HYDROGEN LOADING

PERMIT TO CONSTRUCT (MODIFICATION)

COMPANY NAME: Air Products and Chemicals, Inc (Wilmington)

COMPANY ID: 101656

MAILING ADDRESS: 700 N. Henry Ford Avenue
Wilmington, CA 90744

EQUIPMENT LOCATION: 700 N. Henry Ford Avenue
Wilmington, CA 90744

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PROPOSED CHANGES TO PERMITS:

Proposed deletions are shown in ~~strikeouts~~. Proposed additions are in **bold and underlined**.

SECTION H: FACILITY DESCRIPTION AND EQUIPMENT SPECIFIC CONDITIONS (Please note that permits for the following equipment under Process 1, System 1, will be moved from Section D to Section H of the facility permit.)

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions And Requirements	Conditions
Process 1 : HYDROGEN PRODUCTION PLANT (Refinery Gas / Steam Reforming)					
System 1 : HYDROGEN PRODUCTION – 88.0 MMSCFD MAXIMUM RATED CAPACITY					S2.1, S13.1, S31.1
VESSEL, V-119, FEED COMPRESSOR SUCTION, LENGTH: 11 FT 4 IN; DIAMETER: 6 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D1				
VESSEL, V-133, PROCESS OILY WATER, HEIGHT: 11 FT 10 IN; DIAMETER: 3 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D2				E336.2

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions And Requirements	Conditions
Process 1 : HYDROGEN PRODUCTION PLANT (Refinery Gas / Steam Reforming)					
FILTER, X-110A/B, FEED GAS COMPRESSOR, 2 TOTAL, 20 CU.FT. CAPACITY EACH A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D3				
COMPRESSOR, C-101A/B, DUAL SERVICES, 2 TOTAL, 7,500 HP EACH WITH BUFFERED PACKING SEALS A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D4				E336.3
HEAT EXCHANGER, E-101/E-104, FG 1A/1B 1ST STAGE FEED DISCHARGE COOLER, 2 TOTAL, 2.81 MMBTU/HR EACH A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D6				
KNOCK OUT POT, V-131A/B, FEED INTERSTAGE, 2 TOTAL, HEIGHT: 9 FT; DIAMETER: 3 FT 6 IN; A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D8				
HEAT EXCHANGER, E-102/E117, FEED COMPRESSOR DISCHARGE COOLER, 2 TOTAL, 2.74 MMBTU/HR EACH A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D10				
VESSEL, COALESCER, V-102A/B, FEED COMPRESSOR DISCHARGE, 2 TOTAL, HEIGHT: 5 FT; DIAMETER: 1 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D12				
REACTOR, V-104, HYDROGENATION, WITH CHLORIDE GUARD, LENGTH: 20 FT; DIAMETER: 8 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D14				
VESSEL, V-105A/B, FEED DESULFURIZER, 2 TOTAL, LENGTH: 19 FT; DIAMETER: 9 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D15				

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions And Requirements	Conditions
Process 1 : HYDROGEN PRODUCTION PLANT (Refinery Gas / Steam Reforming)					
REACTOR, H101, REFINERY GAS/STEAM REFORMING, TUBULAR TYPE A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D49				
HEAT EXCHANGER, E-103, PROCESS GAS, 163.5 MMBTU/HR, SHELL AND TUBE TYPE A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D17				
REACTOR, V-109, HIGH TEMPERATURE SHIFT, LENGTH: 19 FT; DIAMETER: 11 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D18				
HEAT EXCHANGER, E-105, FEED PRETREATER II, 12.76 MMBTU/HR, SHELL AND TUBE TYPE A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D19				
HEAT EXCHANGER, E-106A, BFW PRETREATER I, 47.0 MMBTU/HR, SHELL AND TUBE TYPE A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D20				
HEAT EXCHANGER, E-106B/C, BFW PRETREATER II, 67.01 MMBTU/HR, SHELL AND TUBE TYPE, 2 TOTAL A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D21				
REACTOR, V-110, LOW TEMPERATURE SHIFT, LENGTH: 16 FT; DIAMTER: 11 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D22				
HEAT EXCHANGER, E-107, FEED PRETREATER I, 5.0 MMBTU/HR, SHELL AND TUBE TYPE A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D23				
HEAT EXCHANGER, E-108, BFW MAKEUP HEATER, 49.0 MMBTU/HR, SHELL AND TUBE TYPE A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D24				

