase maximum volume of hydrogen product combusted in the flare (Emission Unit 03) based on a review of daily average volumes of hydrogen product flared from 2013 to 2021. Maximum daily average of hydrogen product combusted in the flare conservatively changed from 9.29 MMscf (2015 calendar year) to 10.76 MMscf (2019 calendar year). Rationale consistent with customer changes noted above.	• Emission calculations • DEP7007N – Source Emissions Profile • No significant changes to permit; no explicit limits on annual or daily volumes of hydrogen product combusted in the flare.

Table 1. Changes from February 15, 2018 Permit Renewal Application (Continued)

Change	Renewal Application Section(s) Affected
Updated default high heating value (HHV) and CO2 emission factor for natural gas in response to minor updates published on December 9, 2016 in Federal Register Volume 81, 89252 (81 FR 89252). Natural gas HHV changed from 1,028 BTU/scf to 1,026 BTU/scf. Natural gas CO2 emission factor changed from 117.8 lbs CO2/mmBTU to 117.0 lbs CO2/mmBTU.	• Emission calculations • DEP7007N – Source Emissions Profile • No significant changes to permit

2. PROCESS DESCRIPTION

The Air Products Catlettsburg, KY Hydrogen Plant produces hydrogen using steam methane reforming (SMR) technology. The basic raw materials used in the hydrogen production process are a hydrocarbon feedstock and water. The only possible hydrocarbon feedstock available for use at the Catlettsburg, KY Hydrogen Plant is commercial pipeline natural gas. The Catlettsburg, KY Hydrogen Plant is intended to operate 24 hours per day, 365 days per year, except for infrequent shutdowns due to malfunction or for maintenance. A simplified process flow diagram of the plant is provided as Figure 1.

Natural gas process feed and recycled hydrogen product are compressed and then directed to the hydrogenator/desulfurizer beds, where hydrogenation and desulfurization reactions occur. The beds contain specialized catalysts/adsorbents to facilitate both sets of reactions. The hydrogen saturates any unsaturated sulfur species present in the feedgas and breaks down the sulfur compounds in the feedgas stream into hydrogen sulfide (H_2S). The H_2S in the feedgas is then removed from the feedgas by an in-situ adsorption reaction with a zinc oxide (ZnO) catalyst that forms zinc sulfide (ZnS). When the catalysts/adsorbents become spent, the spent catalysts/adsorbents are removed and disposed of as a solid waste or reclaimed and replaced with virgin catalysts/adsorbents. Steam is then mixed with the desulfurized feedgas at the mix tee and the steam/desulfurized feedgas mixture is directed to the reformer.

The hydrogen reformer combusts desulfurized pressure swing adsorption (PSA) purge gas (and possibly syngas) along with natural gas as trim fuel to generate the necessary heat of reaction. The combustion products are emitted from the hydrogen reformer flue gas stack (Emission Unit 01), which is equipped with a continuous emissions monitoring system (CEMS) for nitrogen oxides (NO_x). The hydrogen reformer contains catalyst-filled tubes in which the reforming reactions occur. During the reforming reactions, the mixed feed is converted into hydrogen and a mixture of carbon oxides, carbon monoxide (CO) and carbon dioxide (CO_2). The synthesis gas (syngas) effluent from the reformer tubes contains the desired hydrogen product plus byproduct CO and CO_2 , unreacted methane, nitrogen, water, and inerts from the feed.

The temperature of syngas exiting the reformer is reduced by a heat recovery process before entering the high temperature shift (HTS) reactor, where the water-gas shift reaction occurs in the presence of a HTS catalyst. During the water-gas shift reaction, most of the CO present in the syngas is converted to CO_2 and additional hydrogen product. The temperature of the syngas exiting the HTS reactor is cooled by a heat recovery process. Liquid, or process condensate, in the cooled syngas exiting the HTS reactor is removed (knocked out) in the process condensate separator. Dissolved CO_2 and potential steam impurities, which may contribute to corrosion, are removed from the process condensate in the process condensate stripper column prior to being fed back into the process. Steam is used in the process condensate stripper column to provide heat and drive the stripping action. Emissions from the process condensate stripper column are emitted to the atmosphere from the condensate stripper vent (Emission Unit 02).

After cooling by heat recovery, the syngas exiting the HTS reactor is purified in the multi-vessel pressure swing adsorption (PSA) units. The specialized adsorbents in the PSA units selectively adsorb the impurities in the syngas, but allow hydrogen product to pass through uninhibited, ultimately generating a high-purity hydrogen product. The PSA vessels are setup in parallel and operate on a repeated cycle of adsorption (on-line), regeneration (off-line), and standby (waiting to be returned on-line). Regeneration is accomplished off-line by depressurizing the adsorbent bed,

purging the bed with gaseous hydrogen product, and re-pressurizing the bed in preparation for a new cycle.

The off-gas generated during the PSA vessel regeneration process is referred to as “PSA purge gas.” The PSA purge gas contains both the hydrogen product used in purging the PSA vessels and the impurities separated from the PSA feed gas (syngas). The PSA purge gas is a relatively low-Btu content, sulfur-free clean fuel. The PSA purge gas consists mostly of CO₂, H₂, methane (CH₄), and CO, with lesser amounts of water vapor and nitrogen (N₂). PSA purge gas exiting the surge drum is returned to the reformer burners as the primary fuel, supplemented by natural gas.

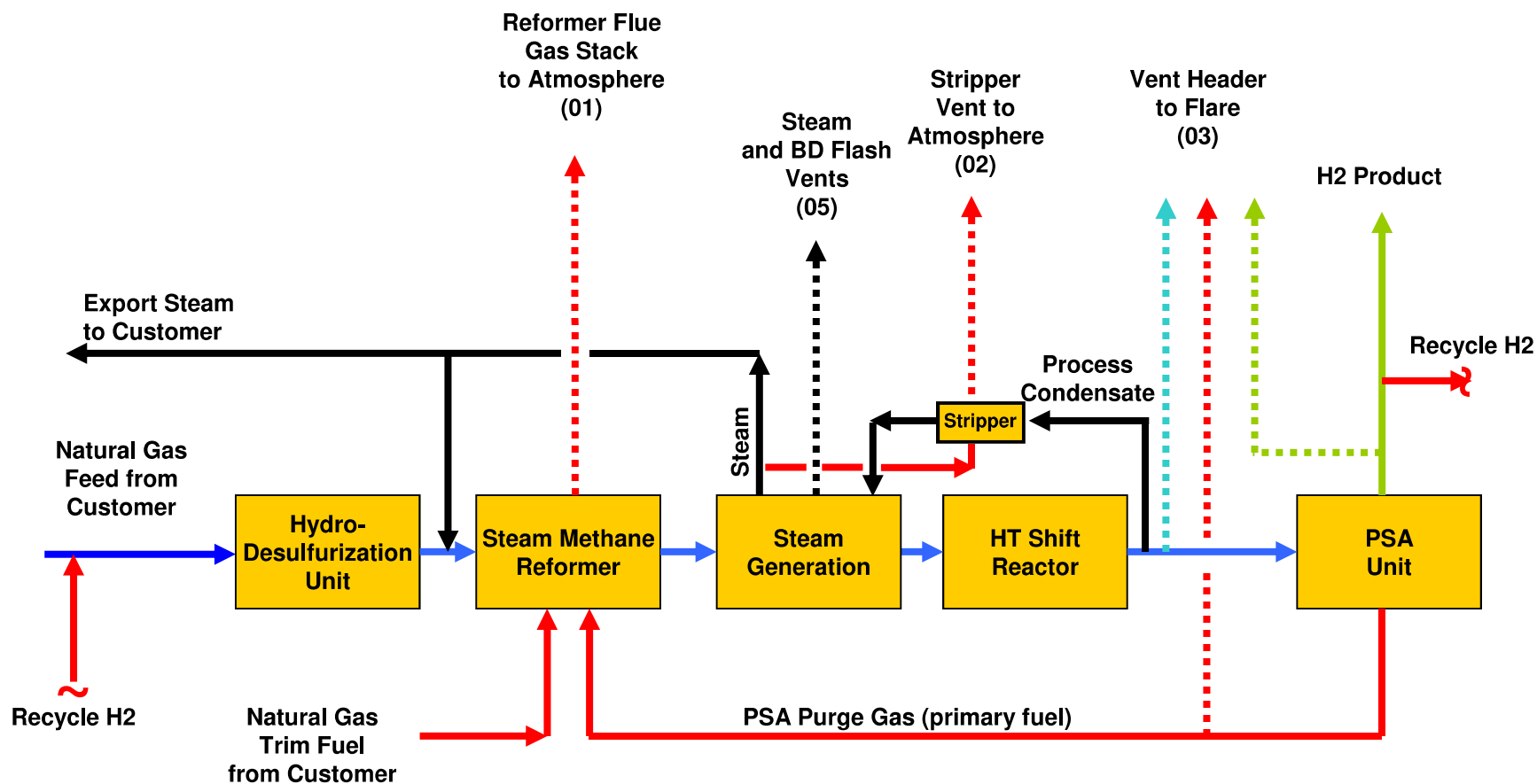
During normal plant operation, PSA purge gas is used as the primary fuel for the reformer burners. During an abnormal operating situation, such as where the PSA units must be taken off-line and the reformer furnace must continue to operate in order to make steam for export to the refinery, the syngas to the PSA unit will be routed as the primary fuel to the reformer burners.

The Catlettsburg, KY Hydrogen Plant includes a flare (Emission Unit 03) with natural gas pilots. During normal operation of the plant, no gas streams are directed to the flare. Normal operation of the plant could be interrupted by hydrogen product demand curtailment by the customer, which may result in temporary venting of excess hydrogen product to the flare. Customer curtailment, PSD unit reduced bed operating modes, other essential operational events, startups, shutdowns, emergencies, and malfunctions may also result in hydrogen product, PSA feed gas (syngas), PSA purge gas, natural gas, and/or relief vents being vented to the flare. Any flaring (other than the natural gas pilots) will be intermittent.

The Catlettsburg, KY Hydrogen Plant also includes fugitive equipment leaks of volatile organic compounds (VOCs) and CO (Emission Unit 04), and small amounts of VOCs from various steam vents (Emission Unit 05). Several insignificant activities are also present that are listed below.

- Cooling Tower (IA-01)
- Analyzer Vents (IA-02)
- Cold Solvent Degreaser(s) (Parts Washers; IA-03)
- Lube Oil Storage (IA-04)
- Water Treatment Chemical Storage and Handling (IA-05)
- Safety Relief Valves (IA-06)
- Wastewater Sump (IA-07)
- Catalyst Loading (IA-08)

Figure 1. Simplified Process Flow Diagram of Catlettsburg H2 Plant



3. EMISSIONS SUMMARY

Air Products has calculated potential emissions from the Catlettsburg, KY Hydrogen Plant. A tabulated summary of potential emissions is presented as Table 2, with detailed emission calculations provided in Appendix A.

Hydrogen Reformer Flue Gas Stack (Emission Unit 01)

The potential to emit (PTE) from the reformer flue gas stack was calculated using the as-built 455 million British Thermal Units per hour (MMBtu/hr; HHV) maximum firing rate. Unless otherwise noted in Table 1, potential emissions were calculated using the same methodology and factors as in the previous permit renewal application submitted on February 15, 2018.

Potential emissions of particulate matter particles less than or equal to 10 micrometers (μm), commonly referred to as PM_{10} , were calculated using a worst-case emission factor of 0.005 pounds per MMBtu (lb/MMBtu; HHV). Total PM and $\text{PM}_{2.5}$ emissions were assumed to be the same as PM_{10} emissions. Potential CO emissions were calculated using a 0.04 lb/MMBtu (HHV) worst-case emission factor. Potential NO_x emissions were estimated as 102.63 tons per year (TPY; 0.0515 lb/MMBtu HHV) based on predicted worst-case operating conditions. Potential sulfur dioxide (SO_2) emissions were calculated using a worst-case emission factor of 0.00036 lb/MMBtu (HHV). Potential VOC emissions were calculated using a standard AP-42 emission factor of 0.0055 lb/MMBtu (HHV) for natural gas combustion.

Greenhouse gas emissions (CO_2 , N_2O , CH_4) were calculated using the methodology specified in 40 CFR 98 Subpart P for greenhouse gas emissions from hydrogen production plants. Potential emissions were estimated by taking actual greenhouse gas emission rates (as calculated per Subpart P), scaled up to reflect the design hydrogen production capacity of 34 million standard cubic feet per day (MMscf/day), and then adding 10% to account for variations in process feed streams.

Condensate Stripper Vent (Emission Unit 02)

Potential VOC and methanol emissions from the process condensate stripper column were calculated using the results of the December 19, 2013 stack test (3.06 lb VOC/MMscf H_2 production and 2.77 lb methanol/MMscf H_2 production). The December 19, 2013 stack testing results were used since measured emissions of these pollutants were lower in the more recent May 22, 2019 stack test (2.26 lb VOC/MMscf H_2 production and 2.1 lb methanol/MMscf H_2 production). The December 19, 2013 and May 22, 2019 stack test results have been previously reviewed and approved by the Kentucky Division for Air Quality (KYDAQ) and are included in Appendix B for reference. Potential CO emissions were calculated using a worst-case emission factor of 1.238 lb/MMscf H_2 production, consistent with previous applications. The December 19, 2013 and May 22, 2019 measured emissions of CO were less than this value.

Flare (Emission Unit 03)

The flare burns pilot gas and flared process gases. Process gas flaring includes flaring excess hydrogen product because of refinery requests for hydrogen product curtailment, transition and alignment. Process gas flaring is also the result of hydrogen plant startups, shutdowns, non-emergency process upsets and malfunctions, and maintenance. Flare calculations do not include unanticipated emergency venting to the flare, such as safety relief valves, since emergency emissions are typically not included in permit applications.

Pilot gas combustion emissions were calculated using AP-42 natural gas combustion emission factors. Emissions from the combustion of hydrogen product, syngas, and PSA purge gas were

calculated using worst-case design scenarios for each event that may result in flaring, and a safety factor was added to the result. VOC emissions from the flare were calculated using a flare VOC destruction efficiency of 98%. VOC emissions associated with simple hydrocarbons such as methane, ethane, and methanol sent to the flare were calculated using a flare VOC destruction efficiency of 99%. This value are based on a Texas Commission on Environmental Quality guideline for flare combustion of simple hydrocarbons. The majority of the hydrocarbons vented to the hydrogen plant flare are simple hydrocarbons such as methane, ethane, and methanol. Potential CO emissions from the flare were calculated using a flare destruction efficiency of 98%. Combustion product NO_x emissions were calculated using the AP-42 flare emission factor.

It is important to note that the flare control efficiencies are incorporated into the emission factors.

Fugitive Equipment Leaks (Emission Unit 04)

Fugitive equipment leaks of VOC are associated with the process upstream of the reformer, the natural gas trim fuel to the reformer, and the natural gas fuel to the flare pilots. VOC composition of pipeline natural gas was taken to be 2.97 weight % (0.95 mol%), which excludes methane and ethane, which are not VOCs. Methanol fugitive emissions are associated with the process condensate stripper overhead components. CO fugitive emissions are associated with the process downstream of the reformer and the PSA purge gas primary fuel to the reformer. Fugitive emissions were calculated using estimated component counts, design stream compositions, and AP-42 SOCMI average emission factors. The number of components included in the potential fugitive emissions calculations are consistent with the previous permit renewal application.

Steam Vents (Emission Unit 05)

There are multiple steam vents of differing composition, some venting intermittently and some venting continuously. VOC and methanol emissions due to impurities in various steam vents were calculated using a worst-case steam venting and worst-case concentration scenarios.

Cooling Tower (Insignificant Activity)

Cooling tower emissions were calculated using AP-42 methodology, and using a maximum potential drift rate of 0.005%. The cooling tower qualifies as an insignificant activity since particulate emissions are less than 5 tons/yr.

Table 2
Potential Emissions Summary

Permit Emission Unit	Description	Insignificant Activity				Potential Emissions (tons/year)								
			PM	PM10	PM2.5	NOx	CO	SO2	VOC	Methanol (HAP)	CO2	N2O	CH4	CO2e
001-1	Hydrogen Reformer Flue Gas		9.96	9.96	9.96	102.63	79.72	0.72	10.96					
001-2	Greenhouse Gas Emissions										408,977	0.77	7.69	409,399
002	Condensate Stripper Vent						7.68		18.99	17.19				
003-1	Flare - Pilot Gas		0.0067	0.0067	0.0067	0.0876	0.0736	0.00053	0.0048					
003-2	Flare - Syngas (intermittent)					1.22	4.44		0.220	1.75E-04				
003-3	Flare - PSA Purge Gas (intermittent)					0.021	0.236		0.0116	1.11E-05				
003-4	Flare - Hydrogen Gas (intermittent)					43.52	0.0197							
004	Fugitive Equipment Leaks						6.51		1.73	0.096				
005	Steam Vents								2.38	2.32				
IA-01	Cooling Tower	x	0.55	0.55	0.55									
IA-02	Analyzer Vents	x												
IA-03	Cold Solvent Degreaser(s) (parts washers)	x												
IA-04	Lube Oil Storage	x												
IA-05	Water Treatment Chemical Storage and Handling	x												
IA-06	Safety Relief Valves	x												
IA-07	Wastewater Sump	x												
IA-08	Catalyst Loading	x												
Total Emissions			10.5	10.5	10.5	147.5	98.7	0.72	34.3	19.6	408,977	0.77	7.7	409,399

4. REGULATORY REVIEW

Source Classification

Based on the maximum source missions summarized in Table 2, the facility is classified as follows:

- Major Source, Subject to Title V Permitting due to NO_x emissions > 100 tons per year (TPY) and Individual Hazardous Air Pollutant [HAP] emissions > 10 TPY
- Major HAP Source (Individual HAP > 10 TPY)
- Not Subject to Prevention of Significant Deterioration (PSD)
 - Synthetic minor source limits were voluntarily accepted so that the hydrogen plant construction was not a major modification.

Applicable and non-applicable regulations are identified in the current Title V permit for the Catlettsburg, KY Hydrogen Plant, but a discussion of several regulatory items that were also previously referenced in the last renewal application are included herein.

Non-Applicability of Regulation 401 KAR 59:015

The Hydrogen Reformer Furnace is not subject to this regulation, because it is not an indirect heat exchanger as defined in the rule. Indirect heat exchanger is defined as:

Any piece of equipment, apparatus or contrivance used for the combustion of fuel in which the energy produced is transferred to its point of usage through a medium that does not come in contact with or add to the products of combustion.

The primary purpose of the reformer is to provide process heat to drive the conversion of feed streams to hydrogen product. There is no heat transfer medium used in this conversion process. The combustion gases pass around catalyst filled tubes. The tubes contain the catalyst and raw materials. There is not a heat transfer medium such as water, steam, or hot oil used to convey the heat to the material. Therefore, the reformer is not an indirect heat exchanger.

Non-Applicability of 40 CFR 63 Subpart VVVVVV

40 CFR 63 Subpart VVVVVV, National Emission Standard for Hazardous Air Pollutants for Chemical Manufacturing Area Sources, applies to certain chemical manufacturing processes at area sources of HAP emissions. The Catlettsburg, KY Hydrogen Plant is a major HAP source, and not an area source. Subpart VVVVVV does not apply.

Non-Applicability of 40 CFR 63 Subpart ZZZZ

40 CFR 63 Subpart ZZZZ, National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE), applies to stationary RICE located at major and area sources of HAP emissions. Air Products occasionally uses temporary, portable RICE. These units remain on site for less than 12 consecutive months, and qualify for classification as non-road engines as defined in 40 CFR 1068.30. Non-road engines are not stationary engines, and as a result, Subpart ZZZZ does not apply.

Non-Applicability of 40 CFR 60 Subparts IIII and JJJJ

40 CFR 60 Subparts IIII and JJJJ, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines and Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, respectively, applies to certain new stationary internal combustion engines. Air Products occasionally uses temporary, portable internal combustion engines. These units remain on site for less than 12 consecutive months, and qualify for classification as non-road engines as

defined in 40 CFR 1068.30. Non-road engines are not stationary engines, and as a result, Subparts IIII and JJJJ do not apply.

Non-Applicability of Compliance Assurance Monitoring 40 CFR Part 64

The Compliance Assurance Monitoring (CAM) rule applies to emission units on a pollutant-specific basis. The rule applies to emission units if an applicable emission limitation or standard applies, if an emission control device is used to achieve compliance, and if potential pre-control device emissions are greater than the major source threshold. The only control device at the hydrogen plant is the flare.

The flare is not subject to an emission limitation or standard, other than the 401 KAR 63:015 flare opacity limit and requirements outlined in Section B, Emission Unit 003 of current permit V-18-004 R1. Flare emissions are included in the source-wide emission limits for NO_x, CO, and VOC.

At Section 64.2(b)(1)(v), the CAM rule exempts emission caps that meet the requirements of 40 CFR 70.4(b)(12). In the preamble to the final CAM rule (62 FR 54940) U.S. EPA stated that CAM is not appropriate for emission units under a bubble emissions cap. EPA states:

...emission limits that apply solely under an emissions trading program approved or promulgated by EPA and emission caps that meet the requirements of Section 70.4(b)(12) or Section 71.6(a)(13)(iii) are explicitly exempt from Part 64 under Section 64.2(b)(1)(iv) and (v). By their nature, these types of standards require methods to confirm trades or to calculate overall compliance with the cap, taking into account the contribution of emissions from all covered units. These types of emission limits also often cover all emissions units at a facility, including those with extremely low amounts of emissions, those without control devices, and those that are not subject to other applicable requirements. Because of the need to consider the interrelationships among units covered by this type of requirement, the type of monitoring in part 64 would not be appropriate.

Because the only emission limitation that applies to the flare is the source-wide emissions cap, the CAM rule does not apply. This determination was previously confirmed by KYDAQ, as stated in Permit V-12-043 R1, Non-Applicable Regulations for Emission Unit 03.

Non-Applicability of PSD and Non-Attainment NSR

Hydrogen plant construction was originally authorized by permit VF-02-001 Revision 1 issued to Catlettsburg Refining, LLC. The permit authorized an overall refinery modernization project, of which the hydrogen plant was a small part. The permit included a netting analysis to demonstrate that neither PSD nor nonattainment NSR would apply to the refinery modernization project, including the Catlettsburg, KY Hydrogen Plant. Section D of the current permit V-18-004 R1 contains hydrogen plant-specific conditions which have been carried over from the original permit VF-02 001 Revision 1 that Air Products has accepted to preclude the applicability of PSD.

Additionally, in July 2013 Air Products submitted a permit revision application to authorize replacing the hydrogen reformer burners with burners having the same rated heat input capacity and emissions as the previous burners. The application presented the rationale that the replacement of the burners was not subject to PSD review since the project emission increases were below their respective PSD significant emission rates. The rationale presented in the permit revision application was accepted by KYDAQ based on the subsequent issuance of permit V-12-043 R1.

Regulation 401 KAR 50:012 Section 1(2), RAP Control Procedures

During the review of the April 11, 2012 renewal application, KYDAQ determined that Air Products was obligated to evaluate applicability of reasonable, available and practical control (RAP) measures for the Hydrogen Reformer (Emission Unit 01). This determination was due to the facts that potential NO_x emissions from that emission unit are greater than the major source threshold level, and the unit is not subject to a standard for NO_x in the Kentucky regulations. On July 10, 2012, Air Products submitted a “RAP Control Analysis for Catlettsburg Hydrogen Plant” to KYDAQ dated July 9, 2012. The analysis demonstrated that the existing low NO_x burners are the only reasonable and practical control device. KYDAQ subsequently concurred, and the applicability of 401 KAR 50:012 for Hydrogen Reformer was removed in permit V-12-043 R1 (refer to Statement of Basis for V-12-043 R1).

Non-Applicability of 40 CFR 60 Subpart Ja

The hydrogen reformer is considered a fuel gas combustion device affected facility under 40 CFR 60 Subpart J, and fuel gas burned in the reformer is subject to the hydrogen sulfide content requirements of Section 60.104(a)(1) of that regulation.

The more recently promulgated 40 CFR 60 Subpart Ja can apply to certain affected facilities which are constructed, modified, or reconstructed after May 14, 2007. As demonstrated in the July 18, 2013 permit revision application to replace the burners, and repeated for reference below, the 2013 burner replacement project did not constitute modification or reconstruction, as those terms are defined at 40 CFR 60 Subpart A. Therefore, the reformer is not subject to Subpart Ja, and remains subject to Subpart J.

Modifications to existing affected facilities are addressed at 40 CFR 60 Subpart A, Section 60.14, which states:

(a) Except as provided under paragraphs (e) and (f) of this section, any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies shall be considered a modification within the meaning of section 111 of the Act. Upon modification, an existing facility shall become an affected facility for each pollutant to which a standard applies and for which there is an increase in the emission rate to the atmosphere.

(b) Emission rate shall be expressed as kg/hr of any pollutant discharged into the atmosphere for which a standard is applicable...

For Subpart Ja, the pollutants to which the fuel gas combustion standards apply are SO₂ and NO_x. The new burners installed in 2013 have the same total maximum design heat input capacity of 455 MMBTU/hr (higher heating value basis). SO₂ emissions are a function of the sulfur content of the fuel gas being burned and the firing rate. The project did not affect the sulfur content of the fuel gas, nor the maximum design firing rate. NO_x emissions are impacted by burner performance and firing rate, neither of which changed due to the 2013 project. Therefore, lb/hr emissions did not increase, and the project was not a modification under Subpart Ja.

Subpart Ja could also be triggered if the 2013 project constituted reconstruction of the reformer affected facility. Reconstruction of an existing affected facility is addressed at 40 CFR 60 Subpart A, Section 60.15, which states:

(a) An existing facility, upon reconstruction, becomes an affected facility, irrespective of

any change in emission rate.

(b) "Reconstruction" means the replacement of components of an existing facility to such an extent that:

(1) The fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, and

(2) It is technologically and economically feasible to meet the applicable standards set forth in this part.

United State Environmental Protection Agency (USEPA) interprets fixed capital cost to include: (1) engineering costs; (2) purchase costs; (3) installation costs; and (4) contractor fees [Refer to 67 Fed. Reg. 58,035 (Sept. 13, 2002) referencing a May 11, 1998 Applicability Determination concerning the same issue]. Air Products estimates that the fixed capital cost of the new burners was approximately \$864,600, versus approximately \$22,306,000 to replace the entire reformer furnace. As a result, the fixed capital cost of the new burners was approximately 4% of constructing an entirely new furnace, and the project was not reconstruction under Subpart Ja.

5. REQUESTED PERMIT REVISIONS

No changes other than the emission factor or emission calculation updates noted in Table 1 are requested to the current permit as part of this permit renewal application.

6. REDLINE PERMIT PAGES

No redline changes to the current permit are presented for consideration as part of this permit renewal application.

7. DEP7007 PERMIT APPLICATION FORMS

The list of permit application forms included in this submission are summarized below.

- DEP7007AI – Administrative Information
- DEP7007B – Manufacturing or Processing Operations
- DEP7007DD – Insignificant Activities
- DEP7007GG – Control Equipment
- DEP7007N – Source Emissions Profile
- DEP7007V – Applicable Requirements and Compliance Activities

Division for Air Quality

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Frankfort, KY 40601
(502) 564-3999

DEP7007AI**Administrative Information**

- ☐ Section AI.1: Source Information
☐ Section AI.2: Applicant Information
☐ Section AI.3: Owner Information
☐ Section AI.4: Type of Application
☐ Section AI.5: Other Required Information
☐ Section AI.6: Signature Block
☐ Section AI.7: Notes, Comments, and Explanations

Additional Documentation

☐ Additional Documentation attached

Source Name: Air Products and Chemicals, Inc.

KY EIS (AFS) #: 21- 019-00117

Permit #: V-18-004 R1

Agency Interest (AI) ID: 83915

Date: 3/1/2023

Section AI.1: Source Information

Physical Location	Street:	<u>11631 US Route 23</u>		
Address:	City:	<u>Catlettsburg</u>	County:	<u>Boyd</u>
			Zip Code:	<u>41129</u>
Mailing Address:	Street or P.O. Box:	<u>1940 Air Products Boulevard, Mail Code A8F04-4</u>		
	City:	<u>Allentown</u>	State:	<u>PA</u>
			Zip Code:	<u>18106-5500</u>

Standard Coordinates for Source Physical Location

Longitude: -82.598056 (decimal degrees) **Latitude:** 38.383333 (decimal degrees)

Primary (NAICS) Category: Industrial Gas Manufacturing **Primary NAICS #:** 32512

Classification (SIC) Category:

Industrial Gases

Primary SIC #:

2813

Briefly discuss the type of business conducted at this site:

Hydrogen plant, operated by Air Products and Chemicals, Inc., uses steam methane reforming technology to produce hydrogen and steam for use only by the Marathon Petroleum Company's Catlettsburg petroleum refinery.

Description of Area Surrounding Source:☐ Rural Area☐ Industrial Park☐ Residential Area**Is any part of the source located on federal land?**☐ Yes**Number of Employees:**

7

☐ Urban Area☒ Industrial Area☐ Commercial Area☒ No**Approximate distance to nearest residence or commercial property:**

2,640 Feet

Property Area:

Approximate 0.75 Acres

Is this source portable? ☐ Yes ☒ No**What other environmental permits or registrations does this source currently hold or need to obtain in Kentucky?****NPDES/KPDES:**☐ Currently Hold☐ Need☒ N/A**Solid Waste:**☐ Currently Hold☐ Need☒ N/A**RCRA:**☐ Currently Hold☐ Need☒ N/A**UST:**☐ Currently Hold☐ Need☒ N/A**Type of Regulated Waste Activity:**☐ Mixed Waste Generator☐ Generator☐ Recycler☐ Other: _____☐ U.S. Importer of Hazardous Waste☐ Transporter☐ Treatment/Storage/Disposal Facility☒ N/A

Section AI.2: Applicant Information**Applicant Name:** Air Products and Chemicals, Inc.**Title:** (if individual) _____**Mailing Address:** **Street or P.O. Box:** 1940 Air Products Boulevard, Mail Code A8F04-4**City:** Allentown **State:** PA **Zip Code:** 18106-5500**Email:** (if individual) _____**Phone:** 610-481-4911**Technical Contact****Name:** Preston Klingseis**Title:** Principal Environmental Specialist**Mailing Address:** **Street or P.O. Box:** 1940 Air Products Boulevard, Mail Code A8F04-4**City:** Allentown **State:** PA **Zip Code:** 18106-5500**Email:** klingspm@airproducts.com**Phone:** 610-481-5909**Air Permit Contact for Source****Name:** Joshua C. Llewellyn**Title:** Plant Manager, Catlettsburg, KY Hydrogen Plant**Mailing Address:** **Street or P.O. Box:** 11631 US Route 23**City:** Catlettsburg **State:** KY **Zip Code:** 41129**Email:** lleweljc@airproducts.com**Phone:** 606-921-2522

Section AI.3: Owner Information

☒ **Owner same as applicant**

Name: _____

Title: _____

Mailing Address: **Street or P.O. Box:** _____
City: _____ **State:** _____ **Zip Code:** _____

Email: _____

Phone: _____

List names of owners and officers of the company who have an interest in the company of 5% or more.

Name		Position	
_____		_____	
_____		_____	
_____		_____	

Section AI.4: Type of Application

Current Status:	☒ Title V	☐ Conditional Major	☐ State-Origin	☐ General Permit	☐ Registration	☐ None
Requested Action: (check all that apply)	☐ Name Change	☐ Initial Registration	☐ Significant Revision	☐ Administrative Permit Amendment		
	☒ Renewal Permit	☐ Revised Registration	☐ Minor Revision	☐ Initial Source-wide Operating Permit		
	☐ 502(b)(10) Change	☐ Extension Request	☐ Addition of New Facility	☐ Portable Plant Relocation Notice		
	☐ Revision	☐ Off Permit Change	☐ Landfill Alternate Compliance Submittal	☐ Modification of Existing Facilities		
	☐ Ownership Change	☐ Closure				
Requested Status:	☒ Title V	☐ Conditional Major	☐ State-Origin	☐ PSD	☐ NSR	☐ Other: _____

Is the source requesting a limitation of potential emissions?

☐ Yes☒ No

Pollutant:	Requested Limit:	Pollutant:	Requested Limit:
☐ Particulate Matter	_____	☐ Single HAP	_____
☐ Volatile Organic Compounds (VOC)	_____	☐ Combined HAPs	_____
☐ Carbon Monoxide	_____	☐ Air Toxics (40 CFR 68, Subpart F)	_____
☐ Nitrogen Oxides	_____	☐ Carbon Dioxide	_____
☐ Sulfur Dioxide	_____	☐ Greenhouse Gases (GHG)	_____
☐ Lead	_____	☐ Other	_____

For New Construction:

Proposed Start Date of Construction:
(MM/YYYY)

Proposed Operation Start-Up Date: (MM/YYYY)

For Modifications:

Proposed Start Date of Modification:
(MM/YYYY)

Proposed Operation Start-Up Date: (MM/YYYY)

Applicant is seeking coverage under a permit shield.

☐ Yes☒ No

Identify any non-applicable requirements for which permit shield is sought on a separate attachment to the application.

Section AI.5 Other Required Information

Indicate the documents attached as part of this application:

- | | |
|--|--|
| ☐ DEP7007A Indirect Heat Exchangers and Turbines | ☐ DEP7007CC Compliance Certification |
| ☒ DEP7007B Manufacturing or Processing Operations | ☒ DEP7007DD Insignificant Activities |
| ☐ DEP7007C Incinerators and Waste Burners | ☐ DEP7007EE Internal Combustion Engines |
| ☐ DEP7007F Episode Standby Plan | ☐ DEP7007FF Secondary Aluminum Processing |
| ☐ DEP7007J Volatile Liquid Storage | ☒ DEP7007GG Control Equipment |
| ☐ DEP7007K Surface Coating or Printing Operations | ☐ DEP7007HH Haul Roads |
| ☐ DEP7007L Mineral Processes | ☐ Confidentiality Claim |
| ☐ DEP7007M Metal Cleaning Degreasers | ☐ Ownership Change Form |
| ☒ DEP7007N Source Emissions Profile | ☐ Secretary of State Certificate |
| ☐ DEP7007P Perchloroethylene Dry Cleaning Systems | ☒ Flowcharts or diagrams depicting process |
| ☐ DEP7007R Emission Offset Credit | ☐ Digital Line Graphs (DLG) files of buildings, roads, etc. |
| ☐ DEP7007S Service Stations | ☐ Site Map |
| ☐ DEP7007T Metal Plating and Surface Treatment Operations | ☒ Map or drawing depicting location of facility |
| ☒ DEP7007V Applicable Requirements and Compliance Activities | ☐ Safety Data Sheet (SDS) |
| ☐ DEP7007Y Good Engineering Practice and Stack Height Determination | ☐ Emergency Response Plan |
| ☐ DEP7007AA Compliance Schedule for Non-complying Emission Units | ☐ Other: _____ |
| ☐ DEP7007BB Certified Progress Report | |

Section AI.6: Signature Block

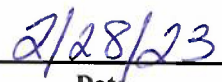
I, the undersigned, hereby certify under penalty of law, that I am a responsible official*, and that I have personally examined, and am familiar with, the information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the information is on knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false or incomplete information, including the possibility of fine or imprisonment.



 Authorized Signature

Joshua C. Llewellyn

Type or Printed Name of Signatory



 Date

Site Manager, Air Products and Chemicals, Inc.

Title of Signatory

*Responsible official as defined by 401 KAR 52:001.

Section AI.7: Notes, Comments, and Explanations

Division for Air Quality

300 Sower Boulevard

Frankfort, KY 40601

(502) 564-3999

DEP7007B**Manufacturing or Processing
Operations**

___ Section B.1: Process Information

___ Section B.2: Materials and Fuel Information

___ Section B.3: Notes, Comments, and Explanations

Additional Documentation___ Complete DEP7007AI, DEP7007N,
DEP7007V, and DEP7007GG.