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions And Requirements	Conditions
Process 1 : HYDROGEN PRODUCTION PLANT (Refinery Gas / Steam Reforming)					
HEAT EXCHANGER, E-109, PSA FEED AIR COOLER, 47.57 MMBTU/HR, FIN-FAN TYPE A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D25				
HEAT EXCHANGER, E-110, PSA FEED TRIM COOLER, 15.85 MMBTU/HR, SHELL AND TUBE TYPE A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D26				
KNOCK OUT POT, V-112, COLD CONDENSATE, LENGTH: 11 FT 10 IN; DIAMTER: 7 FT 3 IN A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D27				
ADSORBER, X-101A-J, PRESSURE SWING ADSORPTION (PSA) UNIT, 10 TOTAL, DIAMETER: 10 FT 6 IN; HEIGHT: 21 FT 6 IN EACH A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D28				D90.3, E336.1
VESSEL, V-113A/B, PSA PURGE GAS, 2 TOTAL, DIAMETER: 12 FT; HEIGHT: 80 FT EACH A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D29				
HEATER, E-451, METHANATOR PRE-HEAT, 75 KW ELECTRICALLY HEATED **A/N 547681** **Permit to Construct Issued: XX/XX/13**	**Dnew1**				
REACTOR, METHANATOR, V-451, DIAMETER: 4 FT 6 IN; LENGTH: 5 FT **A/N 547681** **Permit to Construct Issued: XX/XX/13**	**Dnew2**				
HEAT EXCHANGER, E-452, ECONOMIZER, METHANATOR PRODUCT, 0.461 MMBTU/hr, SHELL AND TUBE TYPE **A/N 547681** **Permit to Construct Issued: XX/XX/13**	**Dnew3**				

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions And Requirements	Conditions
Process 1 : HYDROGEN PRODUCTION PLANT (Refinery Gas / Steam Reforming)					
COOLER, E-455, PURE H2 PRODUCT CONDENSER, CRYOQUIP MODEL NO. VAI-1248-SSBL23, 0.092 MMBTU/hr., AMBIENT VAPORIZER A/N 547681 Permit to Construct Issued: XX/XX/13	**Dnew4**				
VESSEL, V-452A/B, MOLECULAR SIEVE DRIER, 2 IN PARALLEL, WITH REGENERATION VENT TO ATMOSPHERE, DIAMETER: 2 FT; LENGTH: 7 FT EACH A/N 547681 Permit to Construct Issued: XX/XX/13	**Dnew5**			**CO: 2000 PPMV (5) [RULE 407, 4-2-1982]**	**D28.x, D332.1, E336.x**
COMPRESSOR, E-453/454, PURE H2 PRODUCT, 2 TOTAL, 100 HP EACH A/N 547681 Permit to Construct Issued: XX/XX/13	**Dnew6**				
LOADING ARM, H2 TRAILER, STANCHIONS A/B, PURE H2 PRODUCT, 2 TOTAL A/N 547681 Permit to Construct Issued: XX/XX/13	**Dnew7**				
VESSEL, V-114, STEAM DEAERATOR, TWO SECTIONS, WITH UPPER SECTION VENTED TO ATMOSPHERE, LENGTH: 22 FT; DIAMETER: 9 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D31			**CO:** 2000 PPMV (5) **[RULE 407, 4-2-1982]**	D332.1
TANK, V-137, CONDENSATE BREAK, VENTED TO ATMOSPHERE, HEIGHT: 7 FT; DIAMETER: 6 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D32			**CO:** 2000 PPMV (5) **[RULE 407, 4-2-1982]**	D332.1
VESSEL, V-107, BLOWNDOWN, LENGTH: 11 FT 4 IN; DIAMETER: 4 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D33				
VESSEL, V-108, STEAM, HEIGHT: 50 FT; DIAMETER: 9 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D34				

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions And Requirements	Conditions
Process 1 : HYDROGEN PRODUCTION PLANT (Refinery Gas / Steam Reforming)					
VESSEL, V-129, INTERMITTENT BLOWDOWN, VENTED TO ATMOSPHERE, HEIGHT: 11 FT 4 IN; DIAMETER: 4 FT A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D35			**CO:** 2000 PPMV (5) **[RULE 407, 4-2-1982]**	D332.1
CONDENSER, E-130, SURFACE, LENGTH: 32 FT; DIAMETER: 8 FT 8 IN A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D36				
TURBINE, T-101, STEAM, GENERAL ELECTRIC, DOUBLE EXTRACTION, NON-FIRED TYPE WITH A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13** GENERATOR, ELECTRIC, 31.9 MW	D37				
FUGITIVE EMISSIONS, MISCELLANEOUS (PUMPS, COMPRESSORS, VALVES, FLANGES, PRV) A/N ~~310073~~ **547681** **Permit to Construct Issued: XX/XX/13**	D52				H23.2

CONDITIONS:

System Conditions:

S2.1 The operator shall limit emissions from this system as follows

CONTAMINANT	EMISSION LIMIT
VOC	Less than 2.5 lbs / mmscf of hydrogen produced

A totalizing flow meter shall be installed and maintained to accurately indicate and record the flow rate of hydrogen produced.

[RULE 1189, 1-21-2000]

[Systems subject to this condition: Process 1, System 1]

S13.1 All devices under this system are subject to the applicable requirements of the following rules or regulations:

Contaminant	Rule	Rule/Subpart
VOC	District Rule	1189

[RULE 1189, 1-21-2000]

[Systems subject to this condition: Process 1, System 1]

S31.1 The following BACT requirements shall apply to VOC service fugitive components associated with the devices that are covered by application number(s) 310073, 310075 & 293123:

All new components in VOC service as defined in Rule 1173, except valves and flanges, shall be inspected quarterly using EPA reference Method 21. All new valves and flanges in VOC service, except those specifically exempted by Rule 1173, shall be inspected monthly using EPA Method 21.

All new components in VOC service, except pressure relief devices for which a leak in excess of 200 ppmv shall be repaired within 5 days of detection, a leak greater than 500 ppmv but less than 1,000 ppmv, as methane, measured above background using EPA Method 21 shall be repaired within 14 days of detection. Components shall be defined as any valve, fitting, pump, compressor, pressure relief valve, diaphragm, hatch, sight-glass, and meter, which are not exempted by Rule 1173.

All new valves greater than 2-inch size and major components in VOC service as defined by Rule 1173, except those specifically exempted by Rule 1173, shall be distinctly identified from other components through their tag numbers (e.g., numbers ending in the letter "N"), and shall be noted in the records.

All new valves in VOC service, except those specifically exempted by Rule 1173, shall be bellows seal valves for 2-inch and smaller sizes, except as approved by the District, in the following applications: heavy liquid service, control valve, instrument piping/tubing, applications requiring torsional valve stem motion, applications where valve failure could pose safety hazard (e.g., drain valves with valve stems in horizontal position), retrofits/special applications with space limitations, and valves not commercially available.

If 98.0 percent or greater of the new valve and the new flange population inspected is found to leak gaseous or liquid volatile organic compounds at a rate less than 500 ppm for two consecutive months, then the operator shall revert to a quarterly inspection program with the approval of the executive officer. This condition shall not apply to bellow sealed valves.

The operator shall keep records of the monthly inspection (and quarterly where applicable), subsequent repairs and reinspections, in a manner approved by the District.

The operator shall provide to the District, no later than 60 days after initial startup, a plot plan or piping and instrumentation diagrams with a listing showing by functional grouping, location, type, accessibility, and application of each new valve in VOC service.

[RULE 1303(a)(1)-BACT, 5-10-1996]

[Systems subject to this condition: Process 1, System 1, 2; Process 3, System1]

Device Conditions:

D. Monitoring/Testing Requirements

D28.x The operator shall conduct source test(s) in accordance with the following specifications:

The test shall be conducted during the first drier regeneration following startup of this equipment while H2 product is being vented.

The District shall be notified of the date and time of the test at least 10 days prior to the test.

The test shall be conducted to determine the CO emissions.

The test shall be conducted to determine the CH4 emissions.

The test shall be conducted to determine the VOC emissions.

[RULE 1301(b)(1) – NSR Applicability, 12-7-1995; RULE 1703 - PSD Analysis, 10-7-1988; RULE 1714 - PSD for Greenhouse Gases, 11-5-2010]

[Devices subject to this condition: Dnew5]

D90.3 The operator shall continuously monitor the H2S concentration of fuel gas before being burned in this device according to the following specifications:

The operator shall use a total sulfur fuel gas analyzer approved by the District to monitor the parameter.

The operator shall also install and maintain a device to continuously record the parameter being monitored.