___ Attach a flow diagram

___ Attach SDS

Source Name: Air Products and Chemicals, Inc.**KY EIS (AFS) #:** 21- 019-00117**Permit #:** V-18-004 R1**Agency Interest (AI) ID:** 83915**Date:** 3/1/2023**Section B.1: Process Information**

Emission Unit #	Emission Unit Name	Describe Emission Unit	Process ID	Process Name	Manufacturer	Model No.	Proposed/Actual Date of Construction Commencement (MM/YYYY)	Is the Process Continuous or Batch?	Number of Batches per 24 Hours (if applicable)	Hours per Batch (if applicable)
001	Hydrogen Reformer	Hydrogen Reformer Flue Gas Stack Hydrogenerator/Desulfurizer Reformer Furnace High Temperature Shift Reactor Pressure Swing Adsorption Unit	001-01	Hydrogen Reformer	Varies	Varies	Construction commenced in 2002 Reformer burners replaced in 09/2013	Continuous	N/A	N/A
001	Hydrogen Reformer	Greenhouse Gas Emissions	001-02	Hydrogen Reformer	Varies	Varies	Construction commenced in 2002 Reformer burners replaced in 09/2013	Continuous	N/A	N/A
002	Condensate Stripper	Process Condensate Stripper Vent	002-01	Condensate Stripper	Varies	Varies	Construction commenced in 2002	Continuous	N/A	N/A
003	Flare	Flare Pilot Gas (Natural Gas Pilots)	003-01	Flare	Varies	Varies	Construction commenced in 2003	Continuous (Natural Gas Pilots)	N/A	N/A
003	Flare	Flare Syngas (Intermittent)	003-02	Flare	Varies	Varies	Construction commenced in 2003	Batch (Intermittent)	Typically None; Up to Six Events Per Year	1 hr/event

Emission Unit #	Emission Unit Name	Describe Emission Unit	Process ID	Process Name	Manufacturer	Model No.	Proposed/Actual Date of Construction Commencement (MM/YYYY)	Is the Process Continuous or Batch?	Number of Batches per 24 Hours (if applicable)	Hours per Batch (if applicable)
003	Flare	Flare PSA Purge Gas (Intermittent)	003-03	Flare	Varies	Varies	Construction commenced in 2003	Batch (Intermittent)	Typically None; Up to Two Events Per Year	24 hr/event
003	Flare	Flare Hydrogen Gas (Intermittent)	003-04	Flare	Varies	Varies	Construction commenced in 2003	Batch (Intermittent Based on Customer Demand)	Up to 1 Batch/Day	24 hr/event
004	Fugitive Equipment Leaks	Valves, Connectors, Compressors, Seals, Lines, Sampling Connections	004-01	Fugitive Equipment Leaks	Varies	Varies	Construction commenced in 2002	Continuous	N/A	N/A
005	Steam Vents (Continuous and Intermittent)	Multiple Steam Vents	005-01	Steam Vent Emissions	Varies	Varies	Construction commenced in 2002	Continuous (Some Vents Are Intermittent)	N/A	N/A

Section B.2: Materials and Fuel Information

**Maximum yearly fuel usage rate only applies if applicant request operating restrictions through federally enforceable limitations.*

Emission Unit #	Emission Unit Name	Name of Raw Materials Input	Maximum Quantity of Each Raw Material Input		Total Process Weight Rate for Emission Unit (tons/hr)	Name of Finished Materials	Maximum Quantity of Each Finished Material Output		Fuel Type	Maximum Hourly Fuel Usage Rate		Maximum Yearly Fuel Usage Rate		Sulfur Content (%)	Ash Content (%)
				(Specify Units/hr)				(Specify Units/hr)			(Specify Units)		(Specify Units)		
001	Hydrogen Reformer	Pipeline Quality Natural Gas	0.73	MMscf/hr	15.33 tons/hr	Hydrogen	1.42	MMscf/hr	Natural Gas	0.73	MMscf/hr	N/A	N/A	0.00034%	0%
001	Hydrogen Reformer	PSA Purge Gas	77,377	lbs/hr	Varies Based on PSA Purge Gas Composition	Hydrogen	1.42	MMscf/hr	PSA Purge Gas	77,377	lbs/hr	N/A	N/A	0%	0%
002	Condensate Stripper	Water	10,833	lbs/hr	5.42 tons/hr	Water Vapor/Steam (Not a Finished Material)	5.42	tons/hr	N/A	N/A	N/A	N/A	N/A	0%	0%
003	Flare	Natural Gas (Pilots)	200	scf/hr	0.0042 tons/hr	Flare Emissions (Not a Finished Material)	0.000021	tons/hr	Natural Gas	200	scf/hr	N/A	N/A	0.00034%	0%
003	Flare	Syngas	0.0134	MMscf/hr	Varies Based on Syngas Composition	Flare Emissions (Not a Finished Material)	0.00067	tons/hr	Syngas	0.0134	MMscf/hr	N/A	N/A	0%	0%
003	Flare	PSA Purge Gas	0.00025	MMscf/hr	Varies Based on PSA Purge Gas Composition	Flare Emissions (Not a Finished Material)	0.000031	tons/hr	PSA Purge Gas	0.00025	MMscf/hr	N/A	N/A	0%	0%
003	Flare	Hydrogen Gas	0.45	MMscf/hr	1.15 tons/hr	Flare Emissions (Not a Finished Material)	0.0050	tons/hr	Hydrogen Gas	0.45	MMscf/hr	N/A	N/A	0%	0%
004	Fugitive Equipment Leaks	N/A	N/A	N/A	N/A	Fugitive Emissions (Not a Finished Material)	1.902	lbs/hr	N/A	N/A	N/A	N/A	N/A	Up to 0.00034%	0%
005	Steam Vents (Continuous and Intermittent)	Water	235,884	lbs/hr	117.9 tons/hr	Steam	77,168	lbs/hr	N/A	N/A	N/A	N/A	N/A	0%	0%

Section B.3: Notes, Comments, and Explanations

B.1, Flare - Syngas, 003-02 Notes:

Flaring of syngas assumed to align with planned process shutdowns.

B.1, Flare - PSA Purge Gas, 003-03 Notes:

Flaring of PSA Purge Gas assumed to align with process upsets with a conservative duration of 24 hours applied to calculation.

B.1, Flare - Hydrogen Gas, 003-04 Notes:

Dependent upon customer demand for hydrogen, flaring of hydrogen gas may occur up to 24 hours per day during normal operation.

B.2, 001 - Hydrogen Reformer, 003 - Flare, 004 - Fugitive Emission Notes:

Sulfur percentage in pipeline quality natural gas based on sulfur content noted in the footnotes of AP-42, Fifth Edition, Volume 1, Chapter 1: External Combustion Sources, Table 1.4-2. Value converted to percentage. Sulfur percentage was conservatively applied to potential fugitive emissions.

B.2, 005 - Steam Vents (Continuous and Intermittent) Notes:

Maximum quantity of steam is reflective of the most conservative scenario, such as a customer curtailment or process upset that requires a greater percentage of the total steam production to be vented to the atmosphere. Typical steam venting mass flow rate during steady state production is an order of magnitude less than this value.

B.2, 003 - Flare, Hydrogen Gas Notes:

Density for hydrogen gas applied to calculations was 0.0051 lb/ft³.

B.2, 003 - Flare, Maximum Quantity of Each Finished Material Output Notes:

Aggregate total emissions input from Table 2 - Potential Emissions Summary for natural gas (pilots), flaring of syngas, flaring of PSA purge gas, and flaring of hydrogen gas. Individual criteria pollutants and emission components are summarized in Table 2 - Potential Emissions Summary. Air emissions are not considered a finished material.

B.2, 001 - Hydrogen Reformer Notes:

Maximum quantity of PSA Purge Gas raw material input and maximum hourly fuel usage rate scaled up from the Heat and Material Balance (9 MMSCFD Minimum Use Case). Usage rate scaled to 34 MMSCFD.

Division for Air Quality

300 Sower Boulevard

Frankfort, KY 40601

(502) 564-3999

DEP7007DD**Insignificant Activities**

___ Section DD.1: Table of Insignificant Activities

___ Section DD.2: Signature Block

___ Section DD.3: Notes, Comments, and Explanations

Source Name:

Air Products and Chemicals, Inc.

KY EIS (AFS) #:

21- 019-00117

Permit #:

V-18-004 R1

Agency Interest (AI) ID:

83915

Date:

3/1/2023

Section DD.1: Table of Insignificant Activities

*Identify each activity with a unique Insignificant Activity number (IA #); for example: 1, 2, 3... etc.

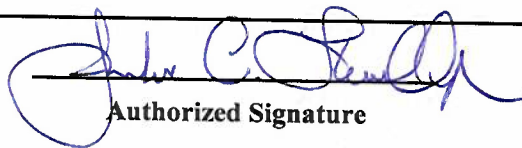
Insignificant Activity #	Description of Activity including Rated Capacity	Serial Number or Other Unique Identifier	Applicable Regulation(s)	Calculated Emissions
1	Cooling Tower 1,000 Gallons/Minute	IA-1	401 KAR 63:010	PM/PM10 Emissions: 0.55 Tons/Year
2	Analyzer Vents	IA-2	None	CO: 0.19 Tons/Year VOCs: 0.176 Tons/Year SO2: 0.00002
3	Cold Solvent Degreaser(s) (Parts Washer)	IA-3	401 KAR 63:020	VOCs: Less Than 0.11 Ton/Year
4	Lube Oil Storage	IA-4	None	VOCs: Less Than 1 Ton/Year
5	Water Treatment Chemical Storage and Handling	IA-5	None	De minimis emissions associated with on-site storage and use of water treatment chemicals

Insignificant Activity #	Description of Activity including Rated Capacity	Serial Number or Other Unique Identifier	Applicable Regulation(s)	Calculated Emissions
6	Safety Relief Valves	IA-6	None	Unless a process/critical upset occurs, no emissions are associated with safety relief valves.
7	Wastewater Sump	IA-7	None	Wastewater sump is sealed to the atmosphere; De minimis emissions occur during operation
8	Catalyst Loading	IA-8	401 KAR 63:010	Fugitive emissions are captured in Table 2; De minimis emissions occur at catalyst changeout

Section DD.2: Signature Block

I, THE UNDERSIGNED, HEREBY CERTIFY UNDER PENALTY OF LAW, THAT I AM A RESPONSIBLE OFFICIAL, AND THAT I HAVE PERSONALLY EXAMINED, AND AM FAMILIAR WITH, THE INFORMATION SUBMITTED IN THIS DOCUMENT AND ALL ITS ATTACHMENTS. BASED ON MY INQUIRY OF THOSE INDIVIDUALS WITH PRIMARY RESPONSIBILITY FOR OBTAINING THE INFORMATION, I CERTIFY THAT THE INFORMATION IS ON KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE OR INCOMPLETE INFORMATION, INCLUDING THE POSSIBILITY OF FINE OR IMPRISONMENT.

By:



Authorized Signature

Joshua C. Llewellyn

Type/Print Name of Signatory

2/28/23

Date

Site Manager, Air Products and Chemicals, Inc.

Title of Signatory

Section DD.3: Notes, Comments, and ExplanationsInsignificant Activity IA-01, Cooling Tower Emission Calculation Notes:

Equation to calculate PM/PM10 emissions from a cooling tower was based on AP-42 Chapter 13.4 - Wet Cooling Towers. Total dissolved solids (TDS) concentration applied was 5,000 ppm (upper design limit). Percentage of drift applied was 0.0050%.

Insignificant Activity IA-02, Analyzer Vents Emission Calculation Notes:

Analyzer vents collectively refer to one 0.5-inch diameter vent for the PSA Feed Analyzer, three 0.5-inch diameter vents for the Hydrogen Product Analyzer, and one 0.5-inch diameter vent for the Natural Gas Feed Analyzer.

Insignificant Activity IA-03, Cold Solvent Degreaser (Parts Washer) Emission Calculation Notes:

Emission calculations were completed using methodology and equations in AP-42, Fifth Edition, Volume I Chapter 7: Liquid Storage Tanks. Emissions from the parts washer drum were calculated as routine losses, consisting of standing losses and working losses with a 20% safety factor.

Insignificant Activity IA-04, Lube Oil Storage Emission Calculation Notes:

Emission calculations were completed using methodology and equations in AP-42, Fifth Edition, Volume I Chapter 7: Liquid Storage Tanks. Emissions assumed 12 55-gallon oil drums were stored on-site at a time. Methodology similar to parts washer calculations, 20% safety factor.

Division for Air Quality

300 Sower Boulevard

Frankfort, KY 40601

(502) 564-3999

DEP7007GG

Control Equipment

Additional Documentation

- ___ Complete Sections GG.1 through GG.12, as applicable
- ___ Attach manufacturer's specifications for each control device
- ___ Complete DEP7007AI

Source Name: Air Products and Chemicals, Inc.

KY EIS (AFS) #: 21- 019-00117

Permit #: V-18-004 R1

Agency Interest (AI) ID: 83915

Date: 3/1/2023

Section GG.1: General Information - Control Equipment

Control Device ID #	Control Device Name	Cost	Manufacturer	Model Name/ Serial #	Date Installed	Inlet Gas Stream Data For <u>All</u> Control Devices					Inlet Gas Stream Data For Condensers, Adsorbers, Afterburners, Incinerators, Oxidizers <u>Only</u>			Equipment Operational Data For <u>All</u> Control Devices		
						Temperature ($^{\circ}F$)	Flowrate (scfm @ 68 $^{\circ}F$)	Average Particle Diameter (μm)	Particle Density (lb/ft 3) or Specific Gravity	Gas Density (lb/ft 3)	Gas Moisture Content (%)	Gas Composition	Fan Type	Pressure Drop Range (in. H $_2$ O)	Pollutants Collected/ Controlled	Pollutant Removal (%)
003-01	Flare	\$1,000,000	John Zink Company, Inc.	EEF-U-16	4/2/2003	95 to 180	20,657 to 47,980	1 to 50	0.0696 to 0.87	0.086 to 0.531	N/A	N/A	N/A	194 to 416	VOCs	98-99%

Section GG.2: Flare Source Information

Control Device ID #	Identify all Emission Units and Control Devices that Feed to Flare	Type of Flare (e.g. steam-assisted, air-assisted, nonassisted)	Process Gas Flowrate (<i>acfm</i>)	Net Heating Value of Stream(s) (Btu/scf)	Removal Efficiency (%)	Flare Rated Capacity (<i>MMBtu/hr</i>)
003-01	Several different gas streams may be sent to the flare based on operational condition (startup, shutdown, customer curtailment, process upset). 1) Natural Gas Pilots (Operational at All Times); 2) Syngas (Intermittent); 3) PSA Purge Gas (Intermittent); 4) Hydrogen Gas (Intermittent)	Non-Assisted	21,991 to 51,078	263.4 - 995.1	98%	390.8 to 1,233.3

Section GG.12: Notes, Comments, and Explanations

Based on a telephone conversation with Durga Patil of KYDAQ on 1/9/23, equipment/process vessels are not required to be listed on Form DEP7007GG because these components are not viewed as pollution control equipment. In addition, low NOx burners are viewed as a design parameter, not a separate pollution control device, and thereby, low NOx burners do not need to be listed on Form DEP7007GG.

GG.1 Notes:

Installation date listed is to the final inspection date performed by John Zink Company, Inc (commissioning date of the flare).
Cost of the flare is estimated. Gas temperature and flowrate varies depending on the gas stream sent to the flare and operational condition.

GG.1 Notes:

Gas density, specific gravity, and average particle diameter varies depending on the gas stream sent to the flare.

GG.1 Notes:

The Texas Commission on Environmental Quality (TCEQ) Publication RG-360, Revised in January 2006, Technical Supplement 4: Flares notes that a 98% (by weight) destruction removal efficiency (DRE) for most VOCs. Air Products and Chemicals, Inc. (APCI) has historically used this 98% DRE value for destruction of VOCs and CO in air permit calculations. The guidance document also notes that a 99% DRE can be used for simple compounds containing no more than three carbons (e.g., methane), and a 99% DRE was applied to methane or methanol emission calculations.

GG.2 Notes:

Process gas flowrate, net heating values, and flare rating capacity vary depending on the gas stream sent to the flare.

REV	CLIENT	ELEVATED FLARE	Rev	Date	Description	DWN	CKD	APPD	Page
	APCI / MARATHON		A	8-7-02	FOR INFORMATION	SR	VKP/PdG	NXC	1/3
	LOCATION		0	10/22/02	APPD. FOR DESIGN	VKP	PdG	WRM	
	CATLETTSBURG, KY, USA								
	UNIT								
	34 MMSCFD Hydrogen Plant	J-882							

VENDOR SHALL PROVIDE A STAND-ALONE, ELEVATED FLARE SYSTEM, WITH ALL UTILITY REQUIREMENTS IDENTIFIED, TO HANDLE ANY ONE OF THE FOLLOWING MAJOR RELIEVING CASES INDICATED:

CASE			BLOCKED OUTLET	PSA FEED DUMP	BLOCKED OUTLET
STREAM NAME			FEED GAS (PRIMARY FEED)	PSA FEED GAS	PSA PRODUCT
MW			17.87	10.71	2.0226
FLOW RATE LB/HR			58360	81250	7607
LB-MOLE/HR			3266	7586	3761
TEMPERATURE °F			180	95	100
COMPOSITION	MOLE%	MW			
METHANE	16.04	83.110	5.230	-----	-----
ETHANE	30.07	12.820	-----	-----	-----
PROPANE	44.09	0.421	-----	-----	-----
ISO-BUTANE	58.12	-----	-----	-----	-----
N-BUTANE	58.12	0.069	-----	-----	-----
ISO-PENTANE	72.15	-----	-----	-----	-----
PENTANE	72.15	-----	-----	-----	-----
H2	2.02	2.160	74.090	99.970	-----
CO2	44.01	0.059	16.300	-----	-----
CO	28.01	-----	3.880	0.025	-----
N2	28.02	1.360	0.314	-----	-----
O2	32.00	-----	-----	-----	-----
H2O	18.02	-----	0.186	-----	-----
Ar	39.94	-----	-----	-----	-----
H2S	34.08	.25 GRAIN/100SCF	-----	-----	-----
TOTAL			100.00	100.00	100.00
ESTIMATED DURATION			SUSTAINED	SUSTAINED	SUSTAINED
FLOW @ NOR.COND. SCFH			1,239,373	2,878,762	1,427,317
LHV BTU/SCF			995.1	263.4	273.8
INITIAL LHV MILLION BTU/H			1,233.3	758.1	390.8

NOTES:

1 VENDOR TO SPECIFY EMISSIONS OF EXHAUST GAS FROM FLARE.

2 DELETED

3 DELETED

4 FOR PILOT GAS CONSUMPTION AND INFORMATION SEE PAGE-2.

5 FOR SITE CONDITION SEE PAGE-2.

6 FOR INSTRUMENT AIR , PURGE GAS, AND SERVICE WATER CONDITION SEE PAGE-3.

7 SEE PID-0041-721 FOR MORE INFORMATION.

8 MAXIMUM THERMAL RADIATION LIMITS (INCLUDING 300 Btu /HR / FT2 FOR SOLAR RADIATION) ARE AS FOLLOWS:

A) In-plant personnel at grade without protection for continuous exposure: Max. thermal radiation is 800 BTU/HR/FT2

B) In-plant personnel at grade or any elevated platforms when:

. Access is restricted, area normally unoccupied or

. Shielding is installed using bare, uninsulated metal in the

immediate area. Max. thermal radiation is 5000 BTU/HR/FT2

C) In-plant personnel at grade or any elevated platform when

shielding is installed using properly insulated materials to prevent

re-radiation of heat to a protected operator in the immediate area.

Max. thermal radiation is 8000 BTU/HR/FT2

9 VENDOR TO DESIGN IGNITION PANEL FOR 30 PSIG DESIGN PRESSURE.

TECHNIP

USA

DOCUMENT NUMBER

30028-000-PDS-0181-001

REV

0

R E V	CLIENT	ELEVATED FLARE	Rev	Date	Description	DWN	CKD	APPD	Page
	APCI / MARATHON		A	8-7-02	FOR INFORMATION	SR	VKP/PdG	NXC	2/3
	LOCATION		0	10/22/02	APPD. FOR DESIGN	VKP	PdG	WRM	
	CATLETTSBURG, KY, USA								
	UNIT								
	34 MMSCFD Hydrogen Plant	J-882							

PILOT GAS COMPOSITION

Composition	Base fuel	Alternate Fuel	Remarks
MW			
Air 28.966			
Oxygen O ₂ 32.000			
Nitrogen N ₂ 28.016	1.39	0.66	
Water Vapor H ₂ O 18.016			
Carbon Monoxide CO 28.010			
Carbon Dioxide CO ₂ 44.010	0.06	0.46	
Hydrogen Sulfide H ₂ S 34.076	.25	.25	S in S compounds, grain/ 100scf
Hydrogen H ₂ 2.016	0.16		
Methane CH ₄ 16.042	84.81	94.87	
Ethylene C ₂ H ₄ 28.052			
Ethane C ₂ H ₆ 30.068	13.08	3.06	
Propylene C ₃ H ₆ 42.078			
Propane C ₃ H ₈ 44.094	0.43	0.52	
I-Butane C ₄ H ₁₀ 58.120		0.12	
n-Butane C ₄ H ₁₀ 58.120	0.07	0.11	
I-Pentane C ₅ H ₁₂ 72.146		0.11	
n-Pentane C ₅ H ₁₂ 72.146		0.09	
Hexane Plus			
Ammonia NH ₃ 17.031			
Hydro chloride HCl 36.461			
Chlorine Cl 70.914			
Chlorides - Traces			
Total Mole %	100	100	
0 Flow rate SCFH (Normal)	150	150	
0 Pressure Psig (Ex. Regulator)	7 to 15	7 to 15	
Temperature oF	80	80	
0 LHV BTU/SCF	995.12	938.33	
0 HHV BTU/SCF	1101.30	1040.61	
0 DESIGN PRESSURE (UP SR. OF REGULATOR)	Psig	595	
DESIGN TEMPERATURE	° F	130	
OPERATING PRESSURE Min / Norm / Max	Psig	150 /150/ 225	
OPERATING TEMPERATURE Min / Norm / Max	° F	40 / 80 / 100	

Site Data:

Elevation	547	FT	Barometer	14.38	Psia(1)
Range of Ambient Temps.					
Normal	o F			60	
Maximum	o F			105	
Minimum	o F			5	
Design Wet Bulb Temperature	o F			78	
Design Dry Bulb Temperature	o F			92	
Max. Dry Bulb Temperature	o F			96	
Design RH	%			60	
Rain fall	inch			HOLD	
Snow Fall	inch			HOLD	
0 Design wind velocity	ft/sec	30	(FOR FLAME TILT)		
Seismic Zone:		1			

R E V	CLIENT APCI / MARATHON	ELEVATED FLARE J-882	Rev	Date	Description	DWN	CKD	APPD	Page
	LOCATION CATLETTSBURG, KY, USA		A	8-7-02	FOR INFORMATION	SR	VKP/PdG	NXC	3/3
	UNIT 34 MMSCFD Hydrogen Plant		0	10/22/02	APPD. FOR DESIGN	VKP	PdG	WRM	

INSTRUMENT AIR

	PRESSURE, Psig				TEMPERATURE, oF			
	MIN.	NORM.	MAX.	DESIGN	MIN.	NORM.	MAX.	DESIGN
IA	55	60	90	150	-20	60	90	150
DEW POINT: HOLD								

PURGE GAS, NITROGEN

	PRESSURE, Psig				TEMPERATURE, oF			
	MIN.	NORM.	MAX.	DESIGN	MIN.	NORM.	MAX.	DESIGN
N	90	92	-----	150	-20	60	90	150

SERVICE WATER

	PRESSURE, Psig				TEMPERATURE, oF			
	MIN.	NORM.	MAX.	DESIGN	MIN.	NORM.	MAX.	DESIGN
SW	55	125	135	150	40	68	100	150

FLARE SYSTEM BACK PRESSURE

	PRESSURE, Psig				TEMPERATURE, oF			
	MIN.	NORM.	MAX.	DESIGN	MIN.	NORM.	MAX.	DESIGN
F	-----	-----	5.5	15	-20	60	105	200

Division for Air Quality 300 Sower Boulevard Frankfort, KY 40601 (502) 564-3999	DEP7007N Source Emissions Profile ___ Section N.1: Emission Summary ___ Section N.2: Stack Information ___ Section N.3: Fugitive Information ___ Section N.4: Notes, Comments, and Explanations	Additional Documentation ___ Complete DEP7007AI
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Source Name:	Air Products and Chemicals, Inc.
KY EIS (AFS) #:	21- 019-00117
Permit #:	V-18-004 R1
Agency Interest (AI) ID:	83915
Date:	3/1/2023

N.1: Emission Summary

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity (SCC Units/hour)	Pollutant	Uncontrolled Emission Factor (lb/SCC Units)	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency (%)	Control Efficiency (%)	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential (lb/hr)	Controlled Potential (lb/hr)	Uncontrolled Potential (tons/yr)	Controlled Potential (tons/yr)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
001	Hydrogen Reformer	001-01	Hydrogen Reformer	N/A	N/A	001	455	CO	0.040	Design	N/A	N/A	18.2	18.2	79.72	79.72
001	Hydrogen Reformer	001-01	Hydrogen Reformer	N/A	N/A	001	455	VOC	0.0055	AP-42	N/A	N/A	2.50	2.50	10.96	10.96
001	Hydrogen Reformer	001-01	Hydrogen Reformer	N/A	N/A	001	455	PM	0.0050	Testing	N/A	N/A	2.28	2.28	9.96	9.96
001	Hydrogen Reformer	001-01	Hydrogen Reformer	N/A	N/A	001	455	PM ₁₀	0.0050	Testing	N/A	N/A	2.28	2.28	9.96	9.96
001	Hydrogen Reformer	001-01	Hydrogen Reformer	N/A	N/A	001	455	PM _{2.5}	0.0050	Testing	N/A	N/A	2.28	2.28	9.96	9.96
001	Hydrogen Reformer	001-01	Hydrogen Reformer	N/A	N/A	001	455	SO ₂	0.00036	Mass Balance	N/A	N/A	0.164	0.164	0.72	0.72
001	Hydrogen Reformer	001-02	Hydrogen Reformer	N/A	N/A	001	1.42	CO ₂	65,909	40 CFR 98	N/A	N/A	93,374	93,374	408,977	408,977
001	Hydrogen Reformer	001-02	Hydrogen Reformer	N/A	N/A	001	1.42	Methane	1.24	40 CFR 98	N/A	N/A	1.76	1.76	7.69	7.69

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity (SCC Units/hour)	Pollutant	Uncontrolled Emission Factor (lb/SCC Units)	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency (%)	Control Efficiency (%)	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential (lb/hr)	Controlled Potential (lb/hr)	Uncontrolled Potential (tons/yr)	Controlled Potential (tons/yr)
001	Hydrogen Reformer	001-02	Hydrogen Reformer	N/A	N/A	001	1.42	N ₂ O	0.12	40 CFR 98	N/A	N/A	0.18	0.18	0.77	0.77
002	Condensate Stripper	002-01	Condensate Stripper	N/A	N/A	002	1.42	CO	1.24	Design	N/A	N/A	1.75	1.75	7.68	7.68
002	Condensate Stripper	002-01	Condensate Stripper	N/A	N/A	002	1.42	VOC	3.06	2013 Stack Test	N/A	N/A	4.34	4.34	18.99	18.99
002	Condensate Stripper	002-01	Condensate Stripper	N/A	N/A	002	1.42	Methanol	2.77	2013 Stack Test	N/A	N/A	3.92	3.92	17.19	17.19
003	Flare	003-01	Flare	Flare	003-01	003	1.0	CO	8.40	AP-42 1.4	N/A	98%	8.40	0.0168	36.792	0.0736
003	Flare	003-01	Flare	Flare	003-01	003	1.0	NO _x	1.00	AP-42 1.4	N/A	98%	1.00	0.0200	4.38	0.0876
003	Flare	003-01	Flare	Flare	003-01	003	1.0	VOC	0.05	AP-42 1.4	N/A	98%	0.0548	0.0011	0.24	0.0048
003	Flare	003-01	Flare	Flare	003-01	003	1.0	PM	0.0765	AP-42 1.4	N/A	98%	0.0765	0.0015	0.335	0.0067
003	Flare	003-01	Flare	Flare	003-01	003	1.0	PM ₁₀	0.0765	AP-42 1.4	N/A	98%	0.0765	0.0015	0.335	0.0067
003	Flare	003-01	Flare	Flare	003-01	003	1.0	PM _{2.5}	0.0765	AP-42 1.4	N/A	98%	0.0765	0.0015	0.335	0.0067
003	Flare	003-01	Flare	Flare	003-01	003	1.0	SO ₂	0.00605	AP-42 1.4	N/A	98%	0.00605	0.000121	0.0265	0.00053
003	Flare	003-02	Flare	Flare	003-02	003	0.0134	CO	3,782	Engineering Estimate	N/A	98%	50.7	1.01	222	4.44
003	Flare	003-02	Flare	Flare	003-02	003	0.0134	NO _x	1,039	Engineering Estimate	N/A	98%	13.9	0.279	61	1.22
003	Flare	003-02	Flare	Flare	003-02	003	0.0134	VOC	187	Engineering Estimate	N/A	98%	2.51	0.0502	11.0	0.220
003	Flare	003-02	Flare	Flare	003-02	003	0.0134	Methanol	0.298	Engineering Estimate	N/A	99%	0.00400	0.0000400	0.01750	0.000175
003	Flare	003-03	Flare	Flare	003-03	003	0.000250	CO	10,776	Engineering Estimate	N/A	98%	2.69	0.0539	11.8	0.236
003	Flare	003-03	Flare	Flare	003-03	003	0.000250	NO _x	959	Engineering Estimate	N/A	98%	0.240	0.00479	1.05	0.0210
003	Flare	003-03	Flare	Flare	003-03	003	0.000250	VOC	530	Engineering Estimate	N/A	98%	0.132	0.00265	0.580	0.0116

Emission Unit #	Emission Unit Name	Process ID	Process Name	Control Device Name	Control Device ID	Stack ID	Maximum Design Capacity (SCC Units/hour)	Pollutant	Uncontrolled Emission Factor (lb/SCC Units)	Emission Factor Source (e.g. AP-42, Stack Test, Mass Balance)	Capture Efficiency (%)	Control Efficiency (%)	Hourly Emissions		Annual Emissions	
													Uncontrolled Potential (lb/hr)	Controlled Potential (lb/hr)	Uncontrolled Potential (tons/yr)	Controlled Potential (tons/yr)
003	Flare	003-03	Flare	Flare	003-03	003	0.000250	Methanol	1.01	Engineering Estimate	N/A	99%	2.53E-04	2.53E-06	1.11E-03	1.11E-05
003	Flare	003-04	Flare	Flare	003-04	003	0.451	CO	0.50	Engineering Estimate	N/A	98%	0.225	0.00450	0.985	0.0197
003	Flare	003-04	Flare	Flare	003-04	003	0.451	NO _x	1,102	Engineering Estimate	N/A	98%	497	9.93607	2,176	43.52
004	Fugitive Equipment Leaks	004-01	Fugitive Equipment Leaks	N/A	N/A	N/A	1.0	VOC	0.395	SOCMI Average Emission Factors	N/A	N/A	0.395	0.395	1.73	1.73
004	Fugitive Equipment Leaks	004-01	Fugitive Equipment Leaks	N/A	N/A	N/A	1.0	CO	1.49	SOCMI Average Emission Factors	N/A	N/A	1.49	1.49	6.51	6.51
004	Fugitive Equipment Leaks	004-01	Fugitive Equipment Leaks	N/A	N/A	N/A	1.0	Methanol	0.0219	SOCMI Average Emission Factors	N/A	N/A	0.0219	0.0219	0.0960	0.0960
005	Steam Vents (Continuous and	005-01	Steam Vent Emissions	N/A	N/A	005	1.0	VOC	0.543	Engineering Estimate	N/A	N/A	0.543	0.543	2.38	2.38
005	Steam Vents (Continuous and	005-01	Steam Vent Emissions	N/A	N/A	005	1.0	Methanol	0.530	Engineering Estimate	N/A	N/A	0.530	0.530	2.32	2.32

Section N.2: Stack Information**UTM Zone: 17**

Stack ID	Identify all Emission Units (with Process ID) and Control Devices that Feed to Stack	Stack Physical Data			Stack UTM Coordinates		Stack Gas Stream Data		
		Equivalent Diameter (ft)	Height (ft)	Base Elevation (ft)	Northing (m)	Easting (m)	Flowrate (acfm)	Temperature (° F)	Exit Velocity (ft/sec)
001	001-01: Hydrogen Reformer Flue Gas Stack (Low NO _x Burners)	7.58	100	534	4249587	360413	121,370	336	44.8
002	002-01: Condensate Stripper Vent	0.25	60 (Estimated)	534	4249562	360408	635	281	216
003	003-01 - 003-04: Flare	N/A	125	534	4249536	360376	Varies	Varies	Varies
004	Fugitive Equipment Leaks	N/A	50	534	Not a point stack; Refer to N.3	Not a point stack; Refer to N.3	Varies	Varies	Varies
005	Steam Vents (Continuous and Intermittent)	0.8	147	534	4249573	360405	27,480	400	828.3

Section N.3: Fugitive Information**UTM Zone: 17**

Emission Unit #	Emission Unit Name	Process ID	Area Physical Data		Area UTM Coordinates		Area Release Data	
			Length of the X Side (ft)	Length of the Y Side (ft)	Northing (m)	Easting (m)	Release Temperature (°F)	Release Height (ft)
004	Fugitive Equipment Leaks	004-01	175	200	4249589 (NW) 4249589 (NE) 4249518 (SW) 4249531 (SE)	360362 (NW) 360421 (NE) 360374 (SW) 360425 (SE)	Varies	0-50

Section N.4: Notes, Comments, and Explanations

N.1, Emission Unit 003, Process ID 003-01 to 003-04 Calculation Notes:

The Texas Commission on Environmental Quality (TCEQ) Publication RG-360, Revised in January 2006, Technical Supplement 4: Flares notes that a 98% (by weight) destruction removal efficiency (DRE) for most VOCs. Air Products and Chemicals, Inc. (APCI) has historically used this 98% DRE value for destruction of VOCs and CO in air permit calculations. The guidance document also notes that a 99% DRE can be used for simple compounds containing no more than three carbons (e.g., methane), and a 99% DRE was applied to methane or methanol emission calculations.

N.2, Stack ID 001, Hydrogen Reformer Flue Gas Stack Data Notes:

Flowrate, temperature, and exit velocity refer to values determined during the November 5, 2013 stack test.

Flowrate during the May 22, 2019 stack test was lower than the November 5, 2013 stack test. More conservative flow rate applied.

N.2, Stack ID 002, Condensate Stripper Vent Data Notes:

Flow rate was obtained the May 22, 2019 Condensate Stripper Stack Test Data. Average rate of 588 scfm from the May 22, 2019 stack test was converted to 635 acfm, assuming ambient temperature of 83 degrees F, barometric pressure of 14.7 psia, and relative humidity of 95%. This value is an update from the last permit renewal, where a lower flow rate obtained from the December 19, 2013 stack test was listed.

N.2, Stack ID 004, Fugitive Equipment Leaks:

As outlined in a July 10, 2012 email to KYDAQ, the potential for fugitive emissions to be emitted is from an area 50 feet x 50 feet x 50 feet. Stack height changed from 25 feet in the last permit renewal to 50 feet for this permit renewal to be consistent with prior correspondence to KYDAQ.

N.2, Stack ID 005, Steam Vent Data Notes:

Flowrate, temperature, and exit velocity refer to values for the main steam vent, originally presented in a July 10, 2012 submission to KYDAQ. Flow rate of 27,105 scfm converted to 27,480 acfm, assuming ambient temperature of 60 degrees F, barometric pressure of 14.7 psia, and relative humidity of 95%. Stack base elevation and UTM coordinates provided for the main steam vent.

N.2, Base Elevation Data Notes:

Stack physical data base elevation determined by inputting decimal degree coordinates for each individual stack into the United States Geological Survey The National Map (TNM) online viewer, accessible at <https://apps.nationalmap.gov/elevation/##bottom>.

N.3, Fugitive Information Notes:

Length of X and Y side for area physical area modified from the previous permit renewal submission to conservatively capture the entire footprint of the hydrogen plant. Length of X and Y side changed from 50 feet x 50 feet to 175 feet x 200 feet. UTM coordinates listed for each corner of the rectangular area with a corresponding cardinal direction (NE, NW, SE, SW).

N.2, Hydrogen Reformer Flue Gas Stack Notes:

Based on a telephone conversation with Durga Patil of KYDAQ on 1/9/23, low NOx burners are viewed as a design parameter, and not a stand-alone pollution control device. Stack parameters for the reformer stack are listed in N.2, but a line item for the low NOx burners was not included in N.1.

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Division for Air Quality

300 Sower Boulevard
Frankfort, KY 40601
(502) 564-3999

DEP7007V

Applicable Requirements and Compliance Activities

Additional Documentation

___ Complete DEP7007AI

- ___ Section V.1: Emission and Operating Limitation(s)
 ___ Section V.2: Monitoring Requirements
 ___ Section V.3: Recordkeeping Requirements
 ___ Section V.4: Reporting Requirements
 ___ Section V.5: Testing Requirements
 ___ Section V.6: Notes, Comments, and Explanations

Source Name: Air Products and Chemicals, Inc.

KY EIS (AFS) #: 21- 019-00117

Permit #: V-18-004 R1

Agency Interest (AI) ID: 83915

Date: 3/1/2023

Section V.1: Emission and Operating Limitation(s)

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
001	Hydrogen Reformer Flue Gas Stack	Section B, 1.a. 40 CFR 60.104(a)(1)	Hydrogen Sulfide (H ₂ S)	N/A	Relief Valve Leakage or Other Emergency Malfunction	No fuel gas shall be burned that contains H ₂ S in excess of 230 mg/dscm	Detector tube monitoring (Draeger Tubes)

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
001	Hydrogen Reformer Flue Gas Stack	Section B, 1.b. 40 CFR 63.7500(a)(1)	N/A	N/A	Permittee may delay the burner inspection until the next scheduled or unscheduled shutdown, but must inspect each burner at least once every 72 months	Conduct a tune-up (burner inspection) of the unit every five years	Maintaining records of burner inspections
001	Hydrogen Reformer Flue Gas Stack	Section B, 1.d. 40 CFR 63.7500(a)(3)	N/A	N/A	N/A	Permittee must operate and maintain the affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions.	Maintaining records of monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.
001	Hydrogen Reformer Flue Gas Stack	Section B, 2.a.i. Section B, 2.c.	SO ₂	1.1 TPY	N/A	N/A	Maintain records of daily calculated 365-day rolling total emissions; Emissions of SO ₂ shall be based on site specific emission factor of 0.00036 lb/mmBtu heat input

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
001	Hydrogen Reformer Flue Gas Stack	Section B, 2.a.i. Section B, 2.c.	PM ₁₀	13.3 TPY	N/A	N/A	Maintain records of daily calculated 365-day rolling total emissions; PM ₁₀ emissions based on emission factor of 0.005 lb/mmBtu heat input or that measured during the most recent performance test and heat input rate
001	Hydrogen Reformer Flue Gas Stack	Section B, 2.a.ii. Section B, 2.c. Section D, 3.a.	NO _x	104.6 TPY	N/A	N/A	Maintain records of daily calculated 365-day rolling total emissions; Emission of NO _x based on data obtained from a NO _x CEMS.
001	Hydrogen Reformer Flue Gas Stack	Section B, 2.a.ii. Section B, 2.c. Section D, 3.a.	VOC	9.7 TPY	N/A	N/A	Maintain records of daily calculated 365-day rolling total emissions; emissions of VOC shall be based on AP-42 emission factors of 0.0055 lb/mmBtu heat input for natural gas.
001	Hydrogen Reformer Flue Gas Stack	Section B, 2.a.ii. Section B, 2.c. Section D, 3.a.	CO	70.3 TPY	N/A	N/A	Maintain records of daily calculated 365-day rolling total emissions; CO emissions based on emission factor of 0.04 lb/mmBtu heat input or that measured during the most recent performance test and heat input rate.

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
001	Hydrogen Reformer Flue Gas Stack	Section B, 2.a.iii. Section D, 3.c.	N/A	N/A	N/A	Heat input to the reformer furnace shall not exceed 455 mmBtu/hr based on 365-day rolling average	Maintain records of the daily heat input in mmBtu/hr and the calculated 365-day rolling average heat input to the Hydrogen Reformer.
002	Condensate Stripper	Section B, 1. (EU-02) 401 KAR 63:020	Multiple	N/A	N/A	No owner or operator shall allow any affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals, and plants.	Source is in compliance with 401 KAR 63:020 based on the rates of emissions of airborne toxics provided in the applications submitted by the source.
002	Condensate Stripper	Section D, 3.a	VOC	14.5 TPY	N/A	N/A	Perform daily calculations of daily emission rates and rolling 365-day total emissions of VOC from the Condensate Stripper.
002	Condensate Stripper	Section D, 3.a	CO	4.6 TPY	N/A	N/A	Perform daily calculations of daily emission rates and rolling 365-day total emissions of CO from the Condensate Stripper.

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
003	Flare	Section B, 1.a. (EU-03) 401 KAR 52:020, Section 10	N/A	N/A	N/A	The Permittee shall burn natural gas whenever the flare is in standby mode (pilot operation).	Pursuant to 401 KAR 50:020, Section 10, the permittee shall install and maintain a thermocouple or any other equivalent device to continuously monitor the presence of a pilot flame in the flare.
003	Flare	Section B, 1.b. (EU-03) 401 KAR 52:020, Section 10	Visible Emissions	Flare designed for and operated with no visible emissions; Except for periods not to exceed a total of 5 minutes during any 2 consecutive hours	N/A	No Visible Emissions; Except for Periods Not to Exceed a Total of 5 Minutes During Any 2 Consecutive Hours	Compliance shall be demonstrated by adherence to specific monitoring requirements in Section B, 4.a. - 4.c. (EU-03).
003	Flare	Section B, 1.c. (EU-03) 40 CFR 60.18(f)(2) 401 KAR 52:020, Section 10	N/A	N/A	N/A	The flare shall be operated with a flame present at all times as determined by the methods specified in 40 CFR 60.18(f)(2).	Pursuant to 401 KAR 50:020, Section 10, the permittee shall install and maintain a thermocouple or any other equivalent device to continuously monitor the presence of a pilot flame in the flare.

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
003	Flare	Section B, 1.d. (EU-03) 401 KAR 52:020, Section 10	N/A	N/A	N/A	The flare shall be operated at all times when emissions are vented to it.	Pursuant to 401 KAR 50:020, Section 10, the permittee shall install and maintain a thermocouple or any other equivalent device to continuously monitor the presence of a pilot flame in the flare.
003	Flare	Section B, 2.a (EU-03) Section B, 2.a.i-iv. (EU-03) 401 KAR 63:015, Section 3	Visible Emissions	Visible emissions from the flare shall not exceed 20% opacity for more than 3 minutes in any one day	N/A	Visible emissions from the flare shall not exceed 20% opacity for more than 3 minutes in any one day.	i. Adhering to heat content specifications pursuant to 40 CFR 60.18(c)(3)(ii) ii. Operate a flare designed for no visible emissions as determined by Method 22, except for periods not to exceed a total of 5 minutes during any two consecutive hours as provided for in 40 CFR 60.18(c)(1). iii. Operate the flare with a flame present at all times as determined by the methods in 40 CFR 60.18(f) as provided for in 40 CFR 60.18(c)(2) iv. A flare pilot outage shall be indicated by a control panel pilot flame monitoring light and audible alarm. Attempts shall be made to immediately enable switches to relight the pilot upon flare pilot outage indication.

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
004	Fugitive Emissions	Section B, 1. (EU-04) 401 KAR 63:020	Fugitive Emissions	N/A	N/A	No owner or operator shall allow any affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals, and plants.	Source is in compliance with 401 KAR 63:020 based on the rates of emissions of airborne toxics provided in the applications submitted by the source.
005	Steam Vents	Section B, 1. (EU-05) 401 KAR 63:020	Multiple	N/A	N/A	No owner or operator shall allow any affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals, and plants.	Source is in compliance with 401 KAR 63:020 based on the rates of emissions of airborne toxics provided in the applications submitted by the source.

Emission Unit #	Emission Unit Description	Applicable Regulation or Requirement	Pollutant	Emission Limit (if applicable)	Voluntary Emission Limit or Exemption (if applicable)	Operating Requirement or Limitation (if applicable)	Method of Determining Compliance with the Emission and Operating Requirement(s)
001 - 005 (Source-Wide)	Source-Wide (All Regulated Units)	Section D, 3.a. Section D, 3.b.	NOx	112.7 TPY	N/A	N/A	Permittee shall calculate and record daily actual emissions and total emissions for the previous 365-day period for all the emissions units listed in Section B of this permit. In place of the actual emission rates, the permittee may use worst-case emission estimates.
001 - 005 (Source-Wide)	Source-Wide (All Regulated Units)	Section D, 3.a. Section D, 3.b.	CO	99.5 TPY	N/A	N/A	Permittee shall calculate and record daily actual emissions and total emissions for the previous 365-day period for all the emissions units listed in Section B of this permit. In place of the actual emission rates, the permittee may use worst-case emission estimates.
001 - 005 (Source-Wide)	Source-Wide (All Regulated Units)	Section D, 3.a. Section D, 3.b.	VOC	31.1 TPY	N/A	N/A	Permittee shall calculate and record daily actual emissions and total emissions for the previous 365-day period for all the emissions units listed in Section B of this permit. In place of the actual emission rates, the permittee may use worst-case emission estimates.

Section V.2: Monitoring Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Monitored	Description of Monitoring
001	Hydrogen Reformer Flue Gas Stack	NO _x	Section B, 4.a. and b. 40 CFR 60, Appendix B, Performance Specification 2 40 CFR 60, Appendix F, Procedure 1	NO _x	NO _x emissions shall be monitored by a NO _x CEMS that complies with all provisions of 40 CFR 60, Appendix B, Performance Specification 2. NO _x CEMS shall comply with all provisions of 40 CFR 60, Appendix F, Procedure 1, Quality Assurance Requirements for Gas Continuous Emission Monitoring Systems used in Compliance Determination.
001	Hydrogen Reformer Flue Gas Stack	H ₂ S	Section B, 4.c. Section B, 4.c.i.	H ₂ S	As specified in the H ₂ S Alternative Monitoring Plan approved by USEPA Region IV in a letter dated December 30, 2003, detector tubes shall be used to measure the H ₂ S concentration of the feed stream (natural gas and recycle hydrogen) exiting the first of two hydrogenator/desulfurizer beds located upstream of the hydrogen reformer furnace. Random H ₂ S detector tube samples shall be collected on a semi-annual basis with a minimum of three months between samples.
002	Condensate Stripper	N/A	Section B, 4 (EU-02)	N/A	None
003	Flare	N/A	Section B, 4.a. (EU-03) 401 KAR 52:020, Section 10	Presence of a pilot flame in the flare	The permittee shall install and maintain a thermocouple or any other equivalent device to continuously monitor the presence of a pilot flame in the flare.
003	Flare	Visible Emissions	Section B, 4.b (EU-03) 401 KAR 52:020, Section 10	Presence of visible emissions during daylight hours	The permittee shall perform a qualitative visual observation of the flare at least once per month during daylight hours. If visible emissions are observed, an inspection shall be initiated to determine the cause and repairs made as necessary. After repair, if visible emissions are still observed, the permittee may determine compliance using EPA Reference Method 22.
003	Flare	N/A	Section B, 4.c. (EU-03) 401 KAR 52:020, Section 10	Date and time of a flaring event and volume of each gas vented to the flare	The permittee shall install, operate, and maintain a monitoring system for each vent connected to the flare to measure and record the date and time of a flaring event and the volume of each gas vented to the flare.
004	Fugitive Emissions	Fugitive Emissions	Section B, 4. (EU-04)	N/A	None

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Monitored	Description of Monitoring
005	Steam Vents	N/A	Section B, 4. (EU-05)	N/A	None



1

Section V.3: Recordkeeping Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Recorded	Description of Recordkeeping
001	Hydrogen Reformer Flue Gas Stack	N/A	Section B, 5.a. 401 KAR 52:020, Section 10	Daily Heat Input (mmBtu/hr)	Permittee shall maintain records of the daily heat input in mmBtu/hr and the calculated 365-day rolling average heat input to the Hydrogen Reformer.
001	Hydrogen Reformer Flue Gas Stack	NO _x , VOC, CO	Section B, 5.b. 401 KAR 52:020, Section 10	Daily calculated 365-day rolling total emissions	Permittee shall maintain records of the daily calculated 365-day rolling total emissions of NO _x , VOC, and CO from the Hydrogen Reformer Flue Gas Stack.
001	Hydrogen Reformer Flue Gas Stack	SO ₂ and PM ₁₀	Section B, 5.c. 401 KAR 52:020, Section 10	Daily calculated 365-day rolling total emissions	Permittee shall maintain records of the daily calculated 365-day rolling total emissions of SO ₂ and PM ₁₀ from the Hydrogen Reformer Flue Gas Stack.
001	Hydrogen Reformer Flue Gas Stack	H ₂ S	Section B, 5.d. 401 KAR 52:020, Section 10	H ₂ S Alternative Monitoring Plan Sampling Results	Permittee shall maintain records of the H ₂ S Alternative Monitoring Sampling Results.
001	Hydrogen Reformer Flue Gas Stack	Multiple (NO _x , VOC, CO, SO ₂ , PM ₁₀)	Section B, 5.e. 40 CFR 63.7555 40 CFR 63.7560 40 CFR 63.10	Records specified in regulatory citations listed herein	Permittee shall keep records in accordance with 40 CFR 63.7555, 40 CFR 63,7560, and 40 CFR 63.10.
002	Condensate Stripper	N/A	Section B, 5.a. (EU-02)	Daily records of hydrogen production and calculated 365-day rolling total hydrogen production	The permittee shall maintain daily records of hydrogen production and the calculated 365-day rolling total hydrogen production.
002	Condensate Stripper	VOC and CO	Section B, 5.b. (EU-02)	Daily records of the calculated 365-day rolling total VOC and CO emissions; VOC and CO emission factors developed from the most recent performance test	The permittee shall maintain daily records of the calculated, 365-day rolling total VOC and CO emissions (tpy) from the Condensate Stripper Vent, using the calculated 365-day rolling total hydrogen production and the VOC and CO emission factors (lb/mmcf of hydrogen production) developed from the most recent performance test.
003	Flare	N/A	Section B, 5.a. (EU-03)	Date, time, and duration of each flaring event	The permittee shall keep record of date, time, and duration of each flaring event.

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Recorded	Description of Recordkeeping
003	Flare	N/A	Section B, 5.b. (EU-03)	Records of equipment inspections and any maintenance, inspection, calibration, or replacement of such equipment	The permittee shall keep records of all equipment inspections and any maintenance, inspection, calibration, and/or replacement of such equipment required by Section B, 4 (EU-03). Records shall be available for inspection upon request.
003	Flare	NO _x , VOC, CO	Section B, 5.c. (EU-03)	Daily records of the calculated 365-day rolling total NO _x , VOC, and CO emissions from the flare.	The permittee shall maintain daily records of the calculated 365-day rolling total NO _x , VOC, and CO emissions from the flare.
003	Flare	N/A	Section B, 5.d.i.-iii. (EU-03)	Documentation if a flaring event was due to startup, shutdown, or malfunction. Volume of waste gas vented to the flare and plant process where the waste gas originated. Confirmation that the flare functioned properly (e.g., a flame was present).	The permittee shall keep the following operating records for each time period that flaring occurs: i. Documentation if the event was due to startup, shutdown, or malfunction. ii. Volume of waste gas vented to the flare and plant process where waste gas originated. iii. Confirmation that the flare functioned properly, i.e., a flame was present.
003	Flare	N/A	Section B, 5.e. (EU-03) 40 CFR 63.18(f)(3)	Net heating value of the gas being combusted by the flare.	The permittee shall keep record of the heat content calculations for the waste gas vented to the flare during a startup, a shutdown, process upset, and a product curtailment flaring event. The net heating value of the gas being combusted shall be determined by the methods specified in 40 CFR 63.18(f)(3).
004	Fugitive Emissions	Fugitive Emissions	Section B, 5. (EU-04)	Annual records of calculated VOC and CO emissions (tpy) from fugitive emission leaks.	The permittee shall maintain annual records of the calculated VOC and CO emissions (tpy) from fugitive equipment leaks. Emissions shall be based upon emission factors and estimated component counts. In place of actual emission rates, the permittee may use worst-case emission estimates.
005	Steam Vents	VOC	Section B, 5. (EU-05)	Annual records of calculated VOC (tpy) emissions from steam vents.	The permittee shall maintain annual records of the calculated VOC (tpy) emissions from steam vents. In place of actual emission rates, the permittee may use worst-case emission estimates.

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Recorded	Description of Recordkeeping
001 - 005 (Source-Wide)	Source-Wide (All Regulated Units)	Multiple (NO _x , VOC, CO, SO ₂ , PM ₁₀)	Section D, 3.c.	Documentation of emission calculations (used to demonstrate compliance)	The permittee shall retain documentation of emission calculations on site for a minimum of five years. The documentation shall be made available for inspection by the Division or USEPA upon request.

Section V.4: Reporting Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Reported	Description of Reporting
001	Hydrogen Reformer Flue Gas Stack	H ₂ S	Section B, 6.a. Section F, 5. and 6.	Semi-Annual H ₂ S Alternative Monitoring Plan Sampling Results	Summary of the H ₂ S Alternative Monitoring Plan sampling results shall be included in the semi-annual reports required in Section F.
001	Hydrogen Reformer Flue Gas Stack	N/A	Section B, 6.d.	Records specified in regulatory citations listed herein	The permittee shall submit notifications and reports as specified in 40 CFR 63.7545 and 40 CFR 63.7550.
001 - 005 (Source-Wide)	Source-Wide (All Regulated Units)	Multiple (NO _x , VOC, CO, SO ₂ , PM ₁₀)	Section D, 3.d. Section F, 5. and 6. 401 KAR 59:005, General Provisions, Section 3(3)	Semi-annual summary reports of any required monitoring	Summary reports of any monitoring required by this permit shall be submitted to the Regional Office listed on the front of this permit at least every six months during the life of this permit. Semi-annual reports are due by January 30th and July 30th of each year. All deviations from permit requirements shall be clearly identified in the reports.
001 - 005 (Source-Wide)	Source-Wide (All Regulated Units)	Multiple (NO _x , VOC, CO, SO ₂ , PM ₁₀)	Section F, 9. 401 KAR 52:020, Title V Permits, Section 21	Annual certification of compliance	The permittee shall annually certify compliance with the terms and conditions contained in this permit, by completing and returning a Compliance Certification Form (DEP 7007CC) (or an alternative approved by the Regional Office) to the Regional Office listed on the front of this permit and USEPA.
001 - 005 (Source-Wide)	Source-Wide (All Regulated Units)	Multiple (NO _x , VOC, CO, SO ₂ , PM ₁₀)	Section F, 10. 401 KAR 52:020	Annual emissions survey	The permittee shall provide the Division with all information necessary to determine its subject emissions within 30 days of the date of the Kentucky Emissions Inventory System (KYEIS) emissions survey is mailed to the permittee.

Section V.5: Testing Requirements

Emission Unit #	Emission Unit Description	Pollutant	Applicable Regulation or Requirement	Parameter Tested	Description of Testing
001	Hydrogen Reformer Flue Gas Stack	PM ₁₀ and CO	Section B, 3.b. 401 KAR 50:045	PM ₁₀ CO	Permittee shall perform a stack test for PM ₁₀ and CO emissions from the hydrogen reformer flue gas stack. Testing shall be conducted no later than five years from the date of the last performance test conducted to demonstrate compliance. Testing shall be performed in accordance with 401 KAR 50:045 using EPA Reference Methods 201A/202 and 10. The high heating value heat input (mmBtu/hr) rate of the fuel combusted by the reformer during the test shall be measured and reported. The emission factors for PM ₁₀ and CO in lb/mmBtu heat input (HHV) shall be reported in the test results.
002	Condensate Stripper	VOC and CO	Section B, 3. (EU-02) 401 KAR 50:045	VOC CO	Permittee shall perform a stack test for VOC and CO emissions from the Condensate Stripper stack. Testing shall be conducted no later than five years from the date of the last performance test conducted to demonstrate compliance. Testing shall be performed in accordance with 401 KAR 50:045 using EPA Reference Method 308. The Vent Gas Flow based on 34 MMscf hydrogen production per day (nominal) shall be measured and reported. The emission factors for VOC and CO in lb/mmBtu of hydrogen produced shall be reported in the test results.
003	Flare	N/A	Section B, 3. (EU-03) 401 KAR 50:015 401 KAR 50:045	N/A	Pursuant to 401 KAR 50:045, Section 1, performance testing using the Reference Methods specified in 401 KAR 50:015 shall be conducted if required by the Division.
004	Fugitive Emissions	Fugitive Emissions	Section B, 3. (EU-04) 401 KAR 50:015 401 KAR 50:045	N/A	Pursuant to 401 KAR 50:045, Section 1, performance testing using the Reference Methods specified in 401 KAR 50:015 shall be conducted if required by the Division.
005	Steam Vents	N/A	Section B, 3. (EU-05) 401 KAR 50:015 401 KAR 50:045	N/A	Pursuant to 401 KAR 50:045, Section 1, performance testing using the Reference Methods specified in 401 KAR 50:015 shall be conducted if required by the Division.

Section V.6: Notes, Comments, and Explanations

Eight insignificant activities identified in Section C of the current permit (V-18-004 R1) are not discussed explicitly in individual sections of this form, but are discussed herein. Monthly visible emission observations are conducted of the cooling tower and PM10 emissions for the cooling tower are calculated on a monthly and annual basis. Cold solvent degreaser(s) (parts washers) and catalyst loading comply with 401 KAR 63:020 and 401 KAR 63:010 during normal operation.

General Provisions identified in Section G of the current permit (V-18-004 R1) are not discussed explicitly in individual sections of this form.



Trey Grayson
Secretary of State

Certificate

I, Trey Grayson, Secretary of State for the Commonwealth of Kentucky, do hereby certify that the foregoing writing has been carefully compared by me with the original thereof, now in my official custody as Secretary of State and remaining on file in my office, and found to be a true and correct copy of

CERTIFICATE OF INCORPORATION FOR
AIR PRODUCTS AND CHEMICALS, INC. FILED ON JULY 13, 1961.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my
Official Seal at Frankfort, Kentucky, this 22nd day of January, 2007.



Tn6z

Trey Grayson
Secretary of State
Commonwealth of Kentucky
csorrell/0057241 - Certificate ID: 42499

57241-A

Commonwealth of Kentucky

Department of State



Office of Secretary of State

HENRY H. CARTER, SECRETARY

FOREIGN CORPORATION DEPARTMENT

I, HENRY H. CARTER, Secretary of State of the Commonwealth of Kentucky, hereby certify that certified copies of
Certificate of Incorporation

of AIR PRODUCTS AND CHEMICALS, INC.
Name of Corporation
a corporation of the State of Delaware, with home
Name of State
office at Wilmington, Delaware; have or has been filed in
Address
my office. This corporation has complied with the existing laws of the Commonwealth of Kentucky, and is now authorized to transact business in this State, subject to the restrictions imposed by law.



SECRETARY OF STATE

Given under my hand as Secretary of State,
this 15th day of July 1961

Henry H. Carter
Secretary of State
By J. J. Lyon
Assistant Secretary of State.

Appendix A

Emission Calculations

Air Products and Chemicals, Inc.
Potential Emissions Summary

EU #	Emission Source	Maximum Throughput		Maximum Potential Emission Factors												Units	Source of Emission Factor
				Total PM	PM10	PM2.5	NOx	CO	SO2	VOC	Methanol (HAP)	CO2	N2O	CH4	CO2e		
001-1	Hydrogen Reformer Flue Gas	455.0	MMBtu/hr	0.0050	0.0050	0.0050	0.0515	0.040	0.00036	0.0055						lb/MMBtu	Permits V-07-008 and V-07-008 R1 factors and Statement of Basis
001-2	Greenhouse Gas Emissions	1.4167	MMscf H2/hr									65,911	0.1240	1.2399	65,979	lb/MMscf H2	40 CFR 98 Subpart P
002	Condensate Stripper Vent	1.4167	MMscf H2/hr					1.238		3.06	2.77					lb/MMscf H2	Process knowledge and December 19, 2013 stack test results
003-1	Flare - Pilot Gas	1.00	hr/hr	0.00152	0.00152	0.00152	0.0200	0.0168	0.000120	0.00110						lb/hr emissions	AP-42 for natural gas combustion
003-2	Flare - Syngas (intermittent)	117.09	MMscf/yr				20.88	75.90		3.75	0.00299					lb/MMscf flared	February 25, 2010 APCI letter to KDAQ, March 3, 2009 Application (SO2)
003-3	Flare - PSA Purge Gas (intermittent)	2.190	MMscf/yr				18.88	215.47		10.63	0.0101					lb/MMscf flared	February 25, 2010 APCI letter to KDAQ, March 3, 2009 Application (SO2)
003-4	Flare - Hydrogen Gas (intermittent)	3,947.49	MMscf/yr				22.05	0.010								lb/MMscf flared	February 25, 2010 APCI letter to KDAQ, March 3, 2009 Application (SO2)
004	Fugitive Equipment Leaks	1.00	hr/hr					1.486		0.3943	0.0219					lb/hr emissions	US EPA SOCMi emission factors
005	Steam Vents	1.00	hr/hr							0.5436	0.5286					lb/hr emissions	July 10, 2012 Air Products submittal to KDAQ (response to NOD)
IA-01	Cooling Tower	60.00	thousand gal/hr	0.00208	0.00208	0.00208										lb/thousand gal	AP-42
IA-02	Analyzer Vents																
IA-03	Cold Solvent Degreaser(s) (parts washers)																
IA-04	Lube Oil Storage																
IA-05	Water Treatment Chemical Storage and Handling																
IA-06	Safety Relief Valves																
IA-07	Wastewater Sump																
IA-08	Catalyst Loading																

Air Products and Chemicals, Inc.
Potential Emissions Summary

EU #	Emission Source	Maximum Potential Emissions (ton/yr)											
		Total PM	PM10	PM2.5	NOx	CO	SO2	VOC	Methanol (HAP)	CO2	N2O	CH4	CO2e
001-1	Hydrogen Reformer Flue Gas	9.96	9.96	9.96	102.63	79.72	0.72	10.96					
001-2	Greenhouse Gas Emissions									408,977	0.77	7.7	409,399
002	Condensate Stripper Vent					7.68		18.99	17.19				
003-1	Flare - Pilot Gas	0.0067	0.0067	0.0067	0.0876	0.0736	0.00053	0.0048					
003-2	Flare - Syngas (intermittent)				1.22	4.44		0.220	1.75E-04				
003-3	Flare - PSA Purge Gas (intermittent)				0.021	0.236		0.0116	1.11E-05				
003-4	Flare - Hydrogen Gas (intermittent)				43.52	0.0197							
004	Fugitive Equipment Leaks					6.51		1.73	0.096				
005	Steam Vents							2.38	2.32				
IA-01	Cooling Tower	0.55	0.55	0.55									
IA-02	Analyzer Vents												
IA-03	Cold Solvent Degreaser(s) (parts washers)												
IA-04	Lube Oil Storage												
IA-05	Water Treatment Chemical Storage and Handling												
IA-06	Safety Relief Valves												
IA-07	Wastewater Sump												
IA-08	Catalyst Loading												

Maximum Potential Emissions (ton/yr)												
Total PM	PM10	PM2.5	NOx	CO	SO2	VOC	Methanol (HAP)	CO2	N2O	CH4	CO2e	
10.5	10.5	10.5	147.5	98.7	0.72	34.3	19.6	408,977	0.77	7.69	409,399	

Air Products - Catlettsburg Hydrogen Plant
Hydrogen Reformer Flue Gas Stack PTE Calculations

Operating Parameters:

Event: Firing of reformer furnace during operation of plant.
 Total firing rate = 455 MMBtu/hr (design capacity)
 Total annual reformer operating hours = 8,760 hr/yr

**Potential to Emit
 Emission Factors:**

Pollutant	Emission Factor		Basis
NOx	0.0515	lb/MMBtu	102.6 ton/yr based on predicted worst-case operating conditions per April 11, 2012 renewal application and as incorporated in V-12-043 Statement of Basis
CO	0.040	lb/MMBtu	Worst-case design per refinery application for permit VF-02-001, then specified in V-07-008 Statement of Basis
VOC	0.0055	lb/MMBtu	AP-42 Chapter 1.4 (7/98), incorporated in V-07-008
PM10	0.0050	lb/MMBtu	Testing at Air Products and Chemicals, Inc. Carson, CA H2 plant per March 3, 2009 minor revision application, incorporated in V-07-008 R1
SO2	0.00036	lb/MMBtu	Site-specific sulfur content data per March 3, 2009 minor revision application, incorporated in V-07-008 R1

Potential to Emit

Pollutant	Potential to Emit	
	lb/hr	tpy
NOx	23.43	102.6
CO	18.20	79.72
VOC	2.50	10.96
PM10	2.28	9.96
SO2	0.164	0.72

Note: Greenhouse gas emissions are calculated on a separate worksheet (Estimate of Greenhouse Gases PTE calculation sheet).

Methodology:

lb/hr = firing rate [MMBtu/hr] x emission factor [lb/MMBtu]

ton/yr = firing rate [MMBtu/hr] x emission factor [lb/MMBtu] x total operating time [hr/yr] / 2000 lb/ton

Air Products - Catlettsburg Hydrogen Plant

Condensate Stripper Vent PTE Calculations

Physical Characteristics: Estimated Height = 60 ft
Diameter = 0.25 ft
Temperature = 281 F max
Flow rate = 588 SCFM (Average Flow Rate Measured during May 22, 2019 Stack T
(5/13/2004 and 12/19/2013 Stack Test average flow rates were low

Latitude/Longitude: 38.383373 N / -82.598244 W

Operating Parameters: Event: Operation of condensate stripper during operation of hydrogen plant.
Design H2 production rate of plant = 34 MMscfd
Total annual stripper operating hours = 8,760 hr/yr

Emission Factors & Rates:

Basis
CO EF = 1.238 lb/MMscf H2 Process knowledge per 01/31/2007 APCI application
CO = 7.68 tpy (5/13/04, 12/19/13, and 5/22/19 test results were lower)
VOC EF = 3.06 lb/MMscf H2 12/19/2013 Condensate Stripper Vent stack test
VOC = 18.99 tpy (12/19/13 test result was higher than 01/31/2007 APCI application and 5/22/19 stack test result)
Methanol EF = 2.77 lb/MMscf H2 12/19/2013 Condensate Stripper Vent stack test
Methanol = 17.19 tpy (12/19/13 test result was higher than 01/31/2007 APCI application and 5/22/19 stack test result)

Potential to Emit

Pollutant	Total Mass Emission Rate	
	lb/hr	tpy
CO	1.75	7.68
VOC	4.34	18.99
Methanol	3.92	17.19

Methodology:

lb/hr = H2 production rate [MMscf/day] x [1 day / 24 hr] x emission factor [lb/MMscf]
ton/yr = H2 production rate [MMscf/day] x 365 day/yr x emission factor [lb/MMscf] / 2000 lb/ton

Air Products - Catlettsburg Hydrogen Plant

Flare Pilot PTE Calculations

Methodology:

AP-42 Chapter 1.4 (7/98) emission factors for natural gas combustion in small combustion units (< 100 MMBtu/hr) were used to calculate emissions.

Data:

Maximum hourly natural gas flow 200.0 scf/hr
Maximum operating hours 8,760 hrs/yr

Natural Gas Usage Rates:

Maximum hourly natural gas use 0.00020 10^6 scf/hr
Maximum annual natural gas use 1.75 10^6 scf/yr

Natural Gas Potential Emissions

Pollutant	Em. Factor (lb/ 10^6 scf)	Emissions	
		lb/hr	ton/yr
PM/PM ₁₀ ^a	7.6	0.00152	0.0067
CO ^b	84	0.0168	0.074
NOx ^b	100	0.0200	0.088
SO ₂ ^a	0.6	0.000120	0.00053
VOC ^a	5.5	0.00110	0.0048

^a From AP-42 Table 1.4-2 (7/98)

^b From AP-42 Table 1.4-1 (7/98) for small boilers (< 100 MMBTU/hr)

Equations:

Max annual natural gas [10^6 scf/yr] = Max hourly use [10^6 scf/hr] x Annual hours [hr/yr]

Lb/hr = Hourly natural gas use [10^6 scf/hr] x Em. factor [lb/ 10^6 ft³]

Ton/yr = Annual natural gas use [10^6 scf/yr] x Em. factor [lb/ 10^6 ft³] / 2000 lbs/ton

FLARE FLOW SUMMARY

Emission Point	Operating Scenario	Gas Stream	Flow (MMscf/yr)	Comments
Flare	Cold Startup - PSA Feedgas (Syngas)	Syngas	23.28	
Flare	Max Fire Trip - PSA Feed Gas (Syngas) Flaring	Syngas	73.05	Worst-case is case #1
Flare	Process Upset PSA Reduced Bed Mode - Excess PSA Feed Gas (Syngas) Flaring	Syngas	7.45	
Flare	Planned Shutdown - PSA Feed Gas (Syngas) Flaring	Syngas	6.65	
Flare	Shutdown - System Inventory Purging of PSA Feed Gas	Syngas	6.65	
Flare	TOTAL FOR GAS STREAM	Syngas	117.09	
Flare	Planned Shutdown - H2 Product Flaring	H2 Product	22.13	
Flare	Planned Customer Curtailment - H2 Product Flaring	H2 Product	3919.65	
Flare	Malfunction or Unplanned Customer Curtailment - H2 Product Flaring	H2 Product	5.71	
Flare	TOTAL FOR GAS STREAM	H2 Product	3947.49	
Flare	PSA Purge Gas Header Lost - Flare All PSA Purge Gas	PSA Purge Gas	2.190	
	TOTAL FOR GAS STREAM	PSA Purge Gas	2.190	
Flare	Mix - Tee Manual Vent Flaring Feedgas	Syngas - not worst case		
Flare	Minimum Fire Trip	No flaring		No flaring

Air Products - Catlettsburg Hydrogen Plant

Fugitive CO PTE Calculations

SOCMI Average Emission Factors (Table 2-1 on page 2-12 of EPA-453/R-95-017, "Protocol for Equipment Leak Emission Estimates," Nov. 1995)

Equipment Type	Service	Emission Factor, kg/hr/source ^a
Valves	Gas	0.00597
Valves	Light liquid	0.00403
Valves	Heavy liquid	0.00023
Pump seals ^b	Light liquid	0.0199
Pump seals ^b	Heavy liquid	0.00862
Compressor seals	Gas	0.228
Pressure relief valves	Gas	0.104
Connectors	All	0.00183
Open-ended lines	All	0.0017
Sampling connections	All	0.0150

^aThese factors are for total organic compound emission rates.

^bThe light liquid pump seal factor can be used to estimate the leak rate from agitator seals.

Total CO Fugitive Emission Rates

Component Category	Process Unit	No. of Components	Emission Factor		CO Weight Fraction	Uncontrolled Total Emission	
			kg/hr/ component	lb/hr/ component		lb/hr	tpy
Valves - gas	Syngas upstream of HTS	0	0.00597	0.01316	0.1970	0	0
	Syngas downstream of HTS	82	0.00597	0.01316	0.1016	0.110	0.480
	PSA purge gas	110	0.00597	0.01316	0.1158	0.168	0.735
	Stripper overhead	3	0.00597	0.01316	0.0040	0.000	0.001
	Relief header to flare	0	0.00597	0.01316	0	0	0
Compressor seals - gas	Syngas upstream of HTS	0	0.228	0.503	0.1970	0	0
	Syngas downstream of HTS	0	0.228	0.503	0.1016	0	0
	PSA purge gas	0	0.228	0.503	0.1158	0	0
	Stripper overhead	0	0.228	0.503	0.0040	0	0
	Relief header to flare	0	0.228	0.503	0	0	0
Pressure relief valves - gas	Syngas upstream of HTS	0	0.104	0.229	0.1970	0	0
	Syngas downstream of HTS	12	0.104	0.229	0.1016	0.279	1.224
	PSA purge gas	7	0.104	0.229	0.1158	0.186	0.814
	Stripper overhead	2	0.104	0.229	0.0040	0.002	0.008
	Relief header to flare	0	0.104	0.229	0	0	0
Connectors - all	Syngas upstream of HTS	0	0.00183	0.00404	0.1970	0	0
	Syngas downstream of HTS	216	0.00183	0.00404	0.1016	0.089	0.388
	PSA purge gas	269	0.00183	0.00404	0.1158	0.126	0.551
	Stripper overhead	12	0.00183	0.00404	0.0040	0.000	0.001
	Relief header to flare	0	0.00183	0.00404	0	0	0
Open-ended lines - all	Syngas upstream of HTS	0	0.0017	0.0037	0.1970	0	0
	Syngas downstream of HTS	0	0.0017	0.0037	0.1016	0	0
	PSA purge gas	0	0.0017	0.0037	0.1158	0	0
	Stripper overhead	0	0.0017	0.0037	0.0040	0	0
	Relief header to flare	0	0.0017	0.0037	0	0	0
Sampling connections - all	Syngas upstream of HTS	1	0.0150	0.0331	0.1970	0.007	0.029
	Syngas downstream of HTS	4	0.0150	0.0331	0.1016	0.013	0.059
	PSA purge gas	3	0.0150	0.0331	0.1158	0.011	0.050
	Stripper overhead	1	0.0150	0.0331	0.0040	0.000	0.001
	Relief header to flare	0	0.0150	0.0331	0	0	0
TOTAL		722				0.991	4.340
TOTAL w/ 50% safety factor						1.486	6.510

Air Products - Catlettsburg Hydrogen Plant

Fugitive VOC and Methanol PTE Calculation

SOCMI Average Emission Factors (Table 2-1 on page 2-12 of EPA-453/R-95-017, "Protocol for Equipment Leak Emission Estimates," Nov. 1995)

Equipment Type	Service	Emission Factor, kg/hr/source ^a
Valves	Gas	0.00597
Valves	Light liquid	0.00403
Valves	Heavy liquid	0.00023
Pump seals ^b	Light liquid	0.0199
Pump seals ^b	Heavy liquid	0.00862
Compressor seals	Gas	0.228
Pressure relief valves	Gas	0.104
Connectors	All	0.00183
Open-ended lines	All	0.0017
Sampling connections	All	0.0150

^aThese factors are for total organic compound emission rates.