The operator may monitor the H2S concentration at a single location for fuel combustion devices, if monitoring at this location accurately represents the concentration of H2S in the fuel gas being burned in this device.

The operator shall install and maintain a totalizing fuel meter to accurately indicate the amount of fuel being used at the facility.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(b)(2)-Offset, 5-10-1996; RULE 431.1, 6-12-1998]

[Devices subject to this condition: D28, D38, C46]

D332.1 The operator shall determine compliance with the CO emission limit(s) by conducting a test at least every five years using a portable analyzer and AQMD-approved test method or, if not available, a non-AQMD approved test method. The test shall be conducted when the equipment is operating under normal conditions to demonstrate compliance with the CO emission limit. The operator shall comply with all general testing, reporting, and recordkeeping requirements in Sections E and K of this permit.

[RULE 3004(a)(4)-Periodic Monitoring, 12-12-1997, RULE 407, 4-2-1982]

[Devices subject to this condition: D31, D32, D35, **Dnew5**]

E. Equipment Operation/Construction Requirements

E336.1 The operator shall vent the vent gases from this equipment as follows:

All PSA purge gases shall be vented to the heater (Device D38) except during emergencies, process upset, startup, or shutdown.

This equipment shall not be operated unless the heater is in full use and has a valid permit to receive vent gases from this equipment.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(b)(2)-Offset, 5-10-1996]

[Devices subject to this condition: D28]

E336.2 The operator shall vent the vent gases from this equipment as follows:

All vent gases shall be vented to the flare (Process 3, System 1).

This equipment shall not be operated unless the flare is in full use and has a valid permit to receive vent gases from this equipment.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(b)(2)-Offset, 5-10-1996]

[Devices subject to this condition: D2]

E336.3 The operator shall vent the vent gases from this equipment as follows:

All vent gases from the buffered packing seals shall be vented to the flare (Process 3, System 1).

This equipment shall not be operated unless the flare is in full use and has a valid permit to receive vent gases from this equipment.

[RULE 1303(a)(1)-BACT, 5-10-1996; RULE 1303(b)(2)-Offset, 5-10-1996]

[Devices subject to this condition: D4]

E336.x The operator shall vent the vent gases from this equipment as follows:

The drier regeneration vent shall vent to atmosphere only during periods of drier regeneration. Drier regeneration shall occur no more than once per day.

[RULE 1714 -PSD for Greenhouse Gases, 11-5-2010]

[Devices subject to this condition: Dnew5]

H. Applicable Rules

H23.2 This equipment is subject to the applicable requirements of the following rules or regulations.

Contaminant	Rule	Rule/Subpart
VOC	District Rule	1173

[~~**RULE 1173, 5-13-1994**~~, **RULE 1173, 2-6-2009**]

[Devices subject to this condition: D52, D55, D56]

BACKGROUND:

Air Products and Chemicals, Inc. (AP) operates an 88 MMSCFD hydrogen production plant in Wilmington, CA. This plant was initially constructed to supply the nearby Ultramar Refinery with hydrogen in order to comply with the CARB Reformulated Gasoline regulations. Since construction, this plant (along with another hydrogen plant operated by AP in Carson, CA) now supplies hydrogen to nearly all of the local refineries, including Ultramar, Tesoro, Phillips 66 (Carson and Wilmington), and ExxonMobil. The Wilmington plant receives refinery fuel gas from Ultramar as its feedstock.

AP-Wilmington is currently in RECLAIM for NO_x and first entered RECLAIM as a Cycle 2 facility on June 30, 1999. The facility was issued an initial Title V permit on February 2, 2009. The facility is located in the coastal zone.

The subject application was submitted to modify the hydrogen production permit unit in order to install new equipment to further purify up to 1 MMSCFD of the existing 83 MMSCFD hydrogen product exiting the (Pressure Swing Adsorption) PSA unit for use as a transportation fuel (spec: <1 ppm CO and ppm levels of CH4 and water). Details are provided in the Process Description section below.