^bThe light liquid pump seal factor can be used to estimate the leak rate from agitator seals.

Total VOC and Methanol Fugitive Emission Rates: (Per condensate stripper vent PTE calculations, 85% of the VOCs are speciated as methanol)

Component Category	Process Unit	No. of Components	Emission Factor		VOC Weight Fraction	Methanol Weight Fraction	Uncontrolled Total VOC		Uncontrolled Methanol	
			kg/hr/component	lb/hr/component			lb/hr	tpy	lb/hr	tpy
Valves - gas	NG fuel	93	0.00597	0.01316	0.0297	0	0.036	0.159		
	NG feed up to steam addition	102	0.00597	0.01316	0.0297	0	0.040	0.175		
	NG feed after steam addition	1	0.00597	0.01316	0.0069	0	0.000	0.000		
	Stripper overhead	3	0.00597	0.01316	0.0297	0.02525	0.0012	0.005	0.0010	0.004
Compressor seals - gas	Relief header to flare	0	0.00597	0.01316	0	0	0	0		
	NG fuel	0	0.228	0.503	0.0297	0	0	0		
	NG feed up to steam addition	2	0.228	0.503	0.0297	0	0.030	0.131		
	NG feed after steam addition	0	0.228	0.503	0.0069	0	0	0		
Pressure relief valves - gas	Stripper overhead	0	0.228	0.503	0.0297	0.02525	0	0	0.0000	0
	Relief header to flare	0	0.228	0.503	0	0	0	0		
	NG fuel	4	0.104	0.229	0.0297	0	0.027	0.119		
	NG feed up to steam addition	7	0.104	0.229	0.0297	0	0.048	0.209		
Connectors - all	NG feed after steam addition	1	0.104	0.229	0.0069	0	0.002	0.007		
	Stripper overhead	2	0.104	0.229	0.0297	0.02525	0.0136	0.060	0.0116	0.051
	Relief header to flare	0	0.104	0.229	0	0	0	0		
	NG fuel	223	0.00183	0.00404	0.0297	0	0.027	0.117		
Open-ended lines - all	NG feed up to steam addition	251	0.00183	0.00404	0.0297	0	0.030	0.132		
	NG feed after steam addition	5	0.00183	0.00404	0.0069	0	0.000	0.001		
	Stripper overhead	12	0.00183	0.00404	0.0297	0.02525	0.0014	0.006	0.0012	0.005
	Relief header to flare	0	0.00183	0.00404	0	0	0	0		
Sampling connections - all	NG fuel	1	0.0017	0.0037	0.0297	0	0.000	0.000		
	NG feed up to steam addition	14	0.0017	0.0037	0.0297	0	0.002	0.007		
	NG feed after steam addition	1	0.0017	0.0037	0.0069	0	0.000	0.000		
	Stripper overhead	0	0.0017	0.0037	0.0297	0.02525	0	0	0.0000	0
TOTAL	Relief header to flare	0	0.0017	0.0037	0	0	0	0		
	NG fuel	2	0.0150	0.0331	0.0297	0	0.002	0.009		
	NG feed up to steam addition	2	0.0150	0.0331	0.0297	0	0.002	0.009		
	NG feed after steam addition	1	0.0150	0.0331	0.0069	0	0.000	0.001		
TOTAL w/ 50% safety factor	Stripper overhead	1	0.0150	0.0331	0.0297	0.02525	0.0010	0.004	0.0008	0.004
	Relief header to flare	0	0.0150	0.0331	0	0	0	0		
		727					0.2629	1.151	0.0146	0.064
							0.3943	1.727	0.0219	0.096

Air Products and Chemicals, Inc.
Catlettsburg, KY H2 Plant
Emission Unit 05 - Multiple Steam Vents

STEAM EMISSIONS SUMMARY

Type of Steam Vent	Operating Scenario	Maximum Emissions (ton/yr)	
		VOC	Methanol
Main Steam Vent	Normal plant operation. Assume steam will be continuously emitted from the steam vent due to pressure corrections and leaking valve.	0.3942	0.3668
Main Steam Vent	Steam may be emitted from this vent during scenarios such as startup, shutdown, and maintenance (SSM), and customer curtailment of steam take.	0.4239	0.3945
Main Steam Vent	Steam may be emitted from this vent during scenarios such as process upset (e.g., PSA purge gas header lost).	0.4239	0.3945
Combined Steam Blowdown Standpipe Vent	Atmospheric flashing of steam from continuous blowdown from the steam drum (C712) and the process gas boiler (E301). Venting is through the vent at the top of the combined blowdown standpipe.	0.7509	0.7490
Combined Steam Blowdown Standpipe Vent	Atmospheric flashing of steam from intermittent blowdown from the process gas boiler (E301)	0.7403	0.7384
Mix-Tee Vent	Discharge of steam to atmosphere from the Mix-Tee vent during cold and hot startups	0.0363	0.0338
Steam Drum Sample Coolers	Steam will be emitted from this vent when an operator manually collects steam condensate samples.	0.0057	0.0053
	Total	2.3810	2.3154

Catlettsburg, KY Hydrogen Plant

Estimate of Greenhouse Gases PTE

Based on a review of natural gas use from 2011 to 2021, calendar year 2011 had the highest GHG PTE, and this data was conservatively applied herein.

For the GHG emissions calculations, the CY 2011 design H2 production rate with a 10% safety factor was applied:

			<u>Lb/MMscf</u>	
Max PTE CO2 Emissions	371,797.45 Tonnes	408,977 Tons	65,911	59,319.82 90% Lb/MMscf
Max PTE CH4 Emissions	6.99 Tonnes	7.69 Tons	1.240	
Max PTE N2O Emissions	0.70 Tonnes	0.77 Tons	0.1240	
Max PTE CO2e Emissions	372,180.68 Tonnes	409,399 Tons	65,979	93,470 lbs CO2e/hr

Greenhouse gas (GHG) emissions are expressed as CO2 equivalent (CO2e) using the global warming potentials (GWP) of each gas. GWP taken from 40 CFR 98 Subpart A Table A-1. GWP of CO2 = 1, GWP of methane (CH4) = 25, GWP of nitrous oxide (N2O) = 298.

Methodology: Max PTE Emissions = CY2011 Emissions (as calculated per 40 CFR 98 Subpart P below) x (Design H2 Production / CY2011 H2 Production) x 1.10

Estimate of 2011 GHG Emissions

Total Natural Gas Use: 3,881 mmscf
3,982,214 mmBTU

as Reformer Trim Fuel: 945 mmscf
aka "Fuel Combustion" 969,929 mmBTU

as Reformer Feedgas: 2,935 mmscf
aka "Industrial Process" 3,011,310 mmBTU

CY2011 Hydrogen Production: 7,772.40 mmscf

CO2 Emissions

from Fuel Combustion	51,573 metric tonnes	6.64 tonnes per mmscf H2 produced
from Industrial Process	160,116 metric tonnes	20.60 tonnes per mmscf H2 produced

CH4 Emissions

from Fuel Combustion	3.98 metric tonnes	0.00051 tonnes per mmscf H2 produced
from Industrial Process	NA	

Methane emission from combustion needs to include both the natural gas used as reformer trim fuel and as feedgas.

N2O Emissions

from Fuel Combustion	0.3981 metric tonnes	0.0000512 tonnes per mmscf H2 produced
from Industrial Process	NA	

Catlettsburg H2 Facility Design H2 Production:

34 MMSCF/Day
12,410.00 MMSCF/Year

40 CFR Part 98: Table C-1 of Subpart C - Default High Heat Values and CO2 Emission Factors

Pipeline Natural Gas	1026.00 BTU/scf	117.0 lbs CO2 / mmBTU
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40 CFR Part 98: Table C-2 of Subpart C - Default CH4 and N2O Emission Factors

Pipeline Natural Gas	0.0022 lbs CH4 / mmBTU	0.00022 lbs N2O / mmBTU
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Air Products - Catlettsburg Hydrogen Plant Cooling Tower PTE

Circulating water flow (gpm)	1,000
Maximum annual operation (hr/yr)	8,760
Annual circulating water flow (10 ⁶ gals/yr)	525.60
Worst-case drift (% of flow)	0.0050
Density (lb/gal)	8.30
Total Liquid Drift (lb/10 ³ gal)	0.415
TDS in circulating water (ppm)	5,000
PM/PM10 emission factor (lb/10 ³ gal)	0.00208

Notes:

PM/PM10 (lb/hr) = {Flow (gal/min) x 60 min/hr / 10³} x Drift (lb/10³ gal) x {(TDS (ppm) / 10⁶)}

PM emissions equation based on AP-42 Chapter 13.4 - Wet Cooling Towers (1/95)

Design flow from vendor. TDS in circulating water is maximum design (upper limit).

PM/PM₁₀ Emissions	0.125	lbs/hr
	1091	lbs/yr
	0.55	tons/yr

Appendix B

Emissions References

- 2009 Documentation of Reformer SO₂ Emission Factor
- February 25, 2010 Letter Documenting Flare Emission Factors
- December 19, 2013 Condensate Stripper Stack Test
- May 22, 2019 Condensate Stripper Stack Test

2009 Documentation of Reformer SO₂ Emission Factor

**3 March 2009 Minor Permit Revision Application
Air Products and Chemicals, Inc., Catlettsburg, KY Hydrogen Plant
Title V Operating Permit V-07-008**

**Proposed SO₂ Emission Factor for Compliance Demonstration:
0.00036 lb/MMBtu heat input (HHV)**

What SO₂ Emission Factor Are We Proposing?

1. The Air Products Catlettsburg Hydrogen Plant steam methane reformer ("Hydrogen Reformer," "reformer," or "reformer furnace") SO₂ emission factor in the current Air Quality Permit (Permit ID: V-07-008; Issuance Date: 10/15/07) ("permit") is 0.0006 lb/MMBtu heat input (HHV), which was a carryover from the Catlettsburg Refinery's ("refinery") original permit. The reformer individual source SO₂ emission limit of 1.1 tpy is a carryover from the refinery's original permit. This 1.1 tpy SO₂ emission limit reflects a total reformer heat input of 401 MMBtu/hr (HHV), which is a carryover from the refinery's original permit. It does not reflect the 455 MMBtu/hr (HHV) that was the basis for our 1/31/07 Hydrogen Plant permit carve-out application.
2. Air Products is requesting that for Emission Unit #01, "Hydrogen Reformer," in Section B of the current permit, the Compliance Demonstration Method for SO₂ be changed to reflect a more accurate SO₂ emission factor of 0.00036 lb/MMBtu heat input (HHV).

Reformer Fuels

1. Refinery fuel gas (RFG) is not used in the Hydrogen Plant.
2. During normal operation, the reformer fires two fuels simultaneously, pressure swing adsorption (PSA) purge gas as the primary fuel and commercial pipeline natural gas as the supplemental, or trim, fuel. The PSA purge gas is sulfur-free.
3. A third possible fuel is syngas, which is the inlet feed gas to the PSA unit. Under the abnormal operating scenario of losing the PSA purge gas due to equipment malfunction, the syngas could be temporarily used in place of the PSA purge gas fuel if the reformer needed to be kept operating in order to continue to supply steam to the Refinery. The syngas is sulfur-free.

Why PSA Purge Gas is Sulfur-Free?

1. The PSA purge gas (and the syngas) is a byproduct of the hydrogen production process; and is inherently sulfur-free due to the nature of the process. This sulfur-free condition is stable.
2. The PSA purge gas (and the syngas) is sulfur-free due to hydrogenation and desulfurization of the process feed (i.e., commercial pipeline natural gas) upstream of the reformer.
3. The process feed to the reformer must be kept sulfur-free so as to prevent the permanent poisoning (and hence deactivation) of the reformer catalyst.
4. The reformer catalyst supplier typically specifies a not-to-exceed hydrogen sulfide (H₂S) level in the inlet process feed gas to the reformer.
5. Therefore, Air Products has very significant economic and operational incentives to protect the reformer catalyst by maintaining the sulfur-free condition of the process feed to the reformer.
6. Air Products has a written Best Practice that prescribes monitoring of H₂S around the hydrogenation/desulfurization beds to be sure that H₂S is not breaking through. This monitoring is done on a monthly basis using Dräger (or equal) H₂S detector tubes.
7. Also, two times per day, the H₂ Plant operators visually inspect the exterior surfaces of the catalyst-filled reformer tubes for any signs that would indicate a process issue such as poisoning of the reformer catalyst.

3 March 2009 Minor Permit Revision Application
Air Products and Chemicals, Inc., Catlettsburg, KY Hydrogen Plant
Title V Operating Permit V-07-008

8. As required by the permit (Section B, Emission Unit: 01, Item 1), a H₂S Alternative Monitoring Plan ("AMP") has been developed and implemented for the Hydrogen Reformer. The H₂S monitoring required by the AMP and voluntary supporting monitoring have demonstrated over the life of the Hydrogen Plant, which began commercial operation in November 2003, that the PSA purge gas is sulfur-free. All of our monitoring to date has shown results of less than the lower detection range of the Drager tubes. We are currently using a Drager tube with a range of 0.2 to 5 ppmv. We are not aware of a Drager tube that has a low-end detection range of zero.

Basis for Proposed SO₂ Emission Factor Supporting Calculations

1. During normal operation, the PSA purge gas fuel contributes 50% of the total heat input to the reformer; and the commercial pipeline natural gas fuel contributes 50% of the total heat input to the reformer. [based on evaluation of Catlettsburg Hydrogen Plant operating data by our Global Operations Plant Efficiency Group]
2. Typical heat content of the PSA purge gas is 277 Btu/scf (HHV). [based on evaluation of Catlettsburg Hydrogen Plant operating data by our Global Operations Plant Efficiency Group]
3. The SO₂ emission factor for combustion of natural gas is assumed to be 0.0006 lb/MMBtu (HHV). [based on EPA AP-42, Table 1.4-2, 7/98]
4. H₂S level in PSA purge gas is less than 0.2 ppmv. Conservatively assume this H₂S level is the sulfur level in PSA purge gas. [based on monitoring results in conjunction with the Catlettsburg Hydrogen Plant H₂S Alternative Monitoring Plan]
5. Since the heating value of the syngas would be slightly higher than PSA purge gas's heating value of 277 Btu/scf (due to the presence of hydrogen), the supporting calculations below should conservatively cover the infrequent operating case of using syngas rather than PSA purge gas as the primary fuel to the reformer.

Supporting Calculations for SO₂ Emission Factor

For the following calculations, "MM" represents million and "MMBtu" represents 10⁶ Btu heat input (higher heating value (HHV) basis) to the reformer.

• **PSA Purge Gas (PG) SO₂ Emission Factor**

$$10^6 \text{ Btu/MMBtu} / 277 \text{ Btu/scf PSA PG} = 3610.1 \text{ scf PSA PG/MMBtu}$$

$$\text{SO}_2 \text{ Emission Factor} = 0.2 \text{ lbmol S/MMlbmol PSA PG} * 1 \text{ MM}/10^6 * 3610.1 \text{ scf PSA PG/MMBtu} * 1 \text{ lbmol}/379.35 \text{ scf} * 1 \text{ lbmol SO}_2/\text{lbmol S} * 64.06 \text{ lb SO}_2/\text{lbmol SO}_2 = 0.00012 \text{ lb SO}_2/\text{MMBtu}$$

• **Natural Gas SO₂ Emission Factor**

$$\text{SO}_2 \text{ Emission Factor} = 0.0006 \text{ lb SO}_2/\text{MMBtu}$$

• **Net SO₂ Emission Factor**

$$\text{Net SO}_2 \text{ Emission Factor, lb SO}_2/\text{MMBtu} = \{[(\text{PSA PG EF, lb SO}_2/\text{MMBtu}) * (\text{Total HI, MMBtu}) * (\text{PSA PG split \%})] + [(\text{NG EF, lb SO}_2/\text{MMBtu}) * (\text{Total HI, MMBtu}) * (\text{NG split \%})]\} / \text{Total HI, MMBtu}$$

**3 March 2009 Minor Permit Revision Application
Air Products and Chemicals, Inc., Catlettsburg, KY Hydrogen Plant
Title V Operating Permit V-07-008**

Where:

EF = emission factor, lb SO₂/MMBtu heat input (HHV)

HI = reformer heat input, MMBtu (HHV)

NG = natural gas

PSA PG = PSA purge gas

Split % = % of reformer total heat input contributed by the respective fuel (using % value expressed as a fraction)

Using a conservative reformer total heat input split of 50% from PSA purge gas and 50% from natural gas:

Net SO₂ Emission Factor = $\{[(0.00012 \text{ lb SO}_2/\text{MMBtu}) * (\text{Total HI, MMBtu}) * (0.50)] + [(0.0006 \text{ lb SO}_2/\text{MMBtu}) * (\text{Total HI, MMBtu}) * (0.50)]\} / \text{Total HI, MMBtu} = 0.00036 \text{ lb SO}_2/\text{MMBtu}$

Proposed Compliance Demonstration Method

The permittee shall calculate for each day, in tons per year, the 365-day rolling sum emission of SO₂. Emissions of SO₂ shall be based upon an emission factor of 0.00036 lb/MMBtu heat input (HHV).

25 February 2010 Letter Documenting Flare Emission Factors



Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195-1501
Telephone (610) 481-4911

Certified Mail

Article Number: 7106 4575 1292 6301 7415

25 February 2010

Ms. Melissa Duff, Supervisor
Emissions Inventory Section
Kentucky Department for Environmental Protection
Division for Air Quality, Program Planning and Admin Branch
200 Fair Oaks Lane, 1st Floor
Frankfort, Kentucky 40601-1403

RE: CY2009 Emissions Inventory Survey
Documentation of Changes to Emission Factors
Air Products and Chemicals, Inc. - Catlettsburg Hydrogen Plant
Facility ID: 2101900117 AI ID: 83915
Title V Operating Permit V-07-008 R1

Dear Ms. Duff:

On 25 February 2010 I completed the CY2009 Emissions Inventory Survey for our above referenced facility via use of the KY DAQ Web-Survey. In completing the online survey it was necessary to make changes to several emission factors, as were included on the "Pollutants and Control" tab of the survey. This correspondence now provides a description of the changes and supporting documentation. The attached Table 1 provides a summary of the changed emission factors.

Equipment ID: COMB1
Hydrogen Reformer Flue Gas Stack

In accordance with our Title V operating permit, the reformer furnace NO_x emissions are monitored by a NO_x continuous emission monitoring system (CEMS) that complies with all provisions of 40 CFR 60 Appendix B, Performance Specification 2. The original NO₂ emission factor was listed in the Web-Survey as 0.0596 lbs NO₂ / MMBTU heat input. I have changed that factor to 0.036 lbs NO₂ / MMBTU. This change is based on CY2009 NO_x CEMS data indicating that 46.6 tons of NO_x were emitted per a total annual reformer heat input of 2,598,087 MMBTU. Attachment A provides a summary of the reformer furnace emissions, including NO_x and total Heat Input.

Equipment ID: EQPT2,03

Flare Pilot and Process Vent Gases

This industrial flare is used only for the thermal destruction of the following 3 process gases that are generated within our hydrogen manufacturing process:

Process ID2: Syngas

The flaring of syngas results in emissions of CO, NO_x, and VOC.

- The original CO emission factor was listed as 3.7961 lbs/MMSCF.
It has been changed to 75.90 lbs/MMSCF.
- The original NO_x emission factor was listed as 0.020875 lbs/MMSCF.
It has been changed to 20.88 lbs/MMSCF.
- The original VOC emission factor was listed as 0.3751 lbs/MMSCF.
It has been changed to 3.75 lbs/MMSCF.

Attachment B. provides emission equations for the flaring of syngas, showing the derivation of the above emission factors.

Process ID3: PSA Purge Gas

The flaring of purge gas results in emissions of CO, NO_x, and VOC.

- The original CO emission factor was listed as 10.7769 lbs/MMSCF.
It has been changed to 215.47 lbs/MMSCF.
- The original NO_x emission factor was listed as 0.019224 lbs/MMSCF.
It has been changed to 18.88 lbs/MMSCF.
- The original VOC emission factor was listed as 1.0615 lbs/MMSCF.
It has been changed to 10.63 lbs/MMSCF.

Attachment C. provides emission equations for the flaring of purge gas, showing the derivation of the above emission factors.

Process ID4 Hydrogen Gas

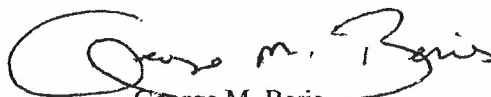
The flaring of hydrogen results in emissions of only CO and NO_x.

- The original CO emission factor was listed as 0.0004 lbs/MMSCF.
It has been changed to 0.01 lbs/MMSCF.
- The original NO_x emission factor was listed as 0.022241 lbs/MMSCF.
It has been changed to 22.05 lbs/MMSCF.

Attachment D. provides emission equations for the flaring of hydrogen, showing the derivation of the above emission factors.

Please contact me at (610) 481-4486, or eMail at berisgm@airproducts.com if you have any questions or concerns regarding these emissions factor changes.

Sincerely,



George M. Beris
Principal Environmental Specialist
Air Products and Chemicals, Inc.

CY2009 Emissions Inventory Survey: Emission Factor Changes

Air Products and Chemicals, Inc. - Catlettsburg Hydrogen Plant

Facility ID: 2101900117 AI ID: 83915

Title V Operating Permit V-07-008 R1

Table 1

Documentation of Changed Emission Factors

Table 1: Air Products and Chemicals, Inc. - Catlettsburg Hydrogen Plant, Facility ID: 2101900117
CY 2009 KY DAQ Web Survey – Documentation of Changed Emission Factors (GM Beris 24 February 2010)

Equipment ID	Equipment Description	Process ID	Process Description	Pollutant	Original Emission Factor	Changed Emission Factor	SCC Units Description	Comments
COMB1,01	Hydrogen Reformer Flue Gas Stack	1	H2 reformer (Report MMBTU/yr)	NO2 (Nitrogen Dioxide)	0.0596	0.036	Each Material Processed	The 0.036 lbs NOx / MMBTU emission factor is based on CY2009 NOx CEMS data of 46.6 tons NOx emitted per total heat input of 2,598,087 MMBTU. The CY2009 reformer furnace emission report is provided as Attachment A.
EQPT2,03	Flare Pilot and Process Vent Gases	2	Syngas	CO (Carbon Monoxide)	3.7961	75.90	Million Cubic Feet Process Gas Burned	Derivation of the changed emission factor is provided in Attachment B.
EQPT2,03	Flare Pilot and Process Vent Gases	2	Syngas	NO2 (Nitrogen Dioxide)	0.020875	20.88	Million Cubic Feet Process Gas Burned	Derivation of the changed emission factor is provided in Attachment B.
EQPT2,03	Flare Pilot and Process Vent Gases	2	Syngas	VOC (Volatile Organic)	0.3751	3.75	Million Cubic Feet Process Gas Burned	Derivation of the changed emission factor is provided in Attachment B.

Equipment ID	Equipment Description	Process ID	Process Description	Pollutant	Original Emission Factor	Changed Emission Factor	SCC Units Description	Comments
EQPT2,03	Flare Pilot and Process Vent Gases	3	PSA Purge Gas	CO (Carbon Monoxide)	10.7769	215.47	Million Cubic Feet Process Gas Burned	Derivation of the changed emission factor is provided in Attachment C.
EQPT2,03	Flare Pilot and Process Vent Gases	3	PSA Purge Gas	NO2 (Nitrogen Dioxide)	0.019224	18.88	Million Cubic Feet Process Gas Burned	Derivation of the changed emission factor is provided in Attachment C.
EQPT2,03	Flare Pilot and Process Vent Gases	3	PSA Purge Gas	VOC (Volatile Organic)	1.0615	10.63	Million Cubic Feet Process Gas Burned	Derivation of the changed emission factor is provided in Attachment C.
EQPT2,03	Flare Pilot and Process Vent Gases	4	Hydrogen Gas	CO (Carbon Monoxide)	0.0004	0.01	Million Cubic Feet Process Gas Burned	Derivation of the changed emission factor is provided in Attachment D.
EQPT2,03	Flare Pilot and Process Vent Gases	4		NO2 (Nitrogen Dioxide)	0.022241	22.05	Million Cubic Feet Process Gas Burned	Derivation of the changed emission factor is provided in Attachment D.

CY2009 Emissions Inventory Survey: Emission Factor Changes

Air Products and Chemicals, Inc. - Catlettsburg Hydrogen Plant

Facility ID: 2101900117 AI ID: 83915

Title V Operating Permit V-07-008 R1

ATTACHMENT A

**Equipment ID: COMB1
Hydrogen Reformer Flue Gas Stack**

Summary of CY2009 reformer furnace emissions,
including NOx and total Heat Input.

ANNUAL HYDROGEN REFORMER FURNACE EMISSIONS
PAGE 1

COMPANY NAME: Air Products and Chemicals, Inc.
 LOCATION: Catlettsburg, KY
 SOURCE: Hydrogen Generation Unit
 DATE CREATED: 02/05/2010 @ 16:08

MONTHLY SUMMARY REPORT

		REFORMER LIMITS (tons)				SO2 1.1	PM10 13.3			
DATE MM/YY	SOURCE ON (hrs)	NOx (tons)	CO (tons)	SO2 (tons)	VOC (tons)	PM10 (tons)	AVG HEAT INPUT (MMBtu/hr)	HEAT INPUT (MMBtu)	NATURAL GAS (MMscfh)	PURGE GAS (MMscfh)
12/09	744.00	4.7	0.0	0.0	0.7	0.9	330.1	245613.9	104.57	497.14
11/09	720.00	3.7	0.0	0.0	0.6	0.8	293.4	211248.1	91.88	420.41
10/09	743.62	4.9	0.0	0.0	0.7	1.0	349.1	259350.5	112.95	516.49
09/09	665.55	3.5	0.0	0.0	0.6	0.5	312.4	207561.0	89.59	417.24
08/09	743.98	2.7	0.0	0.0	0.5	0.4	239.2	177942.3	79.99	344.51
07/09	744.00	2.5	0.0	0.0	0.4	0.4	219.9	163618.9	73.52	316.87
06/09	720.00	2.3	0.0	0.0	0.4	0.4	214.4	154371.7	70.69	294.07
05/09	736.82	2.4	0.0	0.0	0.4	0.5	206.8	150572.8	71.82	271.89
04/09	720.00	3.9	0.0	0.0	0.6	0.8	301.5	216785.5	92.23	374.25
03/09	743.73	4.1	0.0	0.0	0.6	0.8	296.4	219821.3	95.18	380.57
02/09	671.02	5.5	0.0	0.0	0.8	1.0	408.7	273162.7	115.53	459.10
01/09	743.93	6.4	0.0	0.1	0.9	1.2	432.9	318038.0	131.71	535.81
AVG							299.5			
TOTAL	8696.65	46.6	0.3	0.5	7.1	8.9		2598087.0	1129.65	4828.35

365 day results for December 31, 2009 - January 01, 2009

In accordance with Title V construction and operation permit Number V-07-008 R1, the above hydrogen reformer NOx emissions are derived from a NOx Continuous Emissions Monitoring System (CEMS) that complies with all provisions of 40 CFR 60 Appendix B, Performance Specification 2.

CY2009 NOx tons - 46.6
 NOx pounds - 93,200

CY2009 Heat Input (MMBTU) - 2,598,087.0

93,200 pounds NOx / 2,598,087 MMBTU

0.036 pounds NOx / MMBTU

CY2009 Emissions Inventory Survey: Emission Factor Changes

Air Products and Chemicals, Inc. - Catlettsburg Hydrogen Plant

Facility ID: 2101900117 AI ID: 83915

Title V Operating Permit V-07-008 R1

ATTACHMENT B

Equipment ID: EQPT2,03
Flare Pilot and Process Vent Gases

Process ID2: Syngas

Emission equations for the flaring of syngas

Air Products and Chemicals, Inc. Catlettsburg, KY H2 Plant - Emission Equations for Flaring of Syngas

Syngas to Flare = NOx Emission

Component 1: Emissions formed during Combustion:

$$\left(1 \text{ MSCF} \times 1000 \right) \times \frac{307.1 \text{ BTU}}{\text{SCF}} \times \frac{0.068 \text{ Lb NOx}}{\text{MMBTU}} \times \frac{1}{1,000,000} = \begin{matrix} 0.02 \text{ lbs NOx per MSCF of syngas flared} \\ 20.8828 \text{ lbs NOx per MMSCF} \end{matrix}$$

Notes:

1. Standard temp for PV = nRT is 60 degrees F.
2. Component 2: Residual Emissions formed after Destruction" does not apply, because there is no NOx in the syngas.
3. NOx flare emission factor of 0.068 lb/MMBtu from USEPA AP-42 (9/91) Table 13.5-1.

Syngas to Flare = CO Emission

Component 1: Emissions formed during Combustion:

$$\left(1 \text{ MSCF} \times 1000 \right) \times \frac{307.1 \text{ BTU}}{\text{SCF}} \times \frac{0.1743 \text{ Heat Input}}{\text{Adjustment Factor}} \times \frac{0.37 \text{ Lb CO}}{\text{MMBTU}} \times \frac{1}{1,000,000}$$

Component 2: Residual Emissions formed after Destruction:

$$\left(1 \text{ MSCF} \times 1000 \right) \times \frac{0.038 \text{ CO}}{\text{mole fraction}} \times \frac{28.01}{379.5} \times \frac{(100\% - 98\% \text{ destruction})}{100}$$

$$\text{Component 1} + \text{Component 2} = \begin{matrix} 0.08 \text{ lbs CO per MSCF of syngas flared} \\ 75.90 \text{ lbs CO per MMSCF of syngas flared} \end{matrix}$$

Notes:

1. Standard temp for PV = nRT is 60 degrees F.
2. CO flare emission factor of 0.37 lb/MMBtu from USEPA AP-42 (9/91) Table 13.5-1.
3. 0.1743 tunable heat input adjustment factor is ratio of heat input (MMBtu/hr) from syngas constituents that contribute to CO emissions being formed during combustion to the total heat input (MMBtu/hr) of syngas. These contributing constituents are methane, methanol, and ethanol.
4. Air Products has historically used 98% (by weight) destruction removal efficiency (DRE) for CO in our air permit applications for hydrogen plant flares. For comparison, TNRCC "Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers (October 2000; RG-109 (Draft)" (TNRCC Flare Guidance Document) presents a DRE of 98% (by weight) for most VOCs.

Component 1: Emissions formed during Combustion:

Component 2: Residual Emissions formed after Destruction:

+

Notes:

1. Standard temp for PV = nRT is 60 degrees F.
2. VOC flare emission factor of 0.07 lb/MMBtu from USEPA AP-42 (9/91) Table 13.5-1.
3. 0.1743 tunable heat input adjustment factor is ratio of heat input (MMBtu/hr) from the constituents of syngas that contribute to VOC emissions being formed during combustion to the total heat input (MMBtu/hr) of syngas. These contributing constituents are methane, methanol, and ethanol.
4. VOC "residual emissions after destruction" component is the sum of the "residual emissions after destruction" of the VOC constituents in the syngas (i.e., methanol and ethanol). Methane is not one of the constituents considered as it is exempt from the VOC definition in the KYDAQ regs.
5. Per TNRCC Flare Guidance Document, a 99% DRE can be used for simple compounds containing no more than three carbons (e.g., methane, or CH₄).

CY2009 Emissions Inventory Survey: Emission Factor Changes

Air Products and Chemicals, Inc. - Catlettsburg Hydrogen Plant

Facility ID: 2101900117 AI ID: 83915

Title V Operating Permit V-07-008 R1

ATTACHMENT C

Equipment ID: EQPT2,03

Flare Pilot and Process Vent Gases

Process ID3: PSA Purge Gas

Emission equations for the flaring of PSA Purge Gas

Air Products and Chemicals, Inc. Catlettsburg, KY H2 Plant - Emission Equations for Flaring of PSA Purge Gas

PSA Purge Gas to Flare = NO_x Emission

Component 1: Emissions formed during Combustion:

$$\left(1 \text{ MSCF} \times 1000 \right) \times \frac{277.6 \text{ BTU}}{\text{SCF}} \times 0.068 \text{ Lb NO}_x \text{ MMBTU} \times \frac{1}{1,000,000} = \begin{matrix} 0.02 \text{ lbs NO}_x \text{ per MSCF of purge gas flared} \\ 18.88 \text{ lbs NO}_x \text{ per MMSCF} \end{matrix}$$

Notes:

1. Standard temp for PV = nRT is 60 degrees F.
2. Component 2: Residual Emissions formed after Destruction" does not apply, because there is no NO_x in the purge gas.
3. NO_x flare emission factor of 0.068 lb/MMBtu from USEPA AP-42 (9/91) Table 13.5-1.

PSA Purge Gas to Flare = CO Emission

Component 1: Emissions formed during Combustion:

$$\left(1 \text{ MSCF} \times 1000 \right) \times \frac{277.6 \text{ BTU}}{\text{SCF}} \times 0.5457 \text{ Heat Input Adjustment Factor} \times 0.37 \text{ Lb CO MMBTU} \times \frac{1}{1,000,000}$$

Component 2: Residual Emissions formed after Destruction:

$$\left(1 \text{ MSCF} \times 1000 \right) \times 0.108 \text{ CO mole fraction} \times \frac{28.01}{379.5} \times \frac{(100\% - 98\% \text{ destruction})}{100}$$

$$\text{Component 1} + \text{Component 2} = \begin{matrix} 0.22 \text{ lbs CO per MSCF of purge gas flared} \\ 215.47 \text{ lbs CO per MMSCF} \end{matrix}$$

Notes:

1. Standard temp for PV = nRT is 60 degrees F.
2. CO flare emission factor of 0.37 lb/MMBtu from USEPA AP-42 (9/91) Table 13.5-1.
3. 0.5457 tunable heat input adjustment factor is ratio of heat input (MMBtu/hr) from constituents of purge gas that contribute to CO emissions being formed during combustion to total heat input (MMBtu/hr) of purge gas. These contributing constituents are methane, methanol, and ethanol.
4. Air Products has historically used 98% (by weight) destruction removal efficiency (DRE) for CO in our air permit applications for hydrogen plant flares. For comparison, TNRCC "Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers (October 2000; RG-109 (Draft)" (TNRCC Flare Guidance Document) presents a DRE of 98% (by weight) for most VOCs.

X	0.5457 Heat Input	X	0.07 Lb VOC	X
---	-------------------	---	-------------	---

Adjustment Factor	MMBTU
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Received 12 January 2021; accepted 12 January 2021; published online 12 January 2021

Construction:

ethanol	✓	32.04	✓	(100% - 99% destruction)
---------	---	-------	---	--------------------------

λ	52.04	λ	(100% - 99% destruction)
	<u>270.5</u>		<u>100</u>

	379.5	100
--	-------	-----

5. Per TNRCC Flare Guidance Document, a 99% DRE can be used for simple compounds containing no more than three carbons (e.g., methane, or CH₄).

CY2009 Emissions Inventory Survey: Emission Factor Changes

Air Products and Chemicals, Inc. - Catlettsburg Hydrogen Plant

Facility ID: 2101900117 AI ID: 83915

Title V Operating Permit V-07-008 R1

ATTACHMENT D

Equipment ID: EQPT2,03
Flare Pilot and Process Vent Gases

Process ID4 Hydrogen Gas

Emission equations for the flaring of Hydrogen Gas

Air Products and Chemicals, Inc. Catlettsburg, KY H2 Plant - Emission Equations for Flaring of Product Hydrogen

Product Hydrogen to Flare = NOx Emissions

Component 1: Emissions formed during Combustion:

$$\left(1 \text{ MSCF} \times 1000 \right) \times \frac{324.30 \text{ BTU}}{\text{SCF}} \times 0.068 \text{ Lb NOx/MMBTU} \times \frac{1}{1,000,000} = \begin{matrix} 0.02 \text{ lbs NOx per MSCF of hydrogen flared} \\ 22.05 \text{ lbs NOx per MMSCF} \end{matrix}$$

Notes:

1. Standard temp for PV = nRT is 60 degrees F.
2. Component 2: Residual Emissions formed after Destruction" does not apply, because there is no NOx in the product H2 gas.
3. NOx flare emission factor of 0.068 lb/MMBtu from USEPA AP-42 (9/91) Table 13.5-1.

Product Hydrogen to Flare = CO Emissions

Component 2: Residual Emissions formed after Destruction:

$$\left(1 \text{ MSCF} \times 1000 \right) \times 0.000005 \text{ CO mole fraction of H2 product} \times \frac{28.01}{379.5} \times \frac{(100\% - 98\% \text{ destruction})}{100} = \begin{matrix} 0.00001 \text{ lbs CO per MSCF of H2} \\ 0.01 \text{ lbs CO per MMSCF} \end{matrix}$$

Notes:

1. Standard temp for PV = nRT is 60 degrees F.
2. Component 1: Emissions formed during Combustion, does not apply because CO is only formed from combustion of HCs and there are no HCs in the H2 product.
4. Air Products has historically used 98% (by weight) destruction removal efficiency (DRE) for CO in our air permit applications for hydrogen plant flares. For comparison, TNRCC "Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers (October 2000; RG-109 (Draft)" (TNRCC Flare Guidance Document) presents a DRE of 98% (by weight) for most VOCs.

Product Hydrogen to Flare = VOC Emissions

No VOCs formed during flaring because there are no HCs in the product hydrogen.

19 December 2013 Condensate Stripper Stack Test

**CONDENSATE STRIPPER VENT EMISSION TEST REPORT
AIR PRODUCTS AND CHEMICALS, INC.
HYDROGEN PLANT
CATLETTSBURG REFINING, LLC
CATLETTSBURG, KENTUCKY**

Test Date: December 19, 2013

Report Date: January 29, 2014

Prepared for:

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, Pennsylvania 18195-1501

Prepared by:

Air/Compliance Consultants, Inc.
1050 William Pitt Way
Pittsburgh, Pennsylvania 15238
(412) 826-3636

PA Lab Registration #02-04775

Project No. 13-249

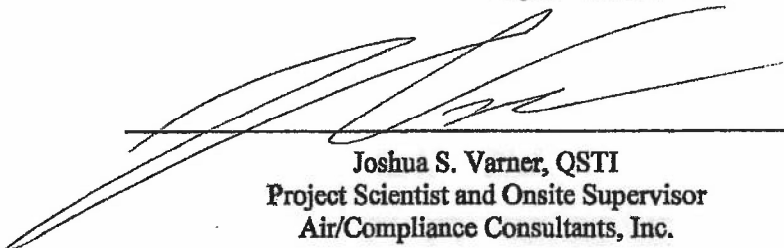
CERTIFICATION STATEMENT

This statement certifies that "to the best of their knowledge," based on state and federal regulations, operating permits, plan approvals applicable to each source tested, and reasonable inquiry, the statements and information presented in the attached document are true, accurate, and complete.

**CONDENSATE STRIPPER VENT EMISSION TEST REPORT
AIR PRODUCTS AND CHEMICALS, INC.
HYDROGEN PLANT
CATLETTSBURG REFINING, LLC
CATLETTSBURG, KENTUCKY**

Test Date: December 19, 2013

Project Number 13-249



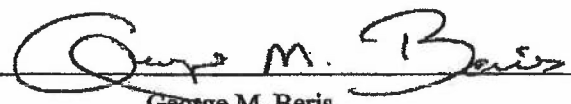
Joshua S. Varner, QSTI
Project Scientist and Onsite Supervisor
Air/Compliance Consultants, Inc.

1/29/14
Date



Robert N. Frey
Vice President and Technical Manager
Air/Compliance Consultants, Inc.

1/29/14
Date



George M. Beris
Sr. Principal Environmental Specialist
Air Products and Chemicals, Inc.

29 Jan 2014
Date

CONDENSATE STRIPPER VENT EMISSION TEST REPORT
AIR PRODUCTS AND CHEMICALS, INC.
HYDROGEN PLANT
CATLETTSBURG REFINING, LLC
CATLETTSBURG, KENTUCKY

1 TEST RESULTS SUMMARY

Permit Number: Title V Permit No. V-12-043	
Source Name: Condensate Stripper Vent	Source ID: EU02
Pollutant	Average Result
Methanol	2.77 lb/MMscf H2 ✓
Ethanol	0.29 lb/MMscf H2 ✓
Carbon Monoxide (CO)	0.09 lb/MMscf H2 ✓
Volatile Organic Compounds (VOCs)	3.06 lb/MMscf H2

2 INTRODUCTION

Air/Compliance Consultants, Inc. (ACCI) was contracted by Air Products and Chemicals, Inc. (APCI) to conduct an emissions stack testing program on the condensate stripper vent at their Catlettsburg, Kentucky facility. Testing was conducted on the stripper vent for emission of volatile organic compounds (VOCs) (as ethanol and methanol) and carbon monoxide (CO). Testing was performed on the exhaust stack to meet the requirements of Kentucky Division of Air Quality (KYDAQ) Title V Permit No. V-12-043 to establish VOC and CO emission factors for the stripper vent. A copy of the original test protocol is contained in Appendix A.

3 CONTACT INFORMATION

Facility	Testing Firm
Mr. George M. Beris Air Products and Chemicals, Inc. 7201 Hamilton Boulevard Allentown, Pennsylvania 18195 (610) 481-4486 – Telephone berisgm@airproducts.com	Mr. Joshua S. Varner, QSTI Air/Compliance Consultants, Inc. 1050 William Pitt Way Pittsburgh, Pennsylvania 15238 (412) 826-3636 – Telephone jvarner@air-comp.com

Table 1. Emissions Test Results, Condensate Stripper Vent
Air Products & Chemicals Inc., Catlettsburg Facility, Catlettsburg, Kentucky

Test Data		Run 1	Run 2	Run 3	Run 4	Average*
Date		12/19/2013	12/19/2013	12/19/2013	12/19/2013	
Start Time		8:34 AM	10:04 AM	11:26 AM	12:42 PM	
End Time		9:34 AM	11:04 AM	12:26 PM	1:42 PM	
Sample Volume	(DSCF)	0.270	0.248	0.288	0.261	0.266
Water Vapor (H ₂ O)	(volume %)	38.58	98.43	95.71	97.94	97.36
Exhaust Gas Flowrate	(dscfm)	379.33	9.74	26.83	12.64	16.40
Production Data						
H2 Production	(MMscfh)	1.4212	1.4227	1.4161	1.4249	1.4212
Steam flow	(lb/hr)	1732.44	1738.15	1752.45	1724.63	1738.41
Steam flow	(scfh)	36,494	36,614	36,915	36,329	36,619
Standard Gas Flowrate @ 60	(scfm)	608	610	615	605	610
Standard Gas Flowrate @ 68	(scfm)	618	620	625	615	620
Results						
Carbon Monoxide (CO)						
Concentration	(ppm _{dv})	350.0	1400.0	1600.0	2200.0	1733.3
Emission Rate	(lb/hr)	0.58	0.06	0.19	0.12	0.12
Emission Rate (H2 Production basis)	(lb/MMscf H2)	0.41	0.04	0.13	0.09	0.09
Methanol						
Emission Mass (total)	(ug)	47729.0	915941.0	153827.0	805947.0	625238.3
Emission Concentration	(ppmv)	4678.7	97836.5	14141.5	81731.4	64569.8
Emission Rate	(lb/hr)	8.87	4.76	1.90	5.16	3.94
Emission Rate (H2 Production basis)	(lb/MMscf H2)	6.24	3.35	1.34	3.62	2.77
Ethanol						
Emission Mass (total)	(ug)	8,298.0	95927.0	16801.0	81674.0	64800.7
Emission Concentration	(ppmv)	566.4	7134.7	1075.5	5767.3	4659.2
Emission Rate	(lb/hr)	1.54	0.50	0.21	0.52	0.41
Emission Rate (H2 Production basis)	(lb/MMscf H2)	1.09	0.35	0.15	0.37	0.29

*Due to inaccurate moisture content, Run 1 was invalidated. Averages are calculated using Runs 2-4 only.

%	Percent
DSCF	Dry standard cubic feet
°F	Degrees Fahrenheit
mscfh	Thousand standard cubic feet per hour
lb/hr	Pounds per hour
SCFM	Standard cubic feet per minute
ppm _{dv}	Parts per million, dry volume
lb/MMscf	Pounds per million standard cubic feet
ug	Micrograms
ppmv	Parts per million by volume

STEVEN L. BESHEAR
GOVERNOR



LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

Division for Air Quality
1550 Wolohan Dr Ste 1
Ashland, KY 41102
www.kentucky.gov

April 30, 2014

Air Products & Chemicals Inc - Catlettsburg Hydrogen Plant
Attn: Mr. Joshua C Llewellyn
PO Box 1492
Catlettsburg, KY 41129

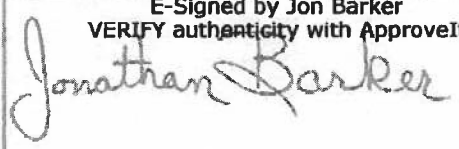
Re: AI ID: 83915
Air Products & Chemicals Inc - Catlettsburg Hydrogen
Plant
DAQ AlternateID.: 2101900117
Boyd County, Kentucky
Activity ID: CIN20140002

Dear Mr. Joshua C Llewellyn

Attached for your information and records is a copy of the DAQ-Performance Test performed at Air Products & Chemicals Inc - Catlettsburg Hydrogen Plant on December 19, 2013.

Please review and address any items of concern listed in the report. If you have any questions or comments concerning this inspection, please contact the Ashland Regional Office at: (606) 929-5285.

Sincerely,

E-Signed by Jon Barker
VERIFY authenticity with ApproveIt


Jonathan Barker
Environmental Inspector III

Energy and Environment Cabinet
Department for Environmental Protection
Division for Air Quality
Air Inspection Report

AI ID: 83915 **AI Type:** MFG- Chemical Manufacturing (325)
AI Name: Air Products & Chemicals Inc - Catlettsburg Hydrogen Plant
AI Address: US 23

City: Catlettsburg, **State:** Kentucky **Zip:** 41129
County: Boyd **Regional Office:** Ashland Regional Office
Latitude: 38.375 **Longitude:** -82.604167
Site Contact: George Beris
Title: Principle Environmental Specialist **Phone #:** 606-481-4486 **e-Mail:** berisgm@airproducts.com
Inspection Type: DAQ-Performance Test **Activity #:** CIN20140002
Incident IDs: NA
Inspection Start Date: December 19, 2013 **Time:** 07:45 AM **End Date:** April 30, 2014 **Time:** 12:10 PM
Site/Permit ID: 2101900117

Lead DEP Investigator: Jonathan Barker
Other DEP Investigators: Frough Sherwani
External Investigators:
Persons Interviewed: George Beris; Josh Lewelyn

General Comments: This report documents the performance testing of the Condensate Stripper Unit for determination of emission factors of VOC and CO emissions. The test was conducted on December 19, 2013 under permit V-12-043.

Appropriate test methods were observed and emission factors of VOC's and CO were determined. Please use these new factors to show continuous compliance with the issued permit.

The hydrogen plant, operated by Air Products, produces hydrogen using steam methane reforming technology to supply hydrogen and steam only to Marathon Petroleum Company's Catlettsburg petroleum refinery. Air Products' hydrogen plant is within the property limit of Marathon's refinery.

Overall Compliance Status: No Violations Observed

Investigation Results

SI: AIO083915

SI Description:

Inspector Comment: Per the issued permit:

The permittee shall perform a stack test for VOC and CO emissions from the Condensate Stripper stack. The testing shall be conducted within five (5) years of the most recent performance test conducted to demonstrate compliance or within 6 months of issuance of the final renewal permit V-12-043, whichever is later. Testing shall be performed in accordance with 401 KAR 50:045, Performance tests. The Vent Gas Flow based on 34 mmscf hydrogen production per day (nominal) shall be measured and reported. The emission factors for VOC and CO in lb/mmscf of hydrogen produced shall be reported in the test results.

Requirement: Sources subject to this administrative regulation shall operate in compliance with a permit issued under this administrative regulation. [401 KAR 52:020 Section 3(1)(b)]

Compliance Status: C-No Violations observed

Comment: The facility performed a scheduled performance test of the Condensate Stripper as required by the permit. Representative operations and test methodology was observed.

SI: EQPT1 02

SI Description: Condensate Stripper Vent Stack

Maximum Capacity: 1.42 mmscf H₂/hr.

Date of construction: 2002

Control Device: None

Inspector Comment: Emission Unit 02, Condensate Stripper Applicable Regulation 401 KAR 63:020, Potentially hazardous matter or toxic substances, is applicable to each affected facility which emits or may emit potentially hazardous matter or toxic substances, provided such emissions are not elsewhere subject to the provisions of the administrative regulations of the Division for Air Quality. [STATE-ORIGIN REQUIREMENT]

Condensate stripper strips off any dissolved CO₂ and potential steam impurities by using stripping steam; the gases are vented to the atmosphere through the vent system.

Date of Construction: 2002

Control Device: None

Capacity: Vent Gas Flow based on 34 mmscf hydrogen production per day (nominal)

Per permit V-12-043

The source has elected to accept permit conditions to preclude the applicability of 401 KAR 51:017, Prevention of Significant Deterioration of Air Quality, and 401 KAR 51:052, Review of New Sources in or impacting upon Non-attainment Areas.

1. Operating Limitations:

Refer to Section D.3 for potentially hazardous matter or toxic substance limitations and compliance pursuant to 401 KAR 63:020.

2. Emission Limitations:

Refer to Section D.4 for the source-wide emission limits and compliance.

Requirement: Sources subject to this administrative regulation shall operate in compliance with a permit issued under this administrative regulation. [401 KAR 52:020 Section 3(1)(b)]

Compliance Status: C-No Violations observed

Comment: The "synthetic minor" emission limitations for the Condensate Stripper Unit are as follows: VOC-14.5 tons/yr and CO 4.6 tons/yr

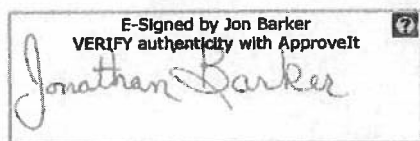
On December 19, 2013 I observed the facility operating under normal conditions while conducting the performance test on the Condensate Stripper. The unit was running at 34.8 tons/yr of Hydrogen Production and 36674.22 scf/hr of steam flow. As a result, the performance testing obtained emission factors for VOC and CO per lb/MMscf of H₂ production. As reported the emission factor for VOC is 3.06 lb/MMscf H₂ and CO is 0.09 lb/MMscf H₂ production. These emission factors shall be used in determining compliance per the facilities issued permit on a 365 day rolling average.

Documentation

- ☐ Photos taken
- ☒ Documents obtained from facility
- ☒ Samples taken by outside source
- ☐ Request for Submission of Documents

- ☐ Record of visual determination of opacity
- ☐ Samples taken by DEP
- ☐ Regional office instrument readings taken
- ☒ Other documentation

Inspector:



Date: April 30, 2014

Received By: _____ **Title:** _____ **Date:** _____

Delivery Method: e-Mail

Certified Mail Number: NA

May 22, 2019 Condensate Stripper Stack Test Report Excerpt

**Compliance Test Report--
Hydrogen Reformer Stack and
Condensate Stripper Vent
Catlettsburg, KY Hydrogen
Plant**

July 2019

**Prepared for:
Air Products and Chemicals, Inc
7201 Hamilton Boulevard
Allentown, Pennsylvania 18195-1501**



**Prepared by:
AECOM
Oak Ridge, Tennessee**

**COMPLIANCE TEST REPORT--
HYDROGEN REFORMER STACK
AND
CONDENSATE STRIPPER VENT
CATLETTSBURG, KY HYDROGEN PLANT**

Prepared for:

**Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, Pennsylvania 18195-1501**

Prepared by:

**AECOM
105 Mitchell Road, Suite 200
Oak Ridge, TN 37830
1906271**

July 2019

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ACRONYMS

Air Products	Air Products and Chemicals, Inc.
ASTM	American Society for Testing and Materials
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
H ₂	Hydrogen
KDEQ	Kentucky Department of Environmental Quality
MMBtu/hr	million British thermal units per hour
MMscfd	million standard cubic feet per day
MMscf H ₂	million standard cubic feet of hydrogen
N ₂	Nitrogen
PM ₁₀	Particulate Matter with an aerodynamic diameter less than 10 microns
ppmv	parts per million by volume
QA	Quality Assurance
QC	Quality Control
TNMOC	Total Non-Methane Organic Compound
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1. INTRODUCTION

Air Products and Chemicals, Inc. (Air Products) owns and operates a hydrogen production plant within the Marathon Petroleum Corp. Catlettsburg Refinery in Catlettsburg, Kentucky. The hydrogen plant produces hydrogen (H_2) by catalytically reforming pipeline quality natural gas using steam and high temperatures.

Air Products contracted AECOM to perform a compliance stack testing program on two sources at the hydrogen plant—the hydrogen reformer furnace stack and the condensate stripper vent. The testing was performed to meet the requirements of Air Product's Title V Permit V-18-004.

For the reformer stack, the compliance tests included measuring particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}) and carbon monoxide (CO). The test results are used to establish PM_{10} and CO emission factors for the reformer stack. For the condensate vent, the compliance tests included measuring CO and Volatile Organic Compounds (VOC) (as methanol and ethanol). The test results are used to establish emission factors for CO and VOC for the condensate stripper vent.

This report contains the complete test results for Emission Unit 01: Hydrogen Reformer, and for Emission Unit 02: Condensate Stripper. Compliance tests for both units were conducted on May 22, 2019, and a test report was submitted to the Division on June 28, 2019. However, because the results for the condensate stripper were still being evaluated due to unexpected sample gas moisture results, that version of the test report summarized only the test results for the hydrogen reformer. To allow a thorough review of the condensate stripper test data, an email request to extend the report due date to July 15, 2019 was submitted to KYDAQ.

Section 2 of this report summarized the test results. The test procedures used during the compliance tests are described in Section 3. Section 4 discusses the Quality Assurance/Quality Control (QC) procedures that were used.

1.1 Key Test Program Personnel

Air Products

Mr. George M. Beris
Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, Pennsylvania 18195

Testing Firm

Mr. Bill Thomas
AECOM
105 Mitchell Rd, Suite 200
Oak Ridge, TN 37830

Laboratory (all analytical coordinated by Test America—Knoxville, TN)

Test America, Knoxville--PM₁₀ by EPA 201A and 202
Test America, Buffalo—Methanol and Ethanol by SW-846 Method 8015
Air Toxics

- Fixed Gases by ASTM D1945
- TNMOC by SW-846 Method TO-12

Kentucky Department of Environmental Quality (KDEQ)

KDEQ did not have a representative present during the compliance tests.

1.2 Process Description

The hydrogen plant produces H₂ by catalytically reforming pipeline-quality natural gas using steam and high temperatures. Residual CO and carbon dioxide (CO₂) are removed from the H₂ gas using several processing steps, including pressure swing adsorption. These processes are exothermic, so the plant also includes heat exchangers to generate steam from the excess energy.

The hydrogen reformer furnace (Emission Unit 01) provides the heat energy to generate the necessary heat of reaction for the steam-methane reformation process. The reformer is fired with pipeline-quality natural gas and pressure swing adsorption purge gas. It has a nominal rated heat input capacity of 455 million British thermal units per hour (MMBtu/hr).

A stream of condensate from the reformation process is used to create the steam product via heat exchangers. Prior to entering the heat exchangers, the condensate is first treated to remove dissolved CO₂ and trace amounts of methanol and ethanol. This is done by directing the condensate stream into the process condensate stripper column. In the column, low pressure steam is used to strip out the dissolved CO₂, methanol, and ethanol. The condensate impurities are discharged to the atmosphere through the condensate stripper vent (Emission Unit 02).

2. TEST RESULTS

The hydrogen plant has a nominal capacity of 34 million standard cubic feet per day (MMscfd) of hydrogen. During the compliance tests, the hydrogen production rate was approximately 34 MMscfd.

2.1 Reformer Stack Test Results

A summary of the PM compliance test data is presented in Table 2-1. Three test runs were conducted, each approximately 2 hours in duration. The average PM₁₀ emission rate from the test runs was calculated to be 0.79 pounds per hour and, normalized to the heat input rate to be 0.0022 pounds per million Btu heat input. As noted in Table 2-1, some of the PM subsamples had non-detectable levels of PM. For calculation purposes, the method detection limit was used for those subsample results. The PM field blank samples also had laboratory results below the reporting limit. No blank correction was made to the PM results.

A summary of the CO compliance test data is presented in Table 2-2. Three 1-hour test runs were conducted. CO (before and after bias adjustments) was zero for all three test runs. The CO analyzer manufacture data sheet indicates the instrument has a detection limit of 0.04 ppmv. For purposes of calculating a CO emission rate and emission factor, a conservative value of 0.1 ppmv CO was used.

2.2 Condensate Stripper Vent Test

A summary of the compliance test data for the condensate stripper vent gases is presented in Table 2-3. A total of five test runs were performed. For reasons that are discussed below, the results for Runs 2, 3, and 4 are felt to be most representative of the vent gases. Therefore, the averages of these three runs are presented in the righthand column of Table 2-3.

2.2.1 Test Results

As shown in Table 2-3, the average CO concentration in the vent gases was almost 7200 ppmv (dry basis). On a mass emission basis the average emission rate was calculated to be 0.97

pounds CO per hour. The resulting emission factor was 0.68 pounds CO per million standard cubic feet of hydrogen produced (MMscf H₂).

The average methanol and ethanol concentrations in the vent gases were approximately 19,500 ppmv (dry basis) and 1020 ppmv (dry basis), respectively. On a mass emission basis, the average emission rates were calculated to be 3.0 and 0.23 pounds per hour for methanol and ethanol, respectively. The resulting emission factors were 2.1 and 0.16 pounds per MMscf H₂ for methanol and ethanol, respectively. Accordingly, this equates to a VOC emission factor of 2.26 pounds per MMscf H₂.

2.2.2 Discussion of Vent Gas Sampling

As described in Section 3.2, the stripper vent gas sample was collected from a hose that carried the vent gases from the vent atop the stripper column to ground level. This sampling arrangement was necessitated because personnel could not safely sample from the platform atop the stripper column due to periodic expulsion of hot condensate with the vent gases.

Prior to the start of each test run, a valve on the sample probe was closed and the complete sampling system excluding the rigid container was evacuated to remove as much air from the sampling equipment as possible. Typically a vacuum of around 23 inches of mercury was obtained. Then the valve on the sample probe was opened and the system was “repressurized” with sample gas. When the system pressure returned to zero vacuum, the rigid container was reconnected and the test run sampling began.

For each test run, the vent gas flow rate was calculated from the measured flow rate of stripping steam (value provided by plant instrumentation) and a calculated moisture content of the vent gases. The initial intent was to use the measured sample gas volumes and measured weight gains in the sampling system impingers for each run to calculate a moisture content of the sample gas (“moisture content from sampling data” in Table 2-3). During all test runs, both condensate and vapor phase gases were discharged from the end of the hose at ground level indicating some vapor phase moisture had condensed inside the hose as the gases cooled. Therefore, the calculated “moisture content from sampling data” is not the same as the moisture content of the gases venting from the stripper column. For Runs 1, 2, and 3, the sampling data

resulted in a calculated moisture significantly biased low due to the amount of moisture condensed inside the hose. For Runs 4 and 5, the sampling data resulted in a calculated moisture biased high due to the amount of condensate entering the sampling equipment with the vapor phase sample (especially Run 5). Based on process knowledge, the vent gases should have a moisture content approaching 100 percent (i.e., mainly just the stripping steam plus the relatively small amount of gases stripped from the condensate). For purposes of calculating the vent gas flow rate, a conservative moisture content of 95 percent was assumed.

For Runs 1, 2, and 3 the sample tap at the end of the hose was positioned on the top side of the hose. This resulted in a minimal amount of condensate entering the sampling equipment with the vapor phase sample. For Run 1, only a small amount of condensate was collected in the knockout impinger and no sample gas was collected in the Tedlar bag. No Run 1 samples were submitted for laboratory analyses so there were no results available for CO, methanol or ethanol. Accordingly, none of the Run 1 results are included in the averages shown in Table 2-3.

For Runs 4 and 5 the sample tap was positioned on the bottom side of the hose resulting in condensate entering the sampling equipment along with the vapor phase vent gases, especially in Run 5. For this reason, the Run 5 results are not believed to be truly representative of the condensate stripper vent gases and are not included in the averages shown in Table 2-3. Also for Run 5, the Tedlar bag sample results indicated the sample gas was essentially air with no CO present. The Tedlar bag samples were transferred into evacuated canisters prior to being sent to the laboratory for analysis. It is possible that something happened to the Run 5 sample during this transfer operation. For this reason, the Run 5 Tedlar bag results are not included in the averages shown in Table 2-3.

Table 2-1. PM Sampling Data Test Run Summary

PM Sampling Data Test Run Summary

Facility:	APCI Catlettsburg			
Location:	H2 Reformer Stack			
Condition	Full Load			
Sample Type:	Method 201A/202			
Run Number:	1	2	3	
Date:	22-May-19	22-May-19	22-May-19	Average
PM Sampling Data				
Total Sampling Time (min)	118.8	118.5	118.3	118.5
Sampling Start Time	8:40:00	12:00:00	14:50:00	
Sampling End Time	10:43:45	14:02:45	16:51:15	
Sample Volume (dscf)	39.29	38.96	38.82	39.02
Stack Moisture (Vol %)	17.8	18.8	18.0	18.2
Stack Gas Volumetric Flow Rate (dscfm)	74133	74753	75044	74643
Stack Gas Oxygen (Vol % dry)	2.4	2.4	2.3	2.4
Stack Gas Carbon Dioxide (Vol % dry)	19.4	19.6	19.5	19.5
Stack Gas Nitrogen (Vol % dry)	78.2	78.0	78.2	78.1
Stack Temperature (F)	328.0	297.0	294.9	306.6
Percent Isokinetic	101.6	99.4	99.6	100.2
PM10 cut size (microns)	10.0	9.9	10.0	10.0
	78.2	78.0	78.2	78.1
Plant Data				
H2 Production (Mscfh)	1420.3	1419.4	1415.7	1418.5
Heat Input (MMBtu/hr; HHV)	365.7	358.8	356.8	360.4
Stack Gas Oxygen (Vol % dry)	2.4	2.4	2.4	2.4
PM Test Results				
Filterable PM10--mg collected	1	1	1	1
Condensable PM (CPM)--mg collected	2.55	1.72	2.06	2.11
PM10 (filterable PM10 + CPM)--mg collected	3.55	2.72	3.06	3.11
Total PM concentration--gr/dscf	0.0014	0.0011	0.0012	0.0012
Total PM Emission Rate--lb/hr	0.88	0.69	0.78	0.79
Total PM Emission Rate--lb/MMBtu	0.0024	0.0019	0.0022	0.0022

Note: Some PM subsamples had non-detectable amounts of PM; the method detection limit was used for calculation purposes.

Table 2-2. Carbon Monoxide Emissions Test Results Summary

Carbon Monoxide Emissions Test Results Summary

Facility:	APCI Catlettsburg			
Location:	H2 Reformer Stack			
Condition	Full Load			
Sample Type:	Method 10			
Run Number:	1	2	3	
Date:	22-May-19	22-May-19	22-May-19	Average
CO Sampling Data				
Total Sampling Time (min)	60.0	60.0	60.0	60.0
Sampling Start Time	8:40	12:00	14:50	
Sampling End Time	9:40	13:00	15:50	
Stack Gas Oxygen (Vol % dry)	2.4	2.4	2.3	2.4
Stack Gas Carbon Dioxide (Vol % dry)	19.4	19.6	19.5	19.5
Stack Gas CO (ppmv dry)	0.0	0.0	0.0	0.0
Stack Moisture (Vol %)	17.8	18.8	18.0	18.2
Plant Data				
H2 Production (Mscfh)	1420.3	1419.4	1415.7	1418.5
Heat Input (MMBtu/hr; HHV)	365.7	358.8	356.8	360.4
Stack Gas Oxygen (Vol % dry)	2.400	2.400	2.400	2.400
CO Emission Results				
Stack Gas Volumetric Flow Rate (dscfm)	74133	74753	75044	74643
Stack Gas CO (ppmv dry)	0.1	0.1	0.1	0.1
CO Emission Rate--lb/hr	0.03	0.03	0.03	0.03
CO Emission Rate--lb/MMBtu	0.00007	0.00007	0.00008	0.00007

Note: CO was Not Detected during all runs; instrument Detection Limit (0.1 ppmv) is shown.

Table 2-3. Condensate Stripper Vent Gases Test Results Summary

		Run 1	Run 2	Run 3	Run 4	Run 5	Average (Runs 2-4)
Date		22-May-19	22-May-19	22-May-19	22-May-19	22-May-19	
Start Time		1230	1424	1607	1747	1936	
Stop Time		1330	1526	1707	1900	2043	
Sample Volume	Liters, dry STP	12.82	18.14	15.96	31.81	15.74	
Moisture Content from Sampling Data	Vol %	56.5%	28.5%	28.5%	99.0%	99.7%	
Moisture Used to Calculate Vent Flow	Vol %	95.0%	95.0%	95.0%	95.0%	95.0%	
H2 Production	MMscfh	1.4197	1.4166	1.4166	1.4166	1.4166	1.417
Steam Stripper Flow	lb/hr	1722.55	1645.26	1638.61	1660.33	1655.82	1648
Steam Stripper Flow	scfm	614	587	584	592	590	588
Calculated Vent Flowrate	dscfm	32.3	30.9	30.8	31.2	31.1	30.9
Carbon Monoxide (CO)							
CO Vent Gas Concentration	ppmv (dry)		6200	9300	6000		7167
Emission Rate @ Calculated Vent Flow							
CO Emission Rate	lb/hr		0.835	1.248	0.816	0.000	0.97
CO Emission Rate	lb/MMscf H2		0.590	0.881	0.576	0.000	0.68
Methanol							
Measured Mass							
KO Impinger Catch	mg		69	146	2021	3415	745
Impinger Solution	mg		93	29	8	29	43
Tedlar Bag	mg		0.05	0.09	0.05	0.01	0.06
Total	mg		162	175	2029	3444	789
Methanol Vent Gas Concentration	ppmv		6255	7679	44640	153169	19525
Emission Rate @ Calculated Vent Flow							
Methanol Emission Rate	lb/hr		0.963	1.177	6.935	23.731	3.0
Methanol Emission Rate	lb/MMscf H2		0.680	0.831	4.895	16.752	2.1
Ethanol							
Measured Mass							
KO Impinger Catch	mg		7	15	145	225	56
Impinger Solution	mg		4	3	1	0	2
Tedlar Bag	mg		0.05	0.09	0.05	0.01	0.06
Total	mg		11	18	146	225	58
Ethanol Vent Gas Concentration	ppmv		302	540	2229	6971	1023
Emission Rate @ Calculated Vent Flow							
Ethanol Emission Rate	lb/hr		0.067	0.119	0.498	1.553	0.23
Ethanol Emission Rate	lb/MMscf H2		0.047	0.084	0.351	1.096	0.16
Fixed Gases							
Oxygen	Vol% dry basis		4.9	5.8	2.1	21	4.3
Nitrogen	Vol% dry basis		24	21	11	79	18.7
Carbon Monoxide	Vol% dry basis		0.62	0.93	0.60	0	0.72
Methane	Vol% dry basis		1.8	2.6	1.9	0	2.1
Carbon Dioxide	Vol% dry basis		58	63	72	0	64.3
Hydrogen	Vol% dry basis		11	6.7	12	0	9.9
Total	Vol% dry basis		100.32	100.03	99.6	100	100.0
Molecular Weight (dry basis)			34.4	36.3	36.3	28.8	35.6

MATTHEW G. BEVIN
GOVERNOR



CHARLES G. SNAVELY
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

ANTHONY R. HATTON
COMMISSIONER

DIVISION FOR AIR QUALITY
1550 WOLOHAN DR STE 1
ASHLAND, KY, 41101

November 7, 2019

Air Products & Chemicals Inc - Catlettsburg Hydrogen Plant
Attn: Mr. Joshua C Llewellyn
PO Box 1492
Catlettsburg, KY 41129

Re: AI ID: 83915
Air Products & Chemicals Inc - Catlettsburg Hydrogen
Plant
DAQ AlternateID.: 2101900117
Boyd County, Kentucky
Activity ID: CRV20190005

Dear Mr. Joshua C Llewellyn

Attached for your information and records is a copy of the DAQ-Performance Test performed at Air Products & Chemicals Inc - Catlettsburg Hydrogen Plant on November 6, 2019.

Please review and address any items of concern listed in the report. If you have any questions or comments concerning this inspection, please contact the Ashland Regional Office at: (606) 929-5285.

Sincerely,

E-Signed by DEP
VERIFY authenticity with eSign Desktop
Alysha Patton

Alysha Patton
Environmental Scientist II

AP
c:



Energy and Environment Cabinet
Department for Environmental Protection
Division for Air Quality
Air Inspection Report

AI ID: 83915 **AI Type:** MFG- Chemical Manufacturing (325)

AI Name: Air Products & Chemicals Inc - Catlettsburg Hydrogen Plant

AI Address: US 23

City: Catlettsburg, **State:** Kentucky **Zip:** 41129

County: Boyd **Regional Office:** Ashland Regional Office

Latitude: 38.375 **Longitude:** -82.604167

Site Contact: Josh Llewellyn

Title: Site Manager **Phone #:** 606-7639-0550 **e-Mail:** lleweljc@airproducts.com

Inspection Type: DAQ-Performance Test **Activity #:** CRV20190005

Incident IDs:

Inspection Start Date: November 6, 2019 **Time:** 08:10 AM **End Date:** November 6, 2019 **Time:** 09:10 AM

Site/Permit ID: 2101900117

Lead DEP Investigator: Alysha Patton

Other DEP Investigators:

External Investigators:

Persons Interviewed:

General Comments: This report documents a final review of the compliance test conducted on Emission Units 1 and 2 on May 22, 2019.

Summary: The Kentucky Division for Air Quality has reviewed the data in the submitted test report for the performance testing conducted on Emission Unit 1 and 2. The listed facility has demonstrated compliance with applicable emission limitation and requirements for Emission Unit 1 and 2.

Overall Compliance Status: No Violations Observed

Investigation Results

SI: AIOO83915

SI Description:

Inspector Comment: Final Stack Test Review

Requirement: Sources subject to this administrative regulation shall operate in compliance with a permit issued under this administrative regulation. [401 KAR 52:020 Section 3(1)(b)]

Compliance Status: C-No Violations observed

Comment: Testing was conducted on Emission Unit 1 Hydrogen Reformer and Emission Unit 2 Condensate Stripper on May 22, 2019. The facility appeared to be operating under normal conditions.

SI: COMB1 01

SI Description: Hydrogen Reformer Flue Gas Stack

Maximum Capacity: 455 mMBtu/hr.

Fuel: Combination of PSA Purge Gas & Natural Gas

Date of construction: 2002

Control Device: None

Inspector Comment: Emission Unit 1

Hydrogen Reformer

Requirement: Sources subject to this administrative regulation shall operate in compliance with a permit issued under this administrative regulation. [401 KAR 52:020 Section 3(1)(b)]

Compliance Status: C-No Violations observed

Comment: Testing was conducted, as required by Permit V- 18-004 to determine the PM and CO emission rate. During the testing period the unit was running at 360.43 MMBtu/hr during PM test and 361.3 MMBtu/hr during the CO test.