Air Products is undergoing the proposed modifications under a California Energy Commission (CEC) grant whose goal is to "fund projects that develop infrastructure necessary to dispense hydrogen transportation fuel" by soliciting projects to "upgrade public and private infrastructure investments, expand the network of public-access and fleet fueling stations, and put in place infrastructure that will be needed to dispense hydrogen based on the population of existing and anticipated fuel cell vehicles (FCVs) and hydrogen internal combustion engine vehicles (HICEVs)." In addition to the modifications at the Wilmington plant, Air Products will be undertaking upgrades to two existing fueling stations (UC Irvine and SCAQMD), as well as installing six new fueling stations in the South Coast Air Basin (Santa Monica, Beverly Hills, West LA, Hermosa Beach, North Irvine, and Hawthorne). The hydrogen produced from the proposed modifications at the Wilmington plant will be delivered to these eight stations for use in hydrogen fueled vehicles. As detailed below in the CEQA section, the fueling stations are considered separate projects because they can operate independently of the modifications proposed for the Wilmington plant. In addition, SCAQMD Permits are not required for the fueling stations (see emails dated 11/13/12 with AP and District staff). Therefore, the operation of these stations is not a part of this evaluation.

The applications submitted to the AQMD for the proposed modification are summarized below in Table 1.

Table 1 – AQMD Applications Submitted

A/N	Equipment	Device ID	Type	Status	Date Received	Requested Action
547681	Hydrogen Production Plant	Various (P1/S1)	50	20	2/26/13	Modify P1/S1 by installing H2 purification and loading equipment
547682	Title V Revision	--	85	21	2/26/13	Revise Title V permit

The fees submitted with these applications are shown below in Table 2.

Table 2 – Fee Summary

A/N	Equipment Description	B/CCAT	Type	Fee Sched	Fee Paid	Fee Required	Balance Due
547681	Hydrogen Production Plant	252560	50	F	$16,311.78*	$10,874.52	$0.00
547682	Title V Revision	555009	85	C	$1,789.12	$1,789.12	$0.00

**Note that Air Products requested expedited permit processing for this application and therefore provided an additional 50% of the permit processing fee.*

PROCESS DESCRIPTION:

As explained in the Background section above, the proposed modification involves installing new equipment to further purify the existing hydrogen product into a purity which may be used as a transportation fuel. The current hydrogen product exiting the PSA unit contains roughly 30 ppm CO – this is the main contaminant requiring purification for use as a transportation fuel, and must be brought into <1 ppm spec. In order to remove this CO, Air Products has proposed installing a Methanator reactor to convert the CO into methane (CH_4) and water (H_20) according to Reaction (A) shown below:

(A) $$CO + 3H_2 \rightarrow CH_4 + H_2O$$ Methanation Reaction

After methanation, the purified hydrogen will be directed to a drier vessel. The drier is used to remove any moisture in the hydrogen after the methanation reaction prior to compression and loading into delivery trailers. The drier utilizes two mole sieve beds in parallel to remove the water. Air Products expects the mole sieve beds in the drier will require monthly regeneration to remove the residual H_2O and ensure proper operation. During regeneration, the beds are heated while pure hydrogen product is passed through the vessel and vented to atmosphere at ~14,000 SCFH through a 2" vent stack. Air Products estimates this process should take 14 hours (6 hours to heat followed by 8 hours of atmospheric venting) once a month, with the stream venting to atmosphere having the following makeup:

- H_2O (20,000 ppmv)
- CH_4 (55 ppmv)
- CO (<1 ppmv)
- H_2 (balance)

The drier regeneration vent is the only point of emissions from the proposed system. Emission calculations are discussed in the next section.

After the hydrogen product has gone through methanation and drying, it is directed to two compressors rated at 100 HP, compressed to 53 MPa (523 atm), and then loaded into trailers for delivery to fueling stations throughout the South Coast basin.

CALCULATIONS:

As described above in the Process Description section, the only potential emissions generated by the proposed project result from the monthly regeneration of the drier beds (no VOC fugitive emissions – see Rule 1173 eval below). The vent stream to atmosphere is composed mainly of hydrogen and water, with some methane and carbon monoxide. Neither hydrogen nor water are criteria pollutants requiring further analysis. Potential emissions of carbon monoxide and methane are calculated below. Note that methane emissions are calculated not as a VOC (per the definition in Rule 102), but as a greenhouse gas (GHG) potentially subject to PSD.