Results:

Results:								
Emission Point	Parameter	Results	Units	Permit Limit	Compliance Status	Test Method	Performance Status	Process Rate/Load
Hydrogen Reformer EU 01	PM10	3.44	ton/yr	13.3	Pass	201A/202	Pass	360.43 MMBtu/hr
	CO	0.14	ton/yr	70.3	Pass	10		361.3 MMBtu/hr
Condensate Stripper EU 02	CO	4.2	ton/yr	4.6	Pass	BAAQMD Method ST-32 w/ASTM D-1945		1.417 MMscfh H2 production
	VOC (MeOH + EtOH)	2.1	ton/yr	14.5	Pass	BAAQMD Method ST-32 w/ SW-846 Method TPO-12 & Method 8015		

The Kentucky Division for Air Quality has reviewed the data in the submitted test report for the performance testing conducted on Unit 1. The listed facility has demonstrated compliance with applicable emission limitation and regulations for Emission Unit 1 Hydrogen Reformer.

SI: EQPT1 02

SI Description: Condensate Stripper Vent Stack

Maximum Capacity: 1.42 mmscf H2/hr.

Date of construction: 2002

Control Device: None

Inspector Comment: Emission Unit 2

Condensate Stripper

Requirement: Sources subject to this administrative regulation shall operate in compliance with a permit issued under this administrative regulation. [401 KAR 52:020 Section 3(1)(b)]

Compliance Status: C-No Violations observed

Comment: Testing was conducted, as required by Permit V-18-004 to determine the CO and VOC emission rate. During the test the unit was operating at 1.417 MMscfh H2 production.

Results:

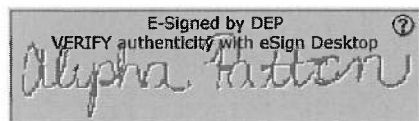
Results:								
Emission Point	Parameter	Results	Units	Permit Limit	Compliance Status	Test Method	Performance Status	Process Rate/Load
Hydrogen Reformer EU 01	PM10	3.44	ton/yr	13.3	Pass	201A/202	Pass	360.43 MMBtu/hr
	CO	0.14	ton/yr	70.3	Pass	10		361.3 MMBtu/hr
Condensate Stripper EU 02	CO	4.2	ton/yr	4.6	Pass	BAAQMD Method ST-32 w/ASTM D-1945		1.417 MMscfh H2 production
	VOC (MeOH + EtOH)	2.1	ton/yr	14.5	Pass	BAAQMD Method ST-32 w/ SW-846 Method TPO-12 & Method 8015		

The Kentucky Division for Air Quality has reviewed the data in the submitted report for the performance testing conducted on Emission Unit 2 Condensate Stripper. The listed facility has demonstrated compliance with applicable emission limitation and requirements for Emission Unit 2 Condensate Stripper.

Documentation

- | | |
|--|--|
| ☐ Photos taken | ☐ Record of visual determination of opacity |
| ☒ Documents obtained from facility | ☐ Samples taken by DEP |
| ☐ Samples taken by outside source | ☐ Regional office instrument readings taken |
| ☐ Request for Submission of Documents | ☐ Other documentation |

Inspector:



Date: November 7, 2019

Received By: _____ **Title:** _____ **Date:** _____

Delivery Method: Email

Email Addresses: George Beris; berisgm@airproducts.com

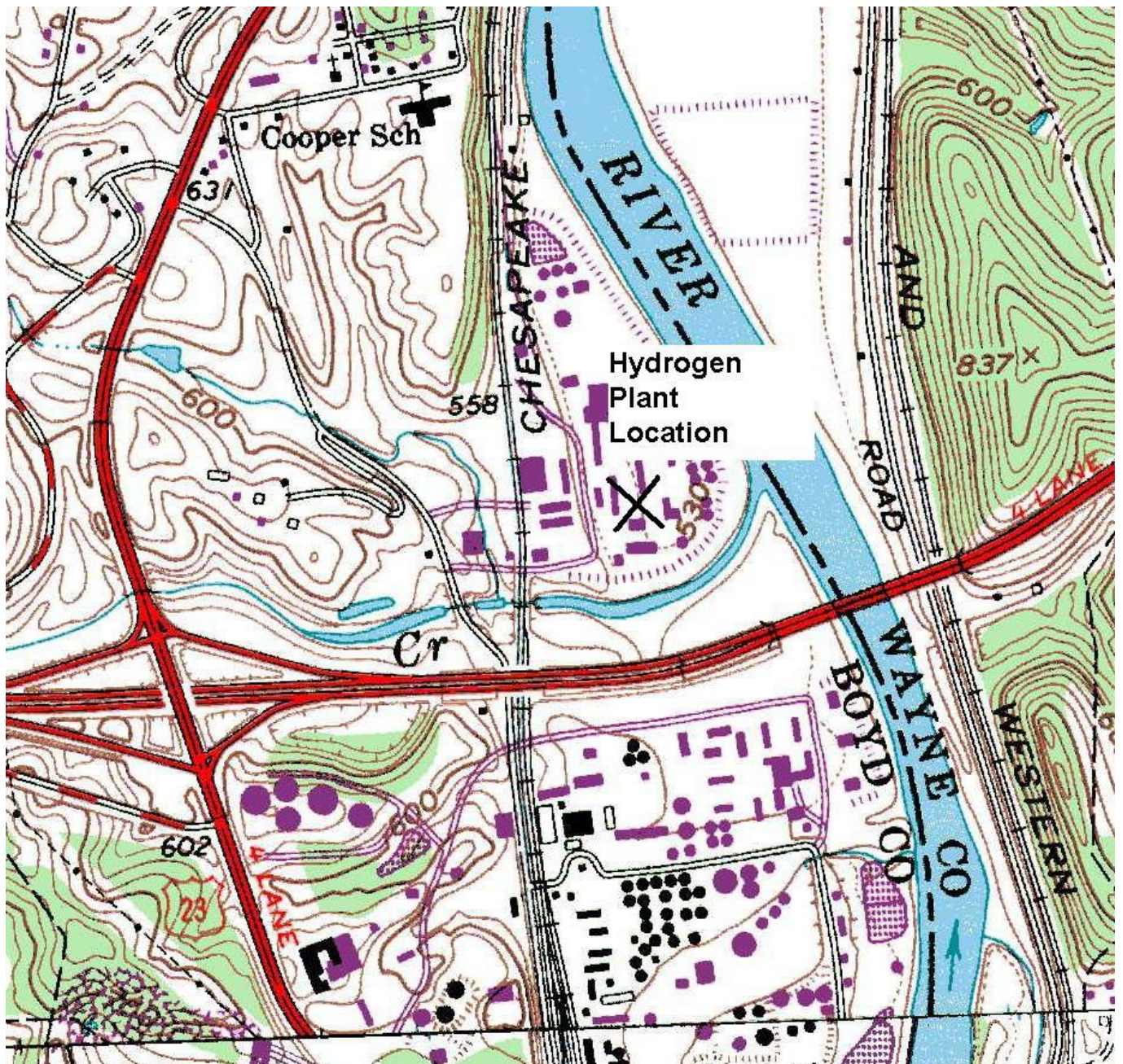
Josh Llewellyn; lleweljc@airproducts.com

Appendix C

Facility Location Map and Site Plans

- **Site Location Map**
- **Plot Plan** (Unchanged Since Last Submission)

Facility Location Map

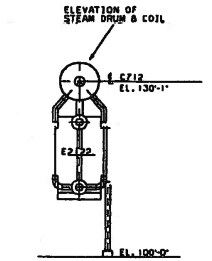
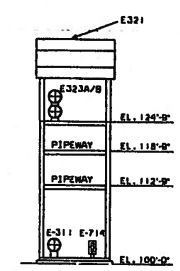
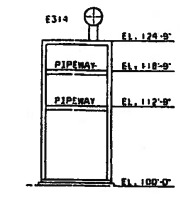


LAT 38.383614
 LON -82.598770

LAT 38.383621
 LON -82.598099

EQUIPMENT LIST

- B3 0 WATER TREATMENT BUILDING
- C137A/B FEED HYDROGENATOR/DESULFURIZERS
- C301 HIGH TEMPERATURE SHIT
- C321 PROCESS CONDENSATE SEPARATOR
- C352 PROCESS COND. STRIPPER COLUMN
- C502 PURGE GAS SURGE DRUM
- C712 STEAM DRUM
- C801 FLARE N.O. POT
- E301 PROCESS GAS BOILER
- E311 FEED PREHEATER
- E314 BOILER FEED WATER PREHEATER
- E321A/B PROCESS GAS TRIM COOLER
- E322A/B COND. STRIPPER COLUMN (ECONOMIZER)
- E714 BLOWDOWN COOLER
- E2103 MIXER FEED PREHEATER (NOT SHOWN)
- E2111 ECONOMIZER COIL (NOT SHOWN)
- E2122 STEAM GENERATION COIL (NOT SHOWN)
- F201 PRIMARY REFORMER
- G351A/B PROCESS CONDENSATE PUMPS
- G804A/B COOLING WATER PUMPS
- G803A/B PROCESS WASTE WATERS SUMP PUMPS
- G8081 SANITARY SEWER PUMP
- IPC001 OFFER ANALYZER PANEL
- IPC006 FLAME SCANNER SYSTEM
- IPC007 GENERATOR PANEL
- J802 FLARE
- K111A/B FEED COMPRESSORS
- R311 ID FAN
- U720 AIR
- U730 CHEMICAL DOSING UNIT
- V803 COOLING TOWER



ELEV.
 527'

Emission Unit 05 - Multiple Steam Vents:

- A. - Main Steam Vent
- B. - Combined Steam Blowdown Standpipe Vent
- C. - Mix-Tee Steam Vent
- D. - Steam Drum Sample Coolers

Emission Unit 02 - Condensate Stripper Vent

Emission Unit 04 - Fugitives (Methanol)

- An area approximately 50 ft L X 50 ft W X 50 ft H, within the immediate vicinity of the process condensate stripper.

To Determine Scale:

Length of facility from NW corner to NE corner = 175' 0"
 NE corner Battery Limit E. 840' 0"
 NW corner Battery Limit E. 665' 0"
 175' 0"

AIR PRODUCTS AND CHEMICALS		CATLETTSBURG KENTUCKY	
PROJECT: AIR 1		PRODUCTS: 34 MMSCFD H2 PLANT	
PLOT PLAN		JUNE 2012	

Balaji, Sriram (EEC)

From: Klingseis,Preston M. <KLINGSPM@airproducts.com>
Sent: Thursday, June 4, 2026 12:35 PM
To: Balaji, Sriram (EEC)
Subject: RE: [External] AI 83915 - Final Permit Questions
Attachments: Catlettsburg_2015Nov30_BoilerAndProcessHeaterEnergyAssessment.pdf

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[Report Suspicious](#)

Good Afternoon Sriram,

Appreciate you reaching out. Responding to your questions:

- A copy of the November 30, 2015 Boiler and Process Heater Energy Assessment is attached.
 - Please note that this report pre-dates my hire date at Air Products.
- Yes, this unit does appear to satisfy the applicability statement you reference in your email below.

If you need anything additional in the interim, please do not hesitate to reach out.

Thanks,

Preston Klingseis, PE, CHMM
North EHSQ Environmental Team Lead
O (610) 481-5909
C (484) 201-1037
klingspm@airproducts.com

tell me more
www.airproducts.com

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From: Balaji, Sriram (EEC) <sriram.balaji@ky.gov>
Sent: Wednesday, June 3, 2026 5:52 PM
To: Klingseis,Preston M. <KLINGSPM@airproducts.com>
Subject: [External] AI 83915 - Final Permit Questions

This email is from an external source. Please exercise caution in opening attachments or links.

Hi Preston,

I just had two questions before I finalize the draft permit and am able to send you all the courtesy copy.

First, per 40 CFR 63.7530(e), there was a required energy assessment that was seemingly performed on 11/30/2015. For some reason I can't find this document in our records. Could you send this to me so I can file it in the Division's system and make sure that this requirement is marked complete in the future.

Secondly, insignificant activity 3 (Cold Solvent Degreaser(s) (parts washers)) has never been looked at for applicability of 401 KAR 59:185 and this unit is seemingly an affected facility per 59:185 Section1(1) and is at a major source in an attainment area. Please let me know if this unit satisfies the applicability statement in 401 KAR 59:185 Section 2(1)(b) and if so, we can apply the proper requirements to the unit.

Thanks for your help,

Sriram Balaji

Office: 502-782-0159 - sriram.balaji@ky.gov

Environmental Engineer Assistant II

KY Division for Air Quality

Permit Review Branch - Chemical Section

Catlettsburg Hydrogen Facility
Catlettsburg, Kentucky

Boiler and Process Heater Energy Assessment

Joshua Llewellyn
Site Supervisor

30 Nov 2015

Disclaimer

This report was prepared by the Assessor in the course of performing an energy assessment for Air Products. Reproduction or distribution of the whole, or any part, of the contents of this document without written permission of Air Products is prohibited. Neither the assessor, company nor any of its employees make any warranty or representations, expressed or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any data, information, method product or process disclosed in this document, or represents that its use will not infringe any privately-owned rights, including, but not limited to, patents, trademarks, or copyrights.

This report uses preliminary information from vendor data and technical references. The report, by itself, is not intended as a basis for the engineering required to adopt any of the recommendations. Its intent is to inform the site of potential energy saving opportunities and very rough cost savings. The purpose of the recommendations and calculations is to determine whether measures warrant further investigation.

Acknowledgements

Authors

Aaron R. Duran – Report Author
Joshua Llewellyn – Qualified Assessor

Assessment Contributors/Assistants

Joshua Llewellyn – Site Supervisor
Clare Emerson – Plant Process Engineer
George Beris – Sr. Principal Environmental Specialist
Preston Kurtz – Business Improvement Engineer

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Executive Summary

A number of energy efficiency opportunities with varying payback periods were identified during the assessment. Based on estimated energy costs of electricity and natural gas, energy cost savings of approximately \$59,300/year are possible through measures that have an average payback period of 5.6 years. Table 1 below summarizes the projected economics for the recommended measures:

Grouped Efficiency Measures	Estimated Yearly Energy Savings	Estimated Installed Cost	Estimated Simple Payback (Years)
High Yearly Savings >\$100,000	-	-	-
Medium Yearly Savings ≥\$5,000	\$54,650	\$325,000	5.9
Low Yearly Savings <\$5,000	\$4,650	\$10,000	2.2
Totals	\$59,300	\$335,000	5.6

Table 1 - Summary of Estimated Savings and Payback Times

1. Facility Overview

The boiler and process heater energy assessment was performed at the Catlettsburg Hydrogen Facility located in Catlettsburg, Kentucky where the plant has a nominal capacity production of 34 MMSCFD of hydrogen gas and 153,800 lbs/hour of export steam utilizing steam reforming technology. The plant went on-stream November 2003 and has provided hydrogen and export steam for Catlettsburg Refining, LLC of Marathon Petroleum Corporation safely and reliably throughout its operation.

2. Boiler and Process Heater Systems

There are six boilers and process heaters being utilized within the plant which are generally classified as such by being main components of steam generation. An inventory of said boilers and process heaters is provided in Table 2 below. Nameplate and technical specifications can be provided upon request.

Boiler/Process Heater	Tag Number
Primary Reformer	F201
Process Gas Boiler	E301
Steam Drum	C712
Boiler Feed Water Preheater	E314
Economizer Coil	E2111
Steam Generation Coil	E2122

Table 2 - Summary of Boiler and Process Heaters On-Site

3. Energy Assessment

The energy assessment completed by the Assessor is separated by two attachments. Attachment A contains the inspections and evaluations for all affected boiler/process heater systems, e.g. Table 2, and Attachment B contains the conservation measures, potential savings, project cost, and the time frame to recoup investments. The energy assessment requirements are governed by Section 3.4.3 of the Major Source Boilers and Process Heaters Compliance Guide and were followed to the best of the Assessor's knowledge and capabilities.

Assessor: Joshua Llewellyn

Date: 30 Nov 2015

Site: Catlettsburg Hydrogen Facility



Attachment A: Boiler/Process Heater Energy Assessment Form

Requirement	Description	Notes
Visual Inspection	The visual inspection followed a comprehensive standard set by the Company that safely and thoroughly inspected the systems for any leaks, cracks, corrosion, and any defects that may compromise the system.	Assessor: No defects of any kind were found during the visual inspection.
Operating Characteristics, Maintenance, Procedures, and Logs	All the operating and maintenance procedures were scrutinized for compliance with the technical specifications and operating procedures as standardized by the Company such as the excess %O ₂ operating temperature, blowdown philosophy, deaerator pressure, makeup water preheat.	Assessor: No operating parameters deviated from the intended design of the boiler and process heater. All operating and maintenance procedures were logged and complied with Company standards.
Major Boiler/Process Heater Users	The major boiler and process heaters at the plant is the reformer, where the feed reacts and produces hydrogen and where export steam is produced from the excess heat. No assessment was done on customer steam use.	Assessor: The major systems at the plant, that are consuming energy from the boiler(s) and process heater(s), were the reformer and export steam as stated in the description.
Engineering Plans and Fuel Usage	The most recent plant flowsheets and the fuel usage monitoring reports were reviewed for agreement with the actual design for each boiler and process heater.	Assessor: The plant flowsheets are valid and accurate as compared with the actual plant. The monthly and daily fuel usage reports are within the specifications of the Company's standards and the boiler design.
Energy Management Practices	The Company's energy management plans call for optimizing fuel usage by recycling energy whenever possible, promoting blowdown philosophy, adhering to environmental, health, and safety policies, and continually improving upon plant efficiency.	Assessor: The facility may improve energy management by adopting any of the conservation measures as listed in Attachment B. The Company continually strives to optimize energy efficiency.

Assessor: Joshua LlewellynDate: 30 Nov 2015Site: Catlettsburg Hydrogen Facility

Attachment B: Overall Energy Assessment Form

Conservation Measures	Potential Savings	Project Cost	Time Frame (Simple Payout)
Clean Convection Coils	\$7,000 / Year	\$30,000	4.3 Years
Steam System Optimization - BFW Temperature to Steam Drum - Steam Drum Pressure	\$1,400 / Year	\$5,000	3.6 Years
Clean Heat Exchangers (Grit Blast Waste Heat Boiler)	\$11,650 / Year	\$50,000 (+\$80,000 for WHB Grit Blast)	4.3 Years (11.2 Years)
PSA Improvement - Surge Drum Pressure - Operate to Breakthrough - Autopurity Control - BD/PP Tuning - Balance Bed Performance - Feed Temperature Control	\$7,000 / Year	\$10,000	1.43 Years
Reformer and Catalyst Operating Parameter Optimization using MVO - Steam to Carbon Ratio - Reformer Pressure - Outlet Temperature	\$7,000 / Year	\$50,000	7.2 Years
Optimize Boiler Blowdown - Minimizing/Automation	\$3,250 / Year	\$5,000	1.6 Years
H2 Optimization - Reduce H2 Venting - Optimize H2 Recycle - Use H2 as Fuel	\$15,000 / Year	\$100,000	6.7 Years
Perform Rate Test	(enabling)	\$10,000	---
Reformer Temperature Balancing - Via Digital Image Analysis	\$7,000 / Year	\$5,000	0.7 Years

Balaji, Sriram (EEC)

From: Klingseis,Preston M. <KLINGSPM@airproducts.com>
Sent: Monday, June 8, 2026 11:05 AM
To: Balaji, Sriram (EEC)
Subject: RE: [External] AI 83915 - Final Permit Questions
Attachments: SDS_SafetyKleen_Premium_Solvent.pdf; Safety_Kleen_Parts_Washer_Manual.pdf

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Good Morning Sriram,

Appreciate the follow-up, answers to your questions are noted below in red. This unit meets all the exemption criteria.

An SDS for Safety Kleen Premium Solvent and the Manual for the Safety Kleen Parts Washer is attached for reference.

Please let me know if you have any additional questions or data needs.

Thanks,

Preston

From: Balaji, Sriram (EEC) <sriram.balaji@ky.gov>
Sent: Friday, June 5, 2026 5:44 PM
To: Klingseis,Preston M. <KLINGSPM@airproducts.com>
Subject: RE: [External] AI 83915 - Final Permit Questions

This email is from an external source. Please exercise caution in opening attachments or links.

Good Evening,

I completely forgot to ask you if the cold cleaners on site met the exemptions within 401 KAR 59:185 before adding the regulation to the permit. I have listed the criteria below:

Section 8. Exemptions. Any cold cleaners, other than cold cleaners subject to Section 4(3) or (4) of this administrative regulation, shall be exempt from Section 4 of this administrative regulation if the following criteria are met:

(1) The cold cleaner shall have a remote solvent reservoir; - Yes, please refer to parts washer manual for photos / diagram of the unit.

- (2) The solvent used in the cold cleaner shall not have a vapor pressure that exceeds thirty-three (33) mm Hg measured at 100°F or be heated above 120°F; - **Section 9 of the SDS notes a vapor pressure of 0.5 mm Hg measured at room temperature. Solvent is not heated during normal use.**
- (3) The sink-like work area shall have an open drain area less than 100 sq. cm.; and – **The specifications listed in the Safety Kleen Parts Washer Manual (Page 6 of the PDF) do not list the sink diameter, but a Google search notes that the sink diameter ranges from 3.8 to 5.1 cm in diameter. Conservatively assuming a 5.1 cm diameter for the drain, this equates to an approximate area of 21 sq. cm.**
- (4) Evidence shall be provided that waste solvent shall be stored or properly disposed of with minimal loss due to evaporation. – **By design and work practice, the cover for the parts washer is kept closed when the unit is not in use. The unit is also stored indoors out of the sunlight.**

And

Section 4(3)(b)

The operation of a cold cleaner using a solvent with a vapor pressure that exceeds one (1.0) mm Hg (0.019 psi) measured at 20° C (68° F) – **Please see response noted above.**

If the units do not meet the exemptions under Section 8 or do meet the exemptions but exceed the vapor pressure standard under Section 4(3)(b) I will need the number of degreasers on site. I can use AP-42 to find the emissions from these units otherwise. (All VOC emissions and should be quite low)

Thanks for your help and sorry for the inconvenience.

- Sri Balaji

From: Klingseis, Preston M. <KLINGSPM@airproducts.com>
Sent: Thursday, June 4, 2026 12:35 PM
To: Balaji, Sriram (EEC) <sriram.balaji@ky.gov>
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Thanks for your help,

Sriram Balaji
Office: 502-782-0159 - sriram.balaji@ky.gov

Environmental Engineer Assistant II
KY Division for Air Quality
Permit Review Branch - Chemical Section

SAFETY-KLEEN

MODELS 16(C) & 30(C)

MANUAL SINK & DRUM PARTS WASHER

Operator Booklet



Customer should read and retain this booklet.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, by anyone other than an authorized Safety-Kleen Service Representative, or employee, without prior written permission of Safety-Kleen Systems, Inc..

LOCAL SAFETY-KLEEN BRANCH

OFFICE ADDRESS

PHONE NUMBER

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SAFETY MEASURES



Safety in the workplace is dependent upon the proper use of this equipment and the solvent used in it. Therefore, it is important to carefully follow all safety instructions and operational procedures provided in this booklet and on the labels, as well as all instructions included in the solvent's Safety Data Sheet (SDS). Failure to do so may create a dangerous working environment.

Keep a copy of this booklet and the SDS near the equipment for quick and easy reference.



In accordance with Occupational Health and Safety Administration (OSHA) in the U.S. and the Workplace Hazardous Materials Information System (WHMIS) in Canada, this parts washer model has been tested by a Nationally Recognized Testing Laboratory (NRTL), Intertek Services, and is found to be in compliance with the following standards:

- UL 201: Standard for Garage Equipment, or
- UL 1204: Standard for Parts Cleaners
- CAN/CSA C22.2 No. 68 : Motor-Operated Appliances (Household And Commercial)

Important Safety Instructions

1. In an emergency, turn off electrical supply.
2. Read and understand this booklet and the Safety Data Sheet for the solvent in use before operating. Operate the equipment only as described in this booklet. Use only manufacturer's supplied attachments.
3. Do not modify the equipment. Modification may cause personal injury and/or property damage, and will void the warranty.
4. Always unplug equipment from the electrical outlet before being maintained, serviced, or repaired. Never use the cord to pull the plug from the outlet. Grasp plug and pull to disconnect.
5. Use only the provided Safety-Kleen solvent. Do not add foreign solvents or chemicals to the solvent. The use of other chemicals may cause a hazardous condition. Do not remove solvent from the equipment.
6. Avoid contact with solvent or vapor. Always wear appropriate personal protective equipment ([PPE] i.e., gloves, apron, eyewear, respirator [where required]) to meet OSHA and WHMIS protection standards. **Always wear safety glasses.** Everyday eyeglasses only have impact resistant lenses, they are not safety glasses. Consult the SDS and follow all recommended PPE and safety information.
7. Do not operate the equipment in any manner that can cause splashing or mist to form. Do not spray aerosols into or around the equipment.
8. Use only in a well-ventilated area.
9. Do not use below garage floor or grade level.
10. Do not operate equipment in the vicinity of any open containers of flammable and/or combustible liquids (e.g., gasoline) or near any ignition source. Keep away from heat, spark, or flame to reduce the risk of fire.
11. Do not place hot parts in contact with the solvent.
12. Do not clean friction materials (e.g., brake linings and clutch surfaces) in this equipment. Do NOT clean or degrease porous or absorbent materials, such as; cloth, leather, wood, or paper in this equipment.
13. Do not use compressed air to dry parts.

14. Do not obstruct, or hang anything on, the lid. Do not leave unattended objects in the equipment that can interfere with automatic lid closure in case of fire. Close the lid when the equipment is not in use.
15. To reduce the risk of electric shock, do not use on wet surfaces or expose to rain. Do not operate any electrical apparatus inside the equipment.
16. Do not operate the equipment if a leak is apparent or occurs during use. Slippery conditions can result. Use caution when attempting to stop the leak. Only attempt if possible to do without risk. Consult the SDS for clean-up measures. Contact your Safety-Kleen Representative.
17. Do not operate damaged equipment until it has been examined by a qualified service technician.
18. Do not smoke, eat, or drink in the work area. Use good personal hygiene. Wash hands thoroughly with soap and water after handling. Make sure clean water is available in the work areas for flushing the eyes and skin.
19. Do not lean into the equipment.

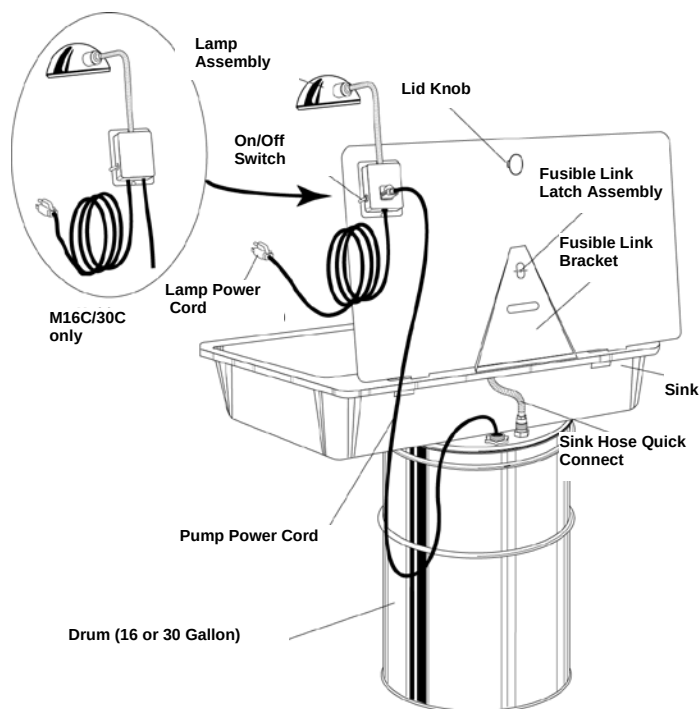
Save These Instructions

Air Quality and Environmental Information

1. The solvent cleaning equipment shall be operated and maintained in proper working order, in strict accordance with the recommendations of the manufacturer. Maintain equipment to minimize leaks and fugitive emissions.
2. Waste solvent should not be disposed of or transferred to another party, such that greater than 20% of the waste (by weight) can evaporate into the atmosphere.
3. Close the cover if parts are not being handled in the cleaner for two (2) minutes or more, or if the device is not in use.
4. Work area fans shall be located and positioned so that they do not blow across the opening of the cold cleaning machine. No degreaser equipment shall be located and positioned so that ventilation from an open window blows across the opening of the solvent cleaning machine. Minimize the drafts across the top of each cold cleaning equipment such that whenever the cover is open the equipment is not exposed to drafts greater than 40 meters per minute (132 feet per minute), as measured between one (1) and two (2) meters (3.3 and 6.6 feet) upwind, at the same elevation as the tank lip.
5. If a degreasing solvent spray is used (e.g., flushing of parts using a flexible hose or other flushing device), work shall be performed only within the freeboard area of the cold cleaning machine. The solvent flushing used shall be a solid fluid stream, not an atomized or shower spray, at a pressure that does not exceed ten (10) pounds per square inch gauge (psig) as measured at the pump outlet.
6. When solvent is added to or drained from a solvent cleaning machine, the solvent shall be transferred using threaded or other leak-proof couplings and the end of the pipe in the solvent sump shall be located beneath the liquid solvent surface.
7. In certain areas, solvent use records must be kept and made available to Air Quality Enforcement Officers upon request. Check your local air quality regulations.
8. DO NOT remove trays, platforms, or other devices designed to cover the solvent or solvent remote reservoir on any parts washer, except when adding or removing parts or to perform maintenance.

SAFETY-KLEEN MODEL 16(C) & MODEL 30(C)

Safety-Kleen's Model 16(C) and Model 30(C), Manual Sink & Drum Parts Washers are classified as remote reservoir cold cleaners according to Federal/State/Provincial solvent degreasing regulations. The Model 30's sink is the larger of the two sinks and sits atop a 30 gallon steel drum containing Safety-Kleen solvent. The Model 16 sits atop a 16 gallon steel drum of solvent. In addition to the sink and drum, other similar components include the fusible link, pump, hose/brush and lamp assemblies. The Model 16C and 30C are designed for Canadian use.



SPECIFICATIONS

	Model 16(C)	Model 30(C)
Floor Space		
Width	27.50" (69.9 cm)	33.25" (84.5 cm)
Depth	16.25" (41.3 cm)	22.25" (56.6 cm)
Height with lid open	53.00" (134.7 cm)	60.00" (152.4 cm)
Sink Dimensions		
Width	27.50" (69.9 cm)	33.25" (84.5 cm)
Depth	16.25" (41.3 cm)	22.25" (56.6 cm)
Height	7.50" (19.1 cm)	8.00" (20.4 cm)
Load capacity of sink	25 lbs (11.4 kg)	25 lbs (11.4 kg)
Weight		
Weight of equipment w/ empty drum	57 lbs. (25.9 kg)	62 lbs. (28.2 kg)

	Model 16(C)	Model 30(C)
Weight of equipment w/ full drum	111 lbs. (50.3 kg)	174 lbs. (73.5 kg)
Electrical	Grounded, dedicated outlet 115V, 60hz, 1.4A, 6' power cord	Grounded, dedicated outlet 115V, 60hz, 1.4A, 6' power cord
Maximum bulb wattage	40 W	40 W
Operating Temperature	Ambient	Ambient
Fusible Link Melt Temp	158°F	158°F
Flowrate		
Spigot	1.3 gpm/1.0 gpm	1.3 gpm/1.0 gpm

THE SOLVENT



Combustible liquid. May cause drowsiness and dizziness. May be fatal if swallowed and enters airways. Causes skin irritation.

Only use the provided solvent such as Safety-Kleen's Premium Solvent or other solvents offered by Safety-Kleen Systems. Do not add water, or foreign solvents or chemicals to the solvent. The use of other chemicals may cause a hazardous condition. Do NOT remove solvent from the equipment.

This equipment has only been investigated for use with hydrocarbon-based solvents (e.g., mineral spirits, petroleum distillates) with a flash point $\geq 105^{\circ}\text{F}$ and an auto-ignition temperature $\geq 410^{\circ}\text{F}$.

PRE-INSTALLATION

1. Confirm the M16(C) or M30(C) will be located
 - ✓ on a level surface
 - ✓ within 6 feet of a grounded, dedicated electrical outlet
2. Use an outlet tester to verify that the power outlet meets the required specifications: 115V, 60hz, 1.4A.
3. Position either a 30 gallon or 16 gallon drum of solvent at the work site and remove the lid.
4. Continue to pump installation.



INSTALLATION

- Caution: To provide continued protection against risk of electric shock, fire, and explosion, connect to properly grounded outlets only.
- Warning Risk of explosion. This equipment has internal arcing or sparking parts, which should not be exposed to flammable vapors. The product should not be located in a recessed floor area or below floor level

The Model 16(C) and Model 30(C) follow the same installation process. The first step involves the pump/sink assembly placement, followed by the lamp and fusible link assembly installations.

Each model includes one of two unique sink/ pump assemblies, either the split basket or full basket sink/pump assembly.

The Split Basket Sink/Pump Assembly

1. Place the pump assembly into the drum of solvent and secure the half-moon's position on the lip of the drum. Ensure the pump's power cord is accessible.
2. Place the sink assembly into the drum. Ensure the sink is resting as illustrated.
3. Connect the sink hose to the pump's quick connect fitting located on the half-moon.
4. Place the crumb cup into the sink drain hole.
5. Continue to lamp assembly.



The Full Basket Sink/Pump Assembly

1. From the top of the sink basket, notice the pump power cord threaded through one of the holes. Grasp the pump's power cord and use it to guide the pump



conduit up through the hole in the bottom of the sink basket, to the corresponding hole located in the top of the basket. Ensure the pump is properly aligned with its white pump screen facing downward, towards the front of the sink.

2. From the top of the basket, secure the pump conduit in the open hole. Insert the rubber grommet into the pump conduit and tighten the lock nut onto the pump conduit.

3. Grasp the black pump/sink hose, and from the top of the basket, guide it through the open hole to the hole in the bottom of the basket. Leave the one free end of pump/sink hose exposed from the top of the basket and connect the other end to the pump fitting.



4. Place the pump/sink assembly into the drum of solvent.
5. Connect the free end of the pump hose to the sink's quick connect fitting.
6. Place the crumb cup into the sink drain hole.
7. Attach the lid knob.

The Nozzle Assembly

NOTE: To prevent the nozzle from snapping during assembly DO NOT over tighten the connection. Slowly tighten the nozzle until you feel some resistance and then stop tightening immediately.

1. Hand tighten the nozzle into the hose barb.
2. Place one washer on the inside of the sink and the other washer on the back side of the sink.
3. Place a $\frac{3}{4}$ wrench on the hose barb behind the sink and another $\frac{3}{4}$ wrench on the hex head of the nozzle.
4. Slowly tighten the nozzle until you feel some resistance and then stop.



The Lamp Assembly

1. Using the shorter provided screws, attach the lamp assembly to the outside of the lid. Install the provided 40 watt light bulb. IMPORTANT~ Do not use any light bulb with a wattage greater than 40 watts. Doing so will cause the equipment to malfunction, requiring a service call.
2. Attach the lamp screen using the thumb screws.
3. Plug the pump's power cord into the lamp assembly's electrical outlet.
4. Plug the lamp's power cord into the customer's electrical outlet. Make sure the lamp and the pump are operational. Note: M16C and M30C pump is hard wired to the lamp control box.
5. Continue to fusible link installation.

The Fusible Link Assembly

A Model 16 or 30 will utilize one of two fusible link assemblies. Both assemblies feature a fusible link wingnut in the lid. This wingnut will engage with one of the completed assemblies below, keeping the lid open for use. The fusible link will melt and disengage in case of fire, allowing the lid to close.

The Bracket Fusible Link Assembly

1. With the bracket's flat side facing the lid, align the four holes on the fusible link bracket with the four holes located on the rear sink edge.
2. Secure the bracket to the sink with the provided hardware.
3. Raise the lid. From the front of the lid, press and twist the fusible link wingnut to engage the fusible link bracket and secure the lid in an open position.
4. The fusible link bracket can also serve as a carrying handle.



J-Hook/Standpipe Fusible Link Assembly **The Standpipe**

1. Locate the two nuts illustrated below, either already attached to the stand pipe, or provided loose in a hardware bag.
2. If the nuts are both attached to the standpipe, remove one. If provided separately, attach one securely to the standpipe.

Now locate the hole on the sink's rear edge, and position and hold the spare nut around that hole from underneath. Next, working from above, insert the standpipe through the hole, then twist and thread the standpipe into the bottom nut until the standpipe is secured to the sink in an upright position.

The J-Hook

1. Working from the sink's interior, insert the J-Hook through the hole in the lid so the J-hook is accessible with the lid closed.
2. Position the components on the J-Hook in this order:
 - a) First slotted washer
 - b) Compression spring
 - c) Second slotted washer
3. Compress the assembled components down to expose the cotter pin hole on the J-Hook.
4. Insert the cotter pin as illustrated and secure the pin to hold the entire J-Hook assembly in place.
5. Open the lid and position the J-hook around the standpipe, to secure the lid in an open position.



OPERATION

M16(C) M30(C) Operation

1. Ensure the parts washer is connected to a functioning 115V, 60Hz electrical outlet.
2. Put on protective eyewear, gloves, clothing, and shoes before operating equipment.
3. Raise the lid and engage the fusible link assembly to secure the lid in an open position.
4. Direct the spigot downward into the sink basin.
5. Drain and remove excess debris from dirty parts before placing them in the equipment for cleaning. The debris should be deposited into an appropriate waste container, not in the equipment.
6. Toggle the lamp assembly's power switch to turn on the lamp and start the pump.
7. Position part under solvent stream and begin cleaning.
8. Clean all parts in the sink area. Avoid splashing outside of the sink area.
9. Once the cleaning operation is complete, shut down the pump and lamp assemblies, and allow the clean parts to drain completely before removing them from the sink.
10. Keep the lid closed when not in use.

TROUBLESHOOTING

Problem	Possible Solution
No Power	• Check power cord connection to a dedicated, grounded and working electrical outlet with sufficient voltage (110V to 125 V). • Check that the pump connection to the lamp assembly is secure.
Lamp Doesn't Work	• Check power cord connection to a dedicated, grounded and working electrical outlet with sufficient voltage (110V to 125 V). • Check that the LAMP power switch is in the ON position. • Replace the bulb (40 watt maximum).
Pump Pulsates	• Check that the pump connection to the lamp assembly is secure. • Check the hose for blockages or crimps. • Remove the sink's crumb cup and/or strainer basket, and check that the pump is fully submerged in solvent in the drum below. If not, contact your Safety-Kleen representative.
Drainage Issue	• Remove debris from the sink's crumb cup and/or strainer basket and dispose of according to local regulations. Do NOT dump debris into the solvent drum as it will clog the pump assembly. • Ensure the equipment is placed on level ground.

SERVICE AND REPAIR

In accordance with your Safety-Kleen service agreement, a Safety-Kleen service representative will:

- Install and set up the Safety-Kleen equipment
- Be your primary contact with Safety-Kleen
- Put the name and phone number of the nearest Safety-Kleen branch on the equipment and/or on the inside cover of this booklet
- Provide information about your service contract with Safety-Kleen
- Explain what solvent is provided with the equipment, provide SDS's and answer any questions about the solvent

This equipment is to be serviced only by authorized Safety-Kleen personnel using an approved solvent. If you have any questions, require repairs, or need early service, contact your local branch or Safety-Kleen at 1-800-669-5740. Additional assistance can be found at www.safety-kleen.com.



Safety-Kleen Systems, Inc.
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Norwell, MA 02061-9149

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Problema	Possible solución
La bomba vibra	• Verifique que la conexión de la bomba al conjunto de la lámpara sea segura. • Verifique que la manguera no esté obstruida o doblada. • Retire el filtro o colador de la batea y compruebe que la bomba esté completamente sumergida en solvente en el tambor de abajo. Si no lo está, póngase en contacto con su representante de Safety-Kleen.
Problema de drenaje	• Retire los residuos del filtro o colador de la batea y deséchelos de acuerdo con las normativas locales. NO vierta residuos en el tambor de solvente, ya que obstruirá el conjunto de la bomba. • Asegúrese de que el equipo esté colocado en un suelo nivelado.

SERVICIO TÉCNICO Y REPARACIÓN

De acuerdo con su contrato de servicio de Safety-Kleen, un representante del servicio de Safety-Kleen:

- Instalará y pondrá en marcha el equipo de Safety-Kleen.
- Será su contacto principal con Safety-Kleen.
- Pondrá el nombre y el número de teléfono de la sucursal de Safety-Kleen más cercana en el equipo o en la cubierta interior de este folleto.
- Proporcionará información sobre su contrato de servicio con Safety-Kleen.
- Explicará qué solvente se suministra con el equipo, proporcionará la HDS y responderá a cualquier pregunta sobre el solvente.

El mantenimiento de este equipo debe ser realizado únicamente por personal autorizado de Safety-Kleen que utilice un solvente aprobado. Si tiene alguna pregunta, necesita realizar una reparación o necesita contratar un mantenimiento anticipado, póngase en contacto con su sucursal local o con Safety-Kleen al 1-800-669-5740. Puede encontrar ayuda adicional en www.safety-kleen.com.

5. Abra la tapa y coloque el gancho en J alrededor del tubo vertical, para asegurar la tapa en posición abierta.



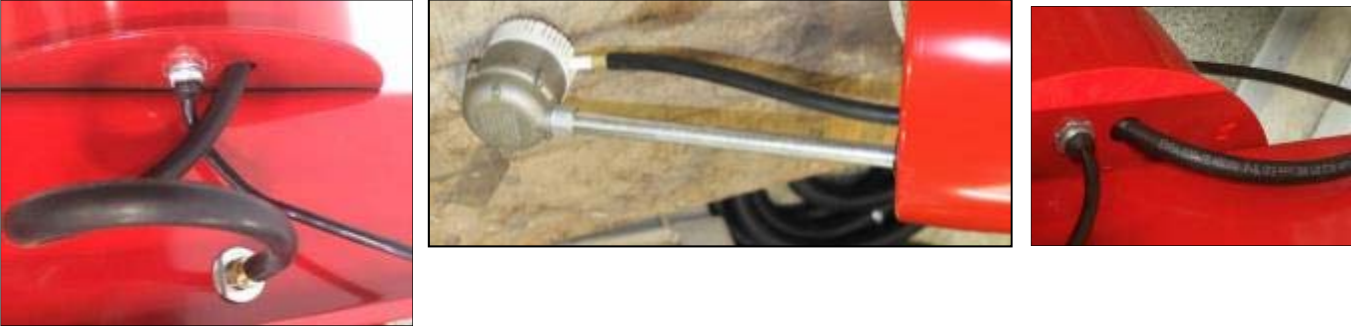
FUNCIONAMIENTO

Funcionamiento de M16(C) y M30(C)

1. Asegúrese de que la lavadora de piezas esté conectada a una toma de corriente de 115 V y 60 Hz que funcione.
2. Póngase gafas, guantes, ropa y calzado de protección antes de utilizar el equipo.
3. Levante la tapa y enganche el conjunto de eslabones fusibles para asegurar la tapa en posición abierta.
4. Dirija la espiga hacia abajo en la piletta de la batea.
5. Escorra las piezas sucias y elimine el exceso de residuos antes de colocarlas en el equipo para limpiarlas. Los residuos deben depositarse en un contenedor de desechos adecuado, no en el equipo.
6. Accione el interruptor de alimentación del conjunto de la lámpara para encenderla y poner en marcha la bomba.
7. Coloque la pieza bajo el chorro de solvente y comience la limpieza.
8. Limpie todas las piezas en la zona de la batea. Evite las salpicaduras fuera de la zona de la batea.
9. Una vez finalizada la operación de limpieza, apague los conjuntos de bomba y lámpara, y deje que las piezas limpias se escurran completamente antes de retirarlas de la batea.
10. Mantenga la tapa cerrada cuando no la utilice.

SOLUCIÓN DE PROBLEMAS

Problema	Possible solución
No hay electricidad	• Verifique la conexión del cable de alimentación a una toma de corriente dedicada, con conexión a tierra y que funcione con un voltaje suficiente (110 V a 125 V). • Verifique que la conexión de la bomba al conjunto de la lámpara sea segura.
La lámpara no funciona	• Verifique la conexión del cable de alimentación a una toma de corriente dedicada, con conexión a tierra y que funcione con un voltaje suficiente (110 V a 125 V). • Compruebe que el interruptor de alimentación de la LAMPARA está en la posición ON. • Sustituya la bombilla (40 vatios como máximo).



4. Coloque el conjunto de la bomba y la batea en el tambor con solvente.
5. Conecte el extremo libre de la manguera de la bomba al accesorio de conexión rápida de la batea.
6. Coloque el filtro en el orificio de desagüe de la batea.
7. Coloque el pomo de la tapa.

Montaje de la boquilla

NOTA: Para evitar que la boquilla se rompa durante el montaje, NO ajuste demasiado la conexión. Ajuste lentamente la boquilla. Cuando perciba cierta resistencia, deje de ajustar inmediatamente.

1. Ajuste a mano la boquilla en la espiga de la manguera.
2. Coloque una arandela en el interior de la batea y la otra en la parte trasera de esta.
3. Coloque una llave de $\frac{3}{4}$ de pulgada en la espiga de la manguera detrás de la batea y otra llave de $\frac{3}{4}$ de pulgada en la cabeza hexagonal de la boquilla.
4. Ajuste lentamente la boquilla. Cuando perciba cierta resistencia, deje de ajustar.



Montaje de la lámpara

1. Fije el conjunto de la lámpara al exterior de la tapa con los tornillos más cortos suministrados. Instale la bombilla de 40 vatios suministrada. **IMPORTANTE:** No utilice ninguna bombilla con una potencia superior a 40 vatios. Si lo hace, el equipo funcionará mal y será necesario llamar al servicio técnico.
2. Fije la pantalla de la lámpara con los tornillos de ajuste manual.
3. Conecte el cable de alimentación de la bomba en la toma de corriente del conjunto de la lámpara.
4. Conecte el cable de alimentación de la lámpara en la toma de corriente del cliente. Asegúrese de que la lámpara y la bomba funcionen correctamente. Nota: Las bombas del M16C y el M30C están conectadas con cables a la caja de control de la lámpara.
5. A continuación, instale el eslabón fusible.

Montaje del eslabón fusible

Tanto el Modelo 16 como el 30 utilizan uno de los dos conjuntos de eslabones fusibles. Ambos conjuntos cuentan con una tuerca de mariposa de eslabón fusible en la tapa. Esta tuerca de mariposa interaccuará con uno de los conjuntos completados de abajo, para mantener la tapa abierta durante el uso. En caso de incendio, el enlace fusible se fundirá y se soltará para permitir que la tapa se cierre.

Montaje del enlace fusible del soporte

1. Con el lado plano del soporte orientado hacia la tapa, alinee los cuatro orificios del soporte del enlace fusible con los cuatro orificios ubicados en el borde posterior de la batea. Fije el soporte a la batea con los tornillos suministrados. Levante la tapa. Desde la parte delantera de la tapa, presione y gire la tuerca de mariposa del eslabón fusible para enganchar el soporte del eslabón fusible y asegurar la tapa en posición abierta.
4. El soporte del eslabón fusible también puede servir como asa de transporte.



Montaje del gancho en J/eslabón fusible del tubo vertical

El tubo vertical

1. Localice las dos tuercas que se ilustran a continuación, ya sea que estén unidas al tubo vertical o que estén sueltas en la bolsa de tornillos.
2. Si ambas tuercas están unidas al tubo vertical, retire una. Si se suministran por separado, fije una de manera firme al tubo vertical. Ahora, localice el orificio en el borde posterior de la batea, y coloque y sostenga la tuerca de repuesto alrededor de ese orificio desde la parte inferior. A continuación, trabaje desde arriba, inserte el tubo vertical a través del orificio, luego gire y enrosque el tubo vertical en la tuerca inferior hasta que el tubo vertical quede fijado a la batea en posición recta.

El gancho en J

1. Trabajando desde el interior de la batea, introduzca el gancho en J a través del orificio de la tapa, de modo se pueda acceder a él con la tapa cerrada.
2. Coloque los componentes del gancho en J en este orden:
 - a) Primera arandela ranurada
 - b) Muelle de compresión
 - c) Segunda arandela ranurada
3. Empuje los componentes ensamblados hacia abajo para exponer el orificio del pasador de chaveta en el gancho en J.
4. Inserte el pasador de chaveta como se ilustra y asegure el pasador para sostener todo el conjunto del gancho en J en su lugar.

- Precaución: Para proporcionar una protección continua contra el riesgo de descargas eléctricas, incendios y explosiones, conéctese únicamente a tomas de corriente con conexión a tierra.
- Advertencia: Riesgo de explosión. Este equipo tiene piezas internas que producen arcos eléctricos o chispas que no deben exponerse a vapores inflamables. El producto no debe ubicarse en una zona de piso empotrado o por debajo del nivel del suelo.

Los Modelos 16(C) y 30(C) siguen el mismo proceso de instalación. El primer paso consiste en colocar el conjunto bomba y batea. Luego, se debe instalar la lámpara y el conjunto de eslabón fusible.

Cada modelo incluye uno de los dos conjuntos únicos de batea y bomba, ya sea el conjunto de batea y bomba de cesta dividida o el de cesta completa.

Montaje de la batea de cesta dividida y bomba

1. Coloque el conjunto de la bomba en el tambor de solvente y asegure la posición de la media luna en el borde del tambor. Asegúrese de que se pueda acceder al cable de alimentación de la bomba.
2. Coloque el conjunto de la batea en el tambor. Asegúrese de que la batea esté apoyada como se indica en la ilustración.
3. Conecte la manguera de la batea al accesorio de conexión rápida de la bomba situado en la media luna.
4. Coloque el filtro en el orificio de desague de la batea.
5. A continuación, monte la lámpara.



Montaje de la batea de cesta única y bomba

1. Desde la parte superior de la cesta de la batea, observe el cable de alimentación de la bomba y utilícelo para guiar el conducto de la bomba hacia arriba a través del orificio en la parte inferior de la cesta de la batea, hasta el orificio correspondiente situado en la parte superior de la cesta. Asegúrese de que la bomba esté correctamente alineada con la rejilla blanca hacia abajo, en dirección a la parte delantera de la batea.

2. Desde la parte superior de la cesta, fije el conducto de la bomba en el orificio abierto. Inserte el ojal de goma en el conducto de la bomba y ajuste la tuerca de seguridad en el conducto de la bomba.
3. Sujete la manguera negra de la bomba/batea y, desde la parte superior de la cesta, guíela por el orificio abierto hasta el orificio de la parte inferior de la cesta. Deje el extremo libre de la manguera de la bomba/batea que sale de la parte superior de la cesta y conecte el otro extremo al accesorio de la bomba.



Modelo 16(C)		Modelo 30(C)	
Peso			
Peso del equipo con el tambor vacío	57 lb (25.9 kg)	62 lb (28.2 kg)	
Peso del equipo con el tambor lleno	111 lb (50.3 kg)	174 lb (73.5 kg)	
Componentes eléctricos	Toma de corriente dedicada y con conexión a tierra	Toma de corriente dedicada y con conexión a tierra	
	Cable de alimentación de 6 ft de 115 V, 60 Hz, 1.4 A	Cable de alimentación de 6 ft de 115 V, 60 Hz, 1.4 A	
Potencia máxima de la bombilla	40 W	40 W	
Temperatura de funcionamiento	Ambiente	Ambiente	
Temperatura de fusión del eslabón fusible	158 °F	158 °F	
Caudal			
Espiga	1.3 gpm/1.0 gpm	1.3 gpm/1.0 gpm	



Líquido combustible. Puede provocar somnolencia y mareos. Puede ser mortal si se ingiere e ingresa a las vías respiratorias. Causa irritación en la piel.

Utilice únicamente el solvente suministrado, como el solvente Premium de Safety-Kleen u otros solventes ofrecidos por Safety-Kleen Systems. No añada agua, ni otros solventes o productos químicos al solvente. El uso de otros productos químicos puede dar lugar a una situación de peligro. NO retire el solvente del equipo.

Solo existen datos de investigación del uso de este equipo con solventes a base de hidrocarburos (por ejemplo, alcoholes minerales, destilados de petróleo) con un punto de inflamación $\geq 105^{\circ}\text{F}$ y una temperatura de autoignición $\geq 410^{\circ}\text{F}$.

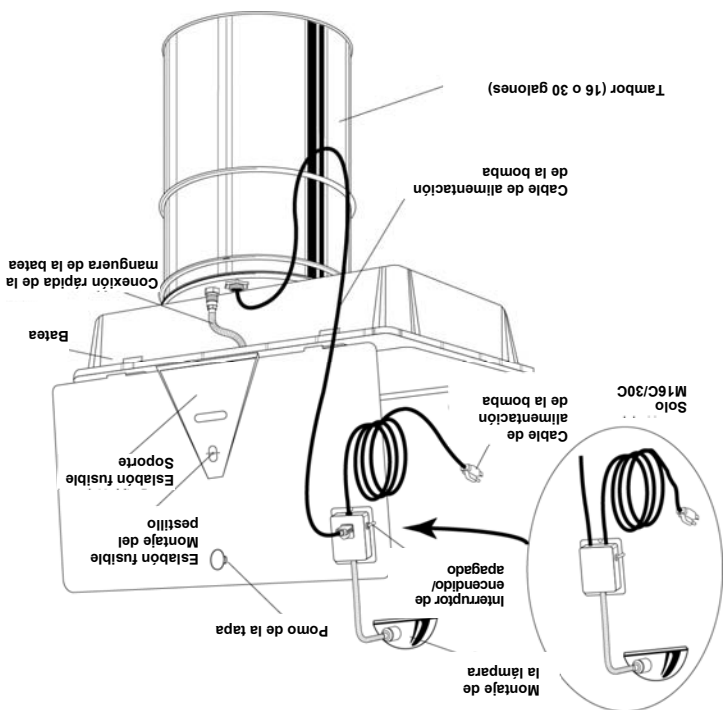
ANTES DE LA INSTALACIÓN

1. Confirme que la lavadora M16(C) o M30(C) estará ubicada:
 - ✓ en una superficie plana,
 - ✓ a menos de 6 pies de una toma de corriente con conexión a tierra.
2. Utilice un comprobador de tomas de corriente para verificar que la toma de corriente cumpla con las especificaciones requeridas: 115 V, 60 Hz, 1.4 A.
3. Coloque el tambor de solvente de 30 galones o de 16 galones en el lugar de trabajo y retire la tapa.
4. A continuación, instale la bomba.



ESPECIFICACIONES

Área en el suelo		
Ancho	27.50 in (69.9 cm)	33.25 in (84.5 cm)
Profundidad	16.25 in (41.3 cm)	22.25 in (56.6 cm)
Altura con la tapa abierta	53.00 in (134.7 cm)	60.00 in (152.4 cm)
Dimensiones de la batea		
Ancho	27.50 in (69.9 cm)	33.25 in (84.5 cm)
Profundidad	16.25 in (41.3 cm)	22.25 in (56.6 cm)
Altura	7.50 in (19.1 cm)	8.00 in (20.4 cm)
Capacidad de carga de la batea	25 lb (11.4 kg)	25 lb (11.4 kg)



Las lavadoras de piezas de batea y tambor manuales Modelo 16(C) y Modelo 30(C) de Safety-Kleen están clasificadas como limpiadores en frío con depósito remoto de acuerdo con las regulaciones federales, estatales o provinciales de desengrasado con solventes. La batea del Modelo 30 es la más grande de las dos bateas y se asienta sobre un tambor de acero de 30 galones que contiene solvente Safety-Kleen. El Modelo 16 se asienta sobre un tambor de acero de 16 galones de solvente. Además de la batea y el tambor, otros componentes similares son el eslabón fusible, la bomba, la manguera o el cepillo y los conjuntos de lámparas. Los Modelos 16C y 30C están diseñados para su uso en Canadá.

13. No utilice aire comprimido para secar las piezas.

14. No obstruya la tapa ni cuelgue nada de ella. No deje objetos desatendidos en el equipo que puedan interferir con el cierre automático de la tapa en caso de incendio. Cierre la tapa cuando el equipo no esté en uso.

15. Para reducir el riesgo de descarga eléctrica, no utilice el equipo sobre superficies húmedas ni lo exponga a la lluvia. No accione ningún aparato eléctrico en el interior del equipo.

16. No haga funcionar el equipo si hay una fuga visible o se produce durante el uso. Las fugas pueden hacer que el suelo quede resbaladizo. Tenga cuidado al intentar detener la fuga. Inténtelo únicamente si se puede hacer sin riesgo. Consulte la HDS para conocer las medidas de limpieza. Póngase en contacto con su representante de Safety-Kleen.

17. No utilice el equipo dañado hasta que lo examine un técnico calificado.

18. No fume, coma ni beba en la zona de trabajo. Mantenga una buena higiene personal. Lávese bien las manos con agua y jabón después de la manipulación. Asegúrese de que haya agua limpia en las zonas de trabajo para enjuagarse los ojos y la piel.

19. No se apoye en el equipo.

Guarde estas instrucciones

Información sobre la calidad del aire y el medioambiente

1. Debe utilizar y mantener el equipo de limpieza con solventes en buen estado de funcionamiento, en estricta conformidad con las recomendaciones del fabricante. Haga un mantenimiento del equipo para minimizar las fugas y las emisiones fugitivas.

2. Los residuos del solvente no deben eliminarse ni transferirse a otra parte; al hacerlo más del 20 % de los residuos (en peso) se pueden evaporarse a la atmósfera.

3. Cierre la tapa si las piezas no se manipulan en la limpiadora durante dos (2) minutos o más, o si el aparato no está en uso.

4. Los ventiladores del área de trabajo deberán estar ubicados y colocados de manera que no soplen a través de la abertura de la máquina de limpieza en frío. Ningún equipo desengrasante deberá situarse y posicionarse de manera que la ventilación de una ventana abierta sople a través de la abertura de la máquina de limpieza con solvente. Reduzca al mínimo las corrientes de aire a través de la parte superior de cada equipo de limpieza en frío de manera que, siempre que la cubierta esté abierta, el equipo no esté expuesto a corrientes de aire superiores a 40 metros por minuto (132 pies por minuto), medidas entre uno (1) y dos (2) metros (3.3 y 6.6 pies) contra el viento, a la misma altura que el borde del tanque.

5. Si se utiliza un solvente desengrasante en aerosol (por ejemplo, el lavado de piezas con una manguera flexible u otro dispositivo de lavado), el trabajo se realizará únicamente dentro de la zona de margen libre de la máquina de limpieza en frío. El lavado con solvente utilizado será un chorro de fluido sólido (no atomizado ni tipo ducha), a una presión que no supere la presión manométrica de diez (10) libras por pulgada cuadrada (psig) medidas en la salida de la bomba.

6. Cuando se añada solvente a una máquina de limpieza con solvente o se drene de ella, el solvente se transferirá utilizando acoplamientos roscados o de otro tipo a prueba de fugas y el extremo de la tubería del sumidero de solvente se situará por debajo de la superficie del solvente líquido.

7. En determinadas zonas, se deben conservar registros de uso de solventes y ponerlos a disposición de los funcionarios encargados de velar por la calidad del aire que lo soliciten. Revise la normativa local sobre la calidad del aire.

8. NO retire las bandejas, plataformas u otros dispositivos diseñados para cubrir el solvente o el depósito remoto de solvente en ninguna lavadora de piezas, excepto cuando añada o retire piezas o para realizar el mantenimiento.

MODELO 16(C) Y MODELO 30(C) DE SAFETY-KLEEN

MEDIDAS DE SEGURIDAD



La seguridad en el lugar de trabajo depende del uso adecuado de este equipo y del solvente con el que se lo utiliza. Por lo tanto, es importante seguir cuidadosamente todas las instrucciones de seguridad y los procedimientos de funcionamiento proporcionados en este folleto y en las etiquetas, así como todas las instrucciones incluidas en la hoja de datos de seguridad (HDS) del solvente. El no seguir estas instrucciones, puede crear un entorno de trabajo peligroso.

Mantenga una copia de este folleto y de la HDS cerca del equipo para tener una referencia rápida y fácil.

De acuerdo con la Administración de Salud y Seguridad Ocupacional (OSHA) en los Estados Unidos y con el Sistema de Información de Materiales Peligrosos en el Lugar de Trabajo (WHMIS) en Canadá, este modelo de lavadora de piezas ha sido probado por un laboratorio de pruebas reconocido a nivel nacional (NRTL), Intertek Services, y se ha determinado que cumple con las siguientes normas:

- UL 201: Norma para equipos de taller mecánico, o
- UL 1204: Norma para limpiadores de piezas
- CAN/CSA C22.2 n.º 68: Electrodomésticos (para el hogar y comerciales)



Instrucciones importantes de seguridad

1. En caso de emergencia, desconecte el suministro de electricidad.
2. Lea y comprenda este folleto y la hoja de datos de seguridad del solvente utilizado antes de usar el equipo. Utilice el equipo solo como se describe en este folleto. Utilice únicamente los accesorios suministrados por el fabricante.
3. No modifique el equipo. Modificarlo puede causar daños personales o materiales, y anulará la garantía.
4. Desenchufe siempre el equipo de la toma de corriente antes de realizarle un mantenimiento, revisión o reparación. Nunca tire del cable para sacar el enchufe de la toma de corriente. Sujete el enchufe y tire para desconectarlo.
5. Utilice únicamente el solvente Safety-Kleen suministrado. No añada otros solventes o productos químicos al solvente. El uso de otros productos químicos puede dar lugar a una situación de peligro. No retire el solvente del equipo.
6. Evite el contacto con el solvente o el vapor. Utilice siempre el equipo de protección personal (EPP) adecuado; es decir, guantes, delantal, gafas, respirador (cuando sea necesario) para cumplir con las normas de protección de la OSHA y el WHMIS. **Utilice siempre gafas de seguridad.** Las gafas de uso cotidiano solo tienen cristales resistentes a los impactos, no son gafas de seguridad. Consultar la HDS y seguir todas las recomendaciones de EPP y la información de seguridad.
7. No utilice el equipo de ninguna manera que pueda provocar salpicaduras o niebla. No rocíe aerosoles dentro del equipo o a su alrededor.
8. Utilice solo en un área bien ventilada.
9. No utilice por debajo del nivel del taller o del nivel del suelo.
10. No haga funcionar el equipo en las proximidades de contenedores abiertos de líquidos inflamables o combustibles (por ejemplo, gasolina) ni cerca de cualquier fuente de ignición. Mantenga el equipo alejado del calor, las chispas o las llamas para reducir el riesgo de incendio.
11. No coloque piezas calientes en contacto con el solvente.
12. No limpie los materiales de fricción (por ejemplo, revestimientos de freno y superficies de embrague) en este equipo. NO limpie ni desengrase materiales porosos o absorbentes como tela, cuero, madera o papel en este equipo.

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NÚMERO DE TELÉFONO

DIRECCIÓN DE LA OFICINA

SUCURSAL LOCAL DE SAFETY-KLEEN

SAFETY-KLEEN MODELOS 16(C) Y 30(C) LAVADORA DE PIEZAS MANUAL DE BATEA Y TAMBOR Folleto para el operador



El cliente debe leer y conservar este folleto.

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SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Substance

Product Name: Safety-Kleen Premium Solvent (Virgin and Recycled)

CAS-No.: 64742-47-8

SDS No: 82658

Synonyms: Safety-Kleen Premium Gold Solvent; Safety-Kleen Continued Use Product Solvent (CUP); High Flash Degreasing Solvent; Parts Washer Solvent; Petroleum Distillates; Petroleum Naphtha; Naphtha, Solvent; Mineral Spirits

1.2 Recommended Use and Restrictions on Use

Use Of The Substance/Mixture : Cleaning and degreasing metal parts. For professional use only.

Restrictions On Use : No additional information available

1.3. Name, Address, and Telephone of the Responsible Party

Manufacturer

Safety-Kleen Systems, Inc.

42 Longwater Drive

Norwell, MA 02061-9149

1-800-669-5740

www.safety-kleen.com

Supplier in Canada

Safety-Kleen Canada, Inc.

25 Regan Road

Brampton, Ontario L7A 1B2

Canada

1.4. Emergency Telephone Number

Emergency Number : 1-800-468-1760

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the Substance or Mixture

GHS-US/CA Classification

Flammable liquids, Category 4

H227

Skin corrosion/irritation, Category 2

H315

Reproductive toxicity, Category 2

H361

Specific target organ toxicity – Single exposure, Category 3, Narcosis

H336

Aspiration hazard, Category 1

H304

2.2. Label Elements

GHS-US/CA Labeling

Hazard Pictograms (GHS-US/CA)

:



GHS07



GHS08

Signal Word (GHS-US/CA)

: Danger

Hazard Statements (GHS-US/CA)

: H227 - Combustible liquid.

H304 - May be fatal if swallowed and enters airways.

H315 - Causes skin irritation.

H336 - May cause drowsiness or dizziness.

H361 - Suspected of damaging fertility or the unborn child.

Precautionary Statements (GHS-US/CA) : P201 - Obtain special instructions before use.

P202 - Do not handle until all safety precautions have been read and understood.

P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P261 - Avoid breathing mist, spray, or vapors.

P263 - Avoid contact during pregnancy and while nursing.

P264 - Wash hands, forearms and face thoroughly after handling.

P271 - Use only outdoors or in a well-ventilated area.

P280 - Wear eye protection, protective gloves, and protective clothing.

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P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or a doctor.
P302+P352 - IF ON SKIN: Wash with plenty of soap and water.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P308+P313 - IF exposed or concerned: Get medical advice or attention.
P321 - Specific treatment (see Section 4 of this Safety Data Sheet).
P331 - Do NOT induce vomiting.
P332+P313 - If skin irritation occurs: Get medical advice or attention.
P362+P364 - Take off contaminated clothing and wash it before reuse.
P370+P378 - In case of fire: Use appropriate media to extinguish.
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.
P501 - Dispose of contents and/or container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulations.

2.3 Hazards associated with known or reasonably anticipated uses

If this product is used in unforeseeable chemical processes and not used as intended or reasonable, the hazards listed in Section 2.3 cannot cover all chemistries. Therefore, a Process Hazard Analysis (PHA) or other hazard assessment for additional specific end uses should be performed to ensure that hazards are fully understood, and adequate safety measures are in place. See Section 10 for relevant reactivity and stability information.

2.4. Other Hazards

Exposure may aggravate pre-existing eye, skin, or respiratory conditions. Repeated exposure may cause skin dryness or cracking.

2.5 Unknown Acute Toxicity (GHS-US/CA)

No additional information available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substance

Name	Synonyms	Product Identifier	% *	GHS Ingredient Classification
Petroleum distillates, hydrotreated light	Distillates (petroleum), hydrotreated light / Distillates, petroleum, hydrotreated light / Hydrotreated light distillate / Kerosene, hydrotreated / Petroleum distillates, hydrotreated light (A complex combination of hydrocarbons obtained by treating a petroleum fraction with hydrogen in the presence of a catalyst. It consists of hydrocarbons having carbon numbers predominantly in the range of C9-16 and boiling in the range of approximately 150-290°C.) / Odorless light petroleum hydrocarbons / Hydrocarbons, C11-14, n-alkanes, isoalkanes, cyclics, / Distillates (petroleum), hydro-treated light; Kerosine - unspecified [A complex combination of hydrocarbons obtained by treating a petroleum fraction with hydrogen in the presence of a catalyst. It consists of hydrocarbons having carbon numbers predominantly in the range of C9 through C16 and boiling in the range of approximately 150°C to 290°C (302°F to 554°F).] / Kerosene / c13-14	(CAS-No.) 64742-47-8	100	Skin Irrit. 2, H315 Repr. 2, H361 STOT SE 3, H336 Asp. Tox. 1, H304 Aquatic Acute 2, H401 Aquatic Chronic 2, H411

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	isoparaffin / Destillate (Erdöl), mit Wasserstoff behandelt leichte (C9-14 Aliphaten) / Light Aliphatic Hydrocarbon / Odourless light petroleum hydrocarbons / Mineral spirits			
Contains:				
Benzene	Cyclohexatriene / Benzol	(CAS-No.) 71-43-2	< 0.1	Flam. Liq. 2, H225 Acute Tox. 4 (Oral), H302 Skin Irrit. 2, H315 Eye Irrit. 2A, H319 Muta. 1B, H340 Carc. 1A, H350 STOT SE 3, H336 STOT SE 3, H335 STOT RE 1, H372 Asp. Tox. 1, H304 Aquatic Acute 2, H401 Aquatic Chronic 3, H412
Ethylbenzene	Benzene, ethyl- / Phenylethane / ETHYLBENZENE / Ethyl benzene	(CAS-No.) 100-41-4	< 0.1	Flam. Liq. 2, H225 Acute Tox. 4 (Inhalation:dust,mist), H332 Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304 Aquatic Acute 2, H401 Aquatic Chronic 3, H412
Naphthalene	Naphthalene, molten / Naphthalene, crude / Naphthalenes / Moth balls	(CAS-No.) 91-20-3	< 0.1	Flam. Sol. 2, H228 Acute Tox. 4 (Oral), H302 Carc. 2, H351 Aquatic Acute 1, H400 Aquatic Chronic 1, H410 Comb. Dust 1
Benzene, 1,4-dichloro-	p-Dichlorobenzene / Benzene, p-dichloro- / para- Dichlorobenzene / 1,4- Dichlorobenzene / Dichlorobenzene, 1,4- / PDCB	(CAS-No.) 106-46-7	< 0.1	Eye Irrit. 2, H319 Carc. 2, H351 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Toluene	Benzene, methyl- / Methylbenzene / Phenylmethane / TOLUENE	(CAS-No.) 108-88-3	< 0.1	Flam. Liq. 2, H225 Acute Tox. 4 (Inhalation), H332 Skin Irrit. 2, H315 Repr. 2, H361 STOT SE 3, H336 STOT RE 2, H373 Asp. Tox. 1, H304 Aquatic Acute 2, H401 Aquatic Chronic 3, H412

Full text of H-statements: see section 16

3.2. Mixture

Not applicable

SECTION 4: FIRST AID MEASURES

4.1. Description of First-aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

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Inhalation: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

Skin Contact: Immediately remove contaminated clothing. Immediately drench affected area with soap and water for at least 15 minutes. If exposed or concerned: Get medical advice/attention. In case of contamination of larger areas, rinse skin with water/shower.

Eye Contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

Ingestion: Rinse mouth. Do NOT induce vomiting. Place affected person on their side. Immediately call a POISON CENTER or doctor/physician. If vomiting occurs have person lean forward.

4.2. Most Important Symptoms and Effects Both Acute and Delayed

General: Causes skin irritation. May cause drowsiness and dizziness. May be fatal if swallowed and enters airways. Suspected of damaging fertility or the unborn child.

Inhalation: High concentrations may cause central nervous system depression such as dizziness, vomiting, numbness, drowsiness, headache, and similar narcotic symptoms.

Skin Contact: Redness, pain, swelling, itching, burning, dryness, and dermatitis.

Eye Contact: May cause slight irritation to eyes.

Ingestion: Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.

Chronic Symptoms: Repeated exposure may cause skin dryness or cracking. Suspected of damaging fertility or the unborn child.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

5.1. Extinguishing Media

Suitable Extinguishing Media: Dry chemical powder, alcohol-resistant foam, carbon dioxide (CO₂). Water may be ineffective but water should be used to keep fire-exposed container cool.

Unsuitable Extinguishing Media: Do not use a heavy water stream. A heavy water stream may spread burning liquid.

5.2. Special Hazards Arising From the Substance or Mixture

Fire Hazard: Will float and can be reignited on water surface. Combustible liquid.

Explosion Hazard: May form flammable or explosive vapor-air mixture.

Reactivity: Reacts violently with strong oxidizers. Increased risk of fire or explosion.

5.3. Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire.

Firefighting Instructions: Use water spray or fog for cooling exposed containers. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide and unidentified organic and inorganic compounds. If sulfur compounds are present in appreciable amounts, combustion products may include also H₂S and SO_x (sulfur oxides) or sulfuric acid.

5.4. Reference to Other Sections

Refer to Section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Remove ignition sources. Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking. Do not get in eyes, on skin, or on clothing. Do not breathe vapor, mist or spray. Use special care to avoid static electric charges.

6.1.1. For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protective equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel. Stop leak if safe to do so.

6.1.2. For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Eliminate ignition sources first, then ventilate the area. Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit.

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6.2. Environmental Precautions

Prevent entry to sewers and public waters.

6.3. Methods and Materials for Containment and Cleaning Up

For Containment: Remove ignition sources. As an immediate precautionary measure, isolate spill or leak area in all directions.

Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.

Methods for Cleaning Up: Clean up spills immediately and dispose of waste safely. Do not take up in combustible material such as: saw dust or cellulosic material. Use only non-sparking tools. Absorb and/or contain spill with inert material. Transfer spilled material to a suitable container for disposal. Contact competent authorities after a spill.

6.4. Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Additional Hazards When Processed: Handle empty containers with care because residual vapors are flammable.

Precautions for Safe Handling: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes, on skin, or on clothing. Do not breathe mist, spray, or vapors. Take precautionary measures against static discharge. Use only non-sparking tools. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures.

7.2. Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations. Take action to prevent static discharges. Ground and bond container and receiving equipment. Use explosion-proof electrical, ventilating, and lighting equipment.

Storage Conditions: Store in a dry, cool place. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials. Store locked up/in a secure area. Store in a well-ventilated place. Keep container tightly closed. Keep in fireproof place.

Incompatible Materials: Strong acids, strong bases, strong oxidizers.

7.3. Specific End Use(s)

Cleaning and degreasing metal parts. For professional use only.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control Parameters

For substances listed in section 3 that are not listed here, there are no established exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), or Canadian provincial governments.

Benzene (71-43-2)		
USA ACGIH	ACGIH® TLV® TWA	0.02 ppm
USA ACGIH	ACGIH chemical category	Confirmed Human Carcinogen, Skin - potential significant contribution to overall exposure by the cutaneous route
USA ACGIH	BEI	25 µg/g Kreatinin Parameter: S-Phenylmercapturic acid - Medium: urine - Sampling time: end of shift (background) 500 µg/g Kreatinin Parameter: t,t-Muconic acid - Medium: urine - Sampling time: end of shift (background)
USA OSHA	OSHA PEL TWA	10 ppm 1 ppm
USA OSHA	OSHA PEL STEL	5 ppm (see 29 CFR 1910.1028)
USA OSHA	OSHA PEL C	25 ppm
USA OSHA	Acceptable Maximum Peak Above The Acceptable Ceiling Concentration For An 8-Hr Shift	50 ppm Peak (10 minutes)
USA OSHA	OSHA Action Level/Excursion Limit	0.5 ppm (Action Level, see 29 CFR 1910.1028)
USA NIOSH	NIOSH REL TWA	0.1 ppm
USA NIOSH	NIOSH REL STEL	1 ppm
USA IDLH	IDLH	500 ppm
Alberta	OEL STEL	8 mg/m ³

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Alberta	OEL STEL	2.5 ppm
Alberta	OEL TWA	1.6 mg/m ³
Alberta	OEL TWA	0.5 ppm
British Columbia	OEL STEL	2.5 ppm
British Columbia	OEL TWA	0.5 ppm
Manitoba	OEL TWA	0.02 ppm
New Brunswick	OEL STEL	2.5 ppm
New Brunswick	OEL TWA	0.5 ppm
Newfoundland & Labrador	OEL TWA	0.02 ppm
Nova Scotia	OEL TWA	0.02 ppm
Ontario	OEL TWAEV	2.5 ppm (designated substances regulation) 2.5 ppm (applies to workplaces to which the designated substances regulation does not apply)
Ontario	OEL TWAEV	0.5 ppm (applies to workplaces to which the designated substances regulation does not apply) 0.5 ppm (designated substances regulation)
Prince Edward Island	OEL TWA	0.02 ppm
Québec	VECD (OEL STEV)	2.5 ppm
Québec	VEMP (OEL TWAEV)	0.5 ppm
Yukon	OEL C	32 mg/m ³
Yukon	OEL C	10 ppm
Ethylbenzene (100-41-4)		
USA ACGIH	ACGIH® TLV® TWA	20 ppm
USA ACGIH	ACGIH chemical category	Confirmed Animal Carcinogen with Unknown Relevance to Humans
USA ACGIH	BEI	150 mg/g Kreatinin Parameter: Sum of mandelic acid and phenylglyoxylic acid - Medium: urine - Sampling time: end of shift (nonspecific)
USA OSHA	OSHA PEL TWA	435 mg/m ³
USA OSHA	OSHA PEL TWA	100 ppm
USA NIOSH	NIOSH REL TWA	435 mg/m ³
USA NIOSH	NIOSH REL TWA	100 ppm
USA NIOSH	NIOSH REL STEL	545 mg/m ³
USA NIOSH	NIOSH REL STEL	125 ppm
USA IDLH	IDLH	800 ppm (10% LEL)
Alberta	OEL STEL	543 mg/m ³
Alberta	OEL STEL	125 ppm
Alberta	OEL TWA	434 mg/m ³
Alberta	OEL TWA	100 ppm
British Columbia	OEL TWA	20 ppm
Manitoba	OEL TWA	20 ppm
New Brunswick	OEL TWA	20 ppm
Newfoundland & Labrador	OEL TWA	20 ppm
Nova Scotia	OEL TWA	20 ppm
Nunavut	OEL STEL	125 ppm
Nunavut	OEL TWA	100 ppm
Northwest Territories	OEL STEL	125 ppm
Northwest Territories	OEL TWA	100 ppm
Ontario	OEL TWAEV	20 ppm
Prince Edward Island	OEL TWA	20 ppm
Québec	VEMP (OEL TWAEV)	20 ppm
Saskatchewan	OEL STEL	125 ppm

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Saskatchewan	OEL TWA	100 ppm
Yukon	OEL STEL	545 mg/m ³
Yukon	OEL STEL	125 ppm
Yukon	OEL TWA	435 mg/m ³
Yukon	OEL TWA	100 ppm
Naphthalene (91-20-3)		
USA ACGIH	ACGIH® TLV® TWA	10 ppm
USA ACGIH	ACGIH chemical category	Confirmed Animal Carcinogen with Unknown Relevance to Humans, Skin - potential significant contribution to overall exposure by the cutaneous route
USA ACGIH	BEI	Parameter: 1-Naphthol with hydrolysis plus 2-Naphthol with hydrolysis - Sampling time: end of shift (nonquantitative, nonspecific)
USA OSHA	OSHA PEL TWA	50 mg/m ³
USA OSHA	OSHA PEL TWA	10 ppm
USA NIOSH	NIOSH REL TWA	50 mg/m ³
USA NIOSH	NIOSH REL TWA	10 ppm
USA NIOSH	NIOSH REL STEL	75 mg/m ³
USA NIOSH	NIOSH REL STEL	15 ppm
USA IDLH	IDLH	250 ppm
Alberta	OEL STEL	79 mg/m ³
Alberta	OEL STEL	15 ppm
Alberta	OEL TWA	52 mg/m ³
Alberta	OEL TWA	10 ppm
British Columbia	OEL TWA	10 ppm
Manitoba	OEL TWA	10 ppm
New Brunswick	OEL TWA	10 ppm
Newfoundland & Labrador	OEL TWA	10 ppm
Nova Scotia	OEL TWA	10 ppm
Nunavut	OEL STEL	15 ppm
Nunavut	OEL TWA	10 ppm
Northwest Territories	OEL STEL	15 ppm
Northwest Territories	OEL TWA	10 ppm
Ontario	OEL TWA EV	10 ppm
Prince Edward Island	OEL TWA	10 ppm
Québec	VEMP (OEL TWA EV)	10 ppm
Saskatchewan	OEL STEL	15 ppm
Saskatchewan	OEL TWA	10 ppm
Yukon	OEL STEL	75 mg/m ³
Yukon	OEL STEL	15 ppm
Yukon	OEL TWA	50 mg/m ³
Yukon	OEL TWA	10 ppm
Benzene, 1,4-dichloro- (106-46-7)		
USA ACGIH	ACGIH® TLV® TWA	10 ppm
USA ACGIH	ACGIH chemical category	Confirmed Animal Carcinogen with Unknown Relevance to Humans
USA OSHA	OSHA PEL TWA	450 mg/m ³
USA OSHA	OSHA PEL TWA	75 ppm
USA IDLH	IDLH	150 ppm
Alberta	OEL TWA	60 mg/m ³
Alberta	OEL TWA	10 ppm

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British Columbia	OEL TWA	10 ppm
Manitoba	OEL TWA	10 ppm
New Brunswick	OEL TWA	10 ppm
Newfoundland & Labrador	OEL TWA	10 ppm
Nova Scotia	OEL TWA	10 ppm
Nunavut	OEL STEL	15 ppm
Nunavut	OEL TWA	10 ppm
Northwest Territories	OEL STEL	15 ppm
Northwest Territories	OEL TWA	10 ppm
Ontario	OEL TWAEV	10 ppm
Prince Edward Island	OEL TWA	10 ppm
Québec	VEMP (OEL TWAEV)	10 ppm
Saskatchewan	OEL STEL	15 ppm
Saskatchewan	OEL TWA	10 ppm
Toluene (108-88-3)		
USA ACGIH	ACGIH® TLV® TWA	20 ppm
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA ACGIH	BEI	0.02 mg/l Parameter: Toluene - Medium: blood - Sampling time: prior to last shift of workweek 0.03 mg/l Parameter: Toluene - Medium: urine - Sampling time: end of shift 0.3 mg/g Kreatinin Parameter: o-Cresol with hydrolysis - Medium: urine - Sampling time: end of shift (background)
USA OSHA	OSHA PEL TWA	200 ppm
USA OSHA	OSHA PEL C	300 ppm
USA OSHA	Acceptable Maximum Peak Above The Acceptable Ceiling Concentration For An 8-Hr Shift	500 ppm Peak (10 minutes)
USA NIOSH	NIOSH REL TWA	375 mg/m ³
USA NIOSH	NIOSH REL TWA	100 ppm
USA NIOSH	NIOSH REL STEL	560 mg/m ³
USA NIOSH	NIOSH REL STEL	150 ppm
USA IDLH	IDLH	500 ppm
Alberta	OEL TWA	188 mg/m ³
Alberta	OEL TWA	50 ppm
British Columbia	OEL TWA	20 ppm
Manitoba	OEL TWA	20 ppm
New Brunswick	OEL TWA	20 ppm
Newfoundland & Labrador	OEL TWA	20 ppm
Nova Scotia	OEL TWA	20 ppm
Nunavut	OEL STEL	60 ppm
Nunavut	OEL TWA	50 ppm
Northwest Territories	OEL STEL	60 ppm
Northwest Territories	OEL TWA	50 ppm
Ontario	OEL TWAEV	20 ppm
Prince Edward Island	OEL TWA	20 ppm
Québec	VEMP (OEL TWAEV)	20 ppm
Saskatchewan	OEL STEL	60 ppm
Saskatchewan	OEL TWA	50 ppm
Yukon	OEL STEL	560 mg/m ³
Yukon	OEL STEL	150 ppm

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Yukon	OEL TWA	375 mg/m ³
Yukon	OEL TWA	100 ppm

8.2. Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed. Gas detectors should be used when flammable gases or vapors may be released. Proper grounding procedures to avoid static electricity should be followed. Use explosion-proof equipment.

Personal Protective Equipment: Safety glasses. Gloves. Protective clothing. Protective goggles. Insufficient ventilation: wear respiratory protection.



Materials for Protective Clothing: Chemically resistant materials and fabrics. Wear fire/flamm resistant/retardant clothing.

Hand Protection: Wear protective gloves/protective clothing/eye protection/face protection.

Eye and Face Protection: Safety glasses with side-shields. Faceshield as determined by task.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Other Information: When using, do not eat, drink or smoke.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on Basic Physical and Chemical Properties

Physical State	: Liquid
Color	: Clear, colorless to pale yellow
Odor	: Mild, hydrocarbon
Odor Threshold	: 30 ppm (based on Stoddard Solvent)
pH	: No data available
Evaporation Rate	: < 1 (butyl acetate = 1)
Melting Point	: -49 °C (-56.2 °F)
Freezing Point	: -43 °C (-45.4 °F)
Boiling Point	: 192 – 205 °C (377.6 – 401 °F)
Flash Point	: > 67 °C (152.6 °F) [Tagliabue(ASTM D-56)]
Auto-ignition Temperature	: 220 °C (428 °F)
Decomposition Temperature	: No data available
Flammability (solid, gas)	: Not applicable
Lower Flammable Limit	: 0.8 %
Upper Flammable Limit	: 6 %
Vapor Pressure	: 0.067 kPa (0.5 mmHg)[room temperature]
Relative Vapor Density at 20°C	: 5 (air = 1)
Relative Density	: No data available
Density	: ≈ 6.67 lb/gal
Specific Gravity	: 0.77 - 0.82 @ @ 15.6 °C (60 °F)
Solubility	: Water: Insoluble
Partition Coefficient: N-Octanol/Water	: No data available
Viscosity, Kinematic	: No data available
Particle characteristics	: No data available
VOC content	: 100 % ; 6.4 to 6.7 LB/US gal; 770 to 800 g/l; As per 40 CFR Part 51.100(s); Consult with your state/local air pollution control agency and their rules and regulations for specific direction in your specific area.

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity:

Reacts violently with strong oxidizers. Increased risk of fire or explosion.

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10.2. Chemical Stability:

Combustible liquid. May form flammable or explosive vapor-air mixture.

10.3. Possibility of Hazardous Reactions, Including those Associated with Foreseeable Emergencies:

Hazardous polymerization will not occur.

10.4. Conditions to Avoid:

Direct sunlight, extremely high or low temperatures, heat, hot surfaces, sparks, open flames, incompatible materials, and other ignition sources.

10.5. Incompatible Materials:

Strong acids, strong bases, strong oxidizers.

10.6. Hazardous Decomposition Products:

Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide, H₂S, SO_x (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on Toxicological Effects - Product

Likely routes of exposure: Dermal, Eye Contact, Inhalation, Oral.

Acute Toxicity (Oral): Not classified.

Acute Toxicity (Dermal): Not classified.

Acute Toxicity (Inhalation): Not classified.

LD50 and LC50 Data: No additional information available

Skin Corrosion/Irritation: Causes skin irritation.

Eye Damage/Irritation: Not classified.

Respiratory or Skin Sensitization: Not classified.

Germ Cell Mutagenicity: Not classified.

Carcinogenicity: Not classified.

Specific Target Organ Toxicity (Repeated Exposure): Not classified.

Reproductive Toxicity: Suspected of damaging fertility or the unborn child.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness or dizziness.

Aspiration Hazard: May be fatal if swallowed and enters airways.

Symptoms/Injuries After Inhalation: High concentrations may cause central nervous system depression such as dizziness, vomiting, numbness, drowsiness, headache, and similar narcotic symptoms.

Symptoms/Injuries After Skin Contact: Redness, pain, swelling, itching, burning, dryness, and dermatitis.

Symptoms/Injuries After Eye Contact: May cause slight irritation to eyes.

Symptoms/Injuries After Ingestion: Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.

Chronic Symptoms: Repeated exposure may cause skin dryness or cracking. Suspected of damaging fertility or the unborn child.

11.2. Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Benzene (71-43-2)	
LD50 Oral Rat	810 mg/kg
LD50 Dermal Rabbit	> 8200 mg/kg (Source: JAPAN_GHS)
LC50 Inhalation Rat	44.66 mg/l/4h
Ethylbenzene (100-41-4)	
LD50 Oral Rat	3500 mg/kg (Source: JAPAN_GHS)
LD50 Dermal Rabbit	15400 mg/kg (Source: JAPAN_GHS)
LC50 Inhalation Rat	17.2 mg/l/4h (Exposure time: 4 h)
LC50 Inhalation Rat	27.5 mg/l/4h
Naphthalene (91-20-3)	
LD50 Oral Rat	533 – 710 mg/kg
LD50 Dermal Rat	> 16000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg body weight [EU RAR, 2003]
Benzene, 1,4-dichloro- (106-46-7)	
LD50 Oral Rat	> 2000 mg/kg
LD50 Dermal Rat	> 6000 mg/kg (Source: NLM_HSDB)

Safety-Kleen Premium Solvent (Virgin and Recycled)

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LC50 Inhalation Rat	> 5.07 mg/l/4h
LC50 Inhalation Rat	6 mg/l/4h
Petroleum distillates, hydrotreated light (64742-47-8)	
LD50 Oral Rat	> 5000 mg/kg (Source: IUCLID)
LD50 Dermal Rabbit	> 2000 mg/kg (Source: NLM_CIP)
LC50 Inhalation Rat	> 2.11 mg/l/4h
Toluene (108-88-3)	
LD50 Oral Rat	5580 mg/kg (Source: EU-RAR)
LD50 Dermal Rabbit	12000 mg/kg (Source: JAPAN_GHS)
LC50 Inhalation Rat	12.5 mg/l/4h
LC50 Inhalation Rat	25.7 mg/l/4h
Benzene (71-43-2)	
IARC Group	1
National Toxicology Program (NTP) Status	Known Human Carcinogens, Evidence of Carcinogenicity.
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.
OSHA Specifically Regulated Carcinogen List	In OSHA Specifically Regulated Carcinogen list.
Ethylbenzene (100-41-4)	
IARC Group	2B
National Toxicology Program (NTP) Status	Evidence of Carcinogenicity.
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.
Naphthalene (91-20-3)	
IARC Group	2B
National Toxicology Program (NTP) Status	Reasonably anticipated to be Human Carcinogen.
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.
Benzene, 1,4-dichloro- (106-46-7)	
IARC Group	2B
National Toxicology Program (NTP) Status	Reasonably anticipated to be Human Carcinogen, Evidence of Carcinogenicity.
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.
Toluene (108-88-3)	
IARC Group	3

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecology - General: Not classified.

Safety-Kleen Premium Solvent (Virgin and Recycled) (64742-47-8)	
LC50 Fish 1	> 500 mg/l
Benzene (71-43-2)	
LC50 Fish 1	10.7 – 14.7 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through] Source: EPA)
EC50 - Crustacea [1]	8.76 – 15.6 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
LC50 Fish 2	5.3 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [flow-through] Source: EPA)
EC50 - Crustacea [2]	10 mg/l (Exposure time: 48 h - Species: Daphnia magna)
ErC50 algae	29 mg/l
NOEC Chronic Fish	0.8 mg/l
Ethylbenzene (100-41-4)	
LC50 Fish 1	11 – 18 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static] Source: EPA)
EC50 - Crustacea [1]	1.8 – 2.4 mg/l (Exposure time: 48 h - Species: Daphnia magna)
LC50 Fish 2	2.661 – 4.093 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [semi-static] Source: EPA)
NOEC Chronic Crustacea	0.956 mg/l

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Naphthalene (91-20-3)	
LC50 Fish 1	5.74 – 6.44 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through] Source: EPA)
EC50 - Crustacea [1]	2.16 mg/l (Exposure time: 48 h - Species: Daphnia magna)
LC50 Fish 2	1.6 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [flow-through] Source: EPA)
EC50 - Crustacea [2]	1.96 mg/l (Exposure time: 48 h - Species: Daphnia magna [Flow through])
ErC50 algae	0.41 mg/l
NOEC Chronic Fish	0.12 mg/l
NOEC Chronic Crustacea	0.6 mg/l
Benzene, 1,4-dichloro- (106-46-7)	
LC50 Fish 1	18 – 50 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static] Source: EPA)
EC50 - Crustacea [1]	0.7 mg/l
LC50 Fish 2	4 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through] Source: EPA)
NOEC Chronic Crustacea	0.1 mg/l
Petroleum distillates, hydrotreated light (64742-47-8)	
LC50 Fish 1	> 500 mg/l
LC50 Fish 2	2.2 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static] Source: EPA)
Toluene (108-88-3)	
LC50 Fish 1	15.22 (15.22 – 19.05) mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
EC50 - Crustacea [1]	5.46 (5.46 – 9.83) mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
LC50 Fish 2	12.6 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static] Source: EPA)
EC50 - Crustacea [2]	11.5 mg/l (Exposure time: 48 h - Species: Daphnia magna)
NOEC Chronic Fish	1.4 mg/l (Oncorhynchus kisutch)
NOEC Chronic Crustacea	0.74 mg/l (Ceriodaphnia dubia)
12.2. Persistence and Degradability	
Safety-Kleen Premium Solvent (Virgin and Recycled) (64742-47-8)	
Persistence and Degradability	Not established.
12.3. Bioaccumulative Potential	
Safety-Kleen Premium Solvent (Virgin and Recycled) (64742-47-8)	
Bioaccumulative Potential	Not established.
Benzene (71-43-2)	
BCF Fish 1	3.5 – 4.4
Partition coefficient n-octanol/water (Log Pow)	2.13
Ethylbenzene (100-41-4)	
BCF Fish 1	(15)
Partition coefficient n-octanol/water (Log Pow)	3.6 (at 20 °C / 68 °F (at pH 7.84))
Naphthalene (91-20-3)	
BCF Fish 1	36.5 – 168 (whole body w.w.)
Partition coefficient n-octanol/water (Log Pow)	3.4 (at 25 °C / 77 °F (at pH 7-7.5))
Benzene, 1,4-dichloro- (106-46-7)	
Partition coefficient n-octanol/water (Log Pow)	3.37 (at 25 °C / 77 °F (at pH 7))
Petroleum distillates, hydrotreated light (64742-47-8)	
BCF Fish 1	61 – 159
Toluene (108-88-3)	
Partition coefficient n-octanol/water	2.73 (at 20 °C / 68 °F (at pH 7))

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(Log Pow)	
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12.4. Mobility in Soil

No additional information available

12.5. Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste Disposal Recommendations: Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

Additional Information: Handle empty containers with care because residual vapors are flammable.

Ecology - Waste Materials: Avoid release to the environment.

SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

14.1. In Accordance with DOT

Proper Shipping Name : COMBUSTIBLE LIQUID, N.O.S.(PETROLEUM NAPHTHA)

Identification Number : NA1993



Packing Group : III

14.2. In Accordance with IMDG

Not regulated for transport

14.3. In Accordance with IATA

Not regulated for transport

14.4. In Accordance with TDG

Not regulated for transport

SECTION 15: REGULATORY INFORMATION

15.1. US Federal Regulations

Safety-Kleen Premium Solvent (Virgin and Recycled) (64742-47-8)	
SARA Section 311/312 Hazard Classes	Health hazard - Specific target organ toxicity (single or repeated exposure) Health hazard - Reproductive toxicity Health hazard - Skin corrosion or Irritation Physical hazard - Flammable (gases, aerosols, liquids, or solids) Health hazard - Aspiration hazard
Benzene (71-43-2)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	10 lb
SARA Section 313 - Emission Reporting	0.1 %
Ethylbenzene (100-41-4)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	1000 lb
SARA Section 313 - Emission Reporting	0.1 %
Naphthalene (91-20-3)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	100 lb
SARA Section 313 - Emission Reporting	0.1 %
Benzene, 1,4-dichloro- (106-46-7)	

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Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active Subject to reporting requirements of United States SARA Section 313	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a final TSCA section 4 test rule.
CERCLA RQ	100 lb
SARA Section 313 - Emission Reporting	0.1 %
Petroleum distillates, hydrotreated light (64742-47-8)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active	
Toluene (108-88-3)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	1000 lb
SARA Section 313 - Emission Reporting	1 %

15.2. US State Regulations

California Proposition 65

 **WARNING:** This product can expose you to chemicals including Benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Chemical Name (CAS No.)	Carcinogenicity	Developmental Toxicity	Female Reproductive Toxicity	Male Reproductive Toxicity
Benzene (71-43-2)	X	X		X
Ethylbenzene (100-41-4)	X			
Naphthalene (91-20-3)	X			
Benzene, 1,4-dichloro- (106-46-7)	X			
Toluene (108-88-3)		X		

Benzene (71-43-2) U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
Ethylbenzene (100-41-4) U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
Naphthalene (91-20-3) U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
Benzene, 1,4-dichloro- (106-46-7) U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
Toluene (108-88-3) U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List U.S. - Massachusetts - Right To Know List

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U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

15.3. Canadian Regulations
Benzene (71-43-2)
Listed on the Canadian DSL (Domestic Substances List)
Ethylbenzene (100-41-4)
Listed on the Canadian DSL (Domestic Substances List)
Naphthalene (91-20-3)
Listed on the Canadian DSL (Domestic Substances List)
Benzene, 1,4-dichloro- (106-46-7)
Listed on the Canadian DSL (Domestic Substances List)
Petroleum distillates, hydrotreated light (64742-47-8)
Listed on the Canadian DSL (Domestic Substances List)
Toluene (108-88-3)
Listed on the Canadian DSL (Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Date of Preparation or Latest Revision	: 11/20/2025
Indication of Changes	: Review of data.Language modified
Other Information	: This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada’s Hazardous Products Regulations (HPR) SOR/2022-272.

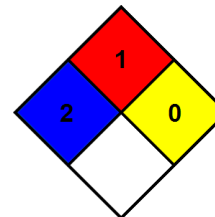
GHS Full Text Phrases:	
H225	Highly flammable liquid and vapor
H227	Combustible liquid
H228	Flammable solid
H302	Harmful if swallowed
H304	May be fatal if swallowed and enters airways
H315	Causes skin irritation
H319	Causes serious eye irritation
H332	Harmful if inhaled
H335	May cause respiratory irritation
H336	May cause drowsiness or dizziness
H340	May cause genetic defects.
H350	May cause cancer.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life
H401	Toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects
H411	Toxic to aquatic life with long lasting effects
H412	Harmful to aquatic life with long lasting effects

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- NFPA Health Hazard** : 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.
- NFPA Fire Hazard** : 1 - Materials that must be preheated before ignition can occur.
- NFPA Reactivity Hazard** : 0 - Material that in themselves are normally stable, even under fire conditions.



Glossary of Data Source Abbreviations

ATSDR: Agency for Toxic Substances and Disease Registry (U.S. Department of Health and Human Services)

AU_WES: Australia WES

CHEMVIEW: ChemView (U.S. Environmental Protection Agency)

EC_RAR: European Commission Renewal Assessment Report

EC_SCOEL: European Commission Scientific Committee on Occupational Exposure Limits

ECETOC: European Centre for Ecotoxicology and Toxicology of Chemicals Reports

ECHA_API: European Chemicals Agency API

ECHA_RAC: ECHA Committee for Risk Assessment

EFSA: European Food Safety Authority

EPA: U.S. Environmental Protection Agency

EPA_AEGL: Acute Exposure Guideline Levels (U.S. Environmental Protection Agency)

EPA_FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act Reregistration Eligibility Decision (U.S. Environmental Protection Agency)

EPA_HPV: High Production Volume Chemicals (U.S. Environmental Protection Agency)

EPA_TRED: Risk Assessment for Tolerance Reassessment Eligibility Decision (U.S. Environmental Protection Agency)

EU_CLH: European Union Harmonised Classification and Labelling Proposal

EU_RAR: European Union Risk Assessment Report

FOOD_JOURN: Food Research Journal (1956)

IARC: The International Agency for Research on Cancer

IDLH: National Institute for Occupational Health and Safety Immediately Dangerous to Life or Health Value Profiles

IUCLID: International Uniform Chemical Information Database

JAPAN_GHS: Japan GHS Basis for Classification Data

JP_J-CHECK: Japan J-Check

KR_NIER: South Korea National Institute of Environmental Research Evaluations

NICNAS: Australia National Industrial Chemicals Notification and Assessment Scheme

NIOSH: National Institute for Occupational Health and Safety (U.S. Department of Health and Human Services)

NLM_CIP: National Library of Medicine ChemID plus database

NLM_HSDB: National Library of Medicine Hazardous Substance Data Bank

NLM_PUBMED: National Library of Medicine PubMed database

NTP: National Toxicology Program

NZ_CCID: New Zealand Chemical Classification and Information Database

OECD_EHSP: Environment, Health, and Safety Publication (Organisation for Economic Co-operation and Development)

OECD_SIDS: Screening Information Data Sets (Organisation for Economic Co-operation and Development)

WHO: World Health Organization

The information contained herein is correct to the best of our knowledge, information, and belief and is designed only as guidance for the handling, use, processing, storage, transportation, disposal, and release of the product. User assumes all risks incident to use of this product and shall determine the quality and suitability of the product for its use. Supplier offers no warranty, express or implied, whatsoever, including warranties of merchantability or fitness for a particular purpose or otherwise, and specifically disclaims any and all liability for incidental, consequential, or other damages arising out the use or misuse of the product. The information provided relates only to the specific material provided and may not be valid if used in combination with any other materials or process, unless specified herein.

NA GHS SDS 2024 (Can, US)

Balaji, Sriram (EEC)

From: Klingseis, Preston M. <KLINGSPM@airproducts.com>
Sent: Wednesday, September 2, 2026 2:49 PM
To: Balaji, Sriram (EEC)
Cc: Ross, Dakota D (EEC); Llewellyn, Joshua C.
Subject: RE: [External] Courtesy Draft Permit
Attachments: JolietH2_2020Oct05_EPA-Reg5-Approves-Elimination-of-H2S-AMP.pdf

****CAUTION** PDF attachments may contain links to malicious sites. Please contact the COT Service Desk ServiceCorrespondence@ky.gov for any assistance.**

This Message Originated from Outside the Organization

This Message Is From an External Sender.

[Report Suspicious](#)

Good Afternoon Sriram,

I completed my review of the draft permit for the Air Products Catlettsburg, KY Hydrogen Plant, and I have several comments:

- Based on confirmation from the Ops Team, the cold solvent degreaser (EU-07) was removed from the site between the time when permit renewal application was submitted and the draft permit was received. Can you please remove any references and requirements associated with the cold solvent degreaser from the permit?
- For Emission Unit 01 (EU-01), Air Products is requesting the removal of any references to the Hydrogen Sulfide (H₂S) Alternative Monitoring Plan (AMP) and/or the addition of a note to the permit documenting the non-applicability of H₂S monitoring based on the rationale listed below.
 - Per 40 CFR § 60.105(a)(4)(iv)(C), fuel gas streams produced in process units that are intolerant to sulfur contamination, such as fuel gas streams produced in [a] hydrogen plant, are considered to be inherently low in sulfur content and are exempt from continuous monitoring requirements. The hydrogen reformer catalyst at Catlettsburg is intolerant to sulfur contamination, and the removal of sulfur from the fuel gas stream is critical to catalyst longevity and operational output/reliability.
 - Please note that I make this request based on a precedent set at other Air Products facilities. Notably, any references to H₂S monitoring requirements were removed from an air permit issued to the Air Products Channahon, IL Hydrogen Plant based on a similar rationale. For reference, I have attached an October 5, 2020 letter from USEPA Region 5 outlining USEPA's rationale for supporting the removal of the H₂S monitoring requirements for the Channahon, IL air permit. The rationale presented in the October 5, 2020 letter is consistent with this request.

- Page 22 of the permit lists insignificant activities in both roman numerals and numbers. List also jumps from 2 to 4. Minor editorial changes requested.

If needed, I am available to discuss my comments at a time that is convenient for you.

Thanks,

Preston Klingseis, PE, CHMM
North EHSQ Environmental Team Lead
O (610) 481-5909
C (484) 201-1037
klingspm@airproducts.com

tell me more
www.airproducts.com

This communication is intended solely for the person addressed and is confidential and may be privileged. If you receive this communication incorrectly, please return it immediately to the sender and destroy all copies in your files. If you have questions, please contact the sender of this message.

From: Balaji, Sriram (EEC) <sriram.balaji@ky.gov>
Sent: Tuesday, September 1, 2026 12:51 PM
To: Klingseis, Preston M. <KLINGSPM@airproducts.com>
Cc: Ross, Dakota D (EEC) <dakota.ross@ky.gov>
Subject: [External] Courtesy Draft Permit

This email is from an external source. Please exercise caution in opening attachments or links.

Hi Preston,

Please find attached a courtesy copy of the Renewed Title V permit for Air Products & Chemicals Inc - Catlettsburg Hydrogen Plant. Please submit any written questions or comments no later than September 8, 2026, so that the Division may continue processing the permitting action. Any submitted questions and comments will be part of the public permitting record and considered disclosable under the Kentucky Open Records Act. Be advised that the final permit may differ from the attached even if there are no questions or comments as the permit package will undergo additional internal reviews and approvals.

Thanks for your patience with the permitting process and ,as always, please reach out with any questions.

Sriram Balaji
Office: 502-782-0159 - sriram.balaji@ky.gov

Environmental Engineer Assistant II
KY Division for Air Quality
Permit Review Branch - Chemical Section



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

George Beris
Senior Principal Environmental Specialist Environmental Business Manager
Air Products and Chemicals, Inc.
BERISGM@airproducts.com

Re: Revised Request to Amend or Eliminate Alternative Monitoring Plan
Joliet, Illinois Hydrogen Production Facility

Dear Mr. Beris:

I am writing in response to a request by Air Products and Chemicals, Inc. (Air Products) regarding its December 12, 2005 hydrogen sulfide (H₂S) alternative monitoring plan (AMP) at the company's hydrogen production facility located in Joliet, Illinois (Joliet Facility). Air Products' request was submitted to EPA via USPS on March 25, 2020 and then resubmitted via e-mail on June 1, 2020. The Joliet Facility is subject to the New Source Performance Standards for Petroleum Refineries at 40 C.F.R. Part 60, Subpart J (NSPS Subpart J)

Specifically, Air Products' has requested that EPA either:

1. Eliminate the Joliet Facility's AMP; or
2. Amend Condition 6 of the AMP so that it is no longer requires Air Products to continuously monitor the H₂S concentration of the gas stream exiting the Hydro-Desulfurization Unit using a process monitor.

According to the information submitted by Air Products, the Joliet Facility is located within the ExxonMobil refinery. To produce hydrogen gas, it uses a steam methane reformation (SMR) process. The hydrogen reformer units in the SMR process are comprised of catalysts that are intolerant to sulfur and furnaces that heat the catalyst. The hydrogen reformer units are fed from a "Hydro-Desulfurization Unit." This gas stream is low in sulfur, i.e., less than 100 parts per billion. In the SMR process, this low-sulfur gas stream is turned into a synthesis gas. The synthesis gas is then purified downstream from the hydrogen reformer units. The purification process creates a waste gas, which is fed into the furnaces of the hydrogen reformer units.

On August 8, 2005, Air Products submitted to EPA Region 5 a proposed AMP for the hydrogen reformer units, which are considered to be fuel gas combustion devices (FGCDs) subject to NSPS Subpart J because their furnaces combust a type of fuel gas. In

its proposal, Air Products requested EPA approval to conduct H₂S grab sampling of the fuel gas combusted in the two hydrogen reformer units' furnaces on a staggered schedule, as opposed to installing a continuous emission monitoring system, as required by NSPS Subpart J. The regulations at NSPS Subpart J provide EPA with the authority to approve AMPs under 40 C.F.R. § 60.13(i). After reviewing the documentation provided by Air Products, on December 12, 2005, EPA approved the proposed Air Products AMP, subject to a various conditions and terms. These include Condition 6, which required Air Products to continuously monitor the H₂S concentration of the gas stream exiting the Hydro-Desulfurization Unit using a process monitor.

On June 24, 2008, EPA amended NSPS Subpart J to provide exemptions for continuous monitoring requirements at FGCDs that are combusting fuel gas streams that are inherently low in sulfur content. *See* 73 Fed. Reg. 35837. Pursuant to 40 C.F.R. § 60.105(a)(4)(iv)(C), as amended, fuel gas streams produced in process units that are intolerant to sulfur contamination, such as fuel gas streams produced in a hydrogen plant, are considered "inherently low in sulfur content."

According to Air Products' current request, its Hydro-Desulfurization Unit is operated to produce a gas stream that is low in sulfur, as that gas is directly fed into sulfur-intolerant hydrogen reformer unit. By monitoring the H₂S concentration of the gas exiting the Hydro-Desulfurization Unit, and fed into the hydrogen reformer unit, Air Products asserts that it has demonstrated that any fuel gas which was created downstream of the hydrogen reformer units is also low in sulfur, since it is not mixed with another type of gas. Air Products also notes that the fuel gas streams combusted in the Joliet Facility's hydrogen reformer units are inherently low in sulfur, because they are created downstream of a process unit which is intolerant to sulfur contamination and are not mixed with any other gases that do contain sulfur.

Based upon the revisions to NSPS Subpart J and the documentation submitted by Air Products on March 25, 2020 and June 1, 2020, EPA has concluded that neither the 2005 AMP nor any other monitoring of the hydrogen reformer units is required. Air Products must nonetheless continue to comply with all remaining applicable provisions of NSPS Subpart J.

If you have any questions regarding this determination, you may contact Virginia Galinsky at (312) 3653-2089 or galinsky.virginia@epa.gov.

Sincerely,

Michael D. Harris, Division Director
Enforcement and Compliance Assurance Division

cc: John Michael, Illinois EPA
Kent Mohr, Illinois EPA