Given,

- Maximum flow of 14,000 scf/hr with 1 ppmv CO and 55 ppmv CH_4
- Global warming potential (40 CFR Part 98, Table A-1): 1 lb CH_4 = 21 lb CO_2-equivalent (CO_2e)
- Max PTE calcs based worst case assumption that the regeneration gas vents 1x per day for 8 hours

<u>CO Emissions</u>

$$\frac{1\ ppmv\ CO}{10^6}\ x\ \frac{28\ lb\ CO}{lbmol\ CO}\ x\ \frac{lbmol}{379\ s\ cu\ ft}\ x\ \frac{14{,}000\ s\ cu\ ft}{hr} = \boxed{0.001\ {}^{lb}/_{hr}\ CO}\ x\ 8\ hr$$
$$= \boxed{0.008\ {}^{lb}/_{day}\ CO}$$

$$\frac{1\ ppmv\ CO}{10^6}\ x\ \frac{28\ lb\ CO}{lbmol\ CO}\ x\ \frac{lbmol}{379\ s\ cu\ ft}\ x\ \frac{14{,}000\ s\ cu\ ft}{hr}\ x\ \frac{8\ hr}{day}\ x\ \frac{365\ days}{yr}\ x\ \frac{ton}{2{,}000\ lb}$$
$$= \boxed{0.002\ tpy\ CO}$$

The current hydrogen production permit unit PTE for CO is 11 lb/day due to atmospheric venting of break tank V-137. The insignificant CO emissions calculated above for the proposed project will not impact the permit unit PTE (11 + 0.008 = 11). As discussed below in the PSD rule evaluation, the increase from the proposed project on an annual basis as calculated above is insignificant and does not trigger any further PSD analysis (the PSD significance threshold for CO is 100 tpy). New condition E336.x will be tagged to the drier bed vessel to ensure that regeneration will not occur more than once per day and ensure that CO emissions will remain below PSD thresholds.

GHG emissions

$$\frac{55\ ppmv\ CH_4}{10^6} x \frac{16\ lb\ CH_4}{lbmol\ CH_4} x \frac{21\ lb\ CO_2e}{1\ lb\ CH_4} x \frac{lbmol}{379\ cu\ ft} x \frac{14{,}000\ cu\ ft}{hr} x \frac{8\ hr}{day} x \frac{365\ days}{yr} x \frac{ton}{2{,}000\ lb} = \boxed{1.00\ tpy\ CO_2e}$$

As discussed below in the PSD rule evaluation, the increase from the proposed project calculated above is insignificant and does not trigger any further PSD analysis (the PSD significance threshold for GHG is 75,000 tpy CO_2e).

Note that Air Products estimates that regeneration of the drier will actually only occur once per month, with the regeneration vent being vented to atmosphere for only ~8 hours. Actual emissions are therefore anticipated to be significantly lower than the emissions calculated above. While no emission increase of attainment pollutants will occur as a result of the proposed modification, it may be considered an NSR event due to the definition of "physical modification" in Rule 1302. Because 1313(g) requires a throughput limit be imposed to limit maximum monthly emissions, new condition E336.x will be added limiting the regeneration of the drier to no more than 1x per day as stated earlier.

COMPLIANCE RECORD REVIEW:

A review of the facility's compliance status for the past 3 years showed that Air Products-Wilmington was issued NOV P61006 on 1/24/13 for sending process water to the cooling tower without a permit and NOV P61005 on 2/8/13 for submitting inaccurate RECLAIM Quarterly Certification Emissions Report (QCER) for compliance year 2011, 2nd quarter. Both NOVs have been resolved and are listed as "In Compliance" in the District's CLASS database.

See Attachment A for facility compliance history.

RULE EVALUATION:

PART 1: SCAQMD REGULATIONS

REG II: PERMITS

Rule 212: Standards for Approving Permits
11/14/97 Rule 212 requires public notice if any of the following subparts are applicable

(c)(1): The source is located within 1000 feet of a school

(c)(2): The source has emission increases exceeding the following thresholds from 212(g), all in lbs/day:

CO:	220	ROG:	30	PM10:	60
NOx:	40	Pb:	3		

(c)(3): The source generates emissions of toxic air contaminants for which the MICR is above one in a million for the subject equipment OR for which MICR is above ten in a million for the facility.

Air Products Wilmington is not located with 1,000 feet of a school. The proposed modification will not result in an emission increase greater than any of the thresholds in 212(c)(2), and there is no expected increase in calculated health risk. Therefore, no public notice is required.

REG IV: PROHIBITIONS

Rule 401: Visible Emissions
11/9/01

This rule prohibits the discharge of emissions with greater opacity than Ringelmann No. 1, with some exemptions. Visible emissions are not anticipated as a result of the proposed modification.

Air Products is in compliance with and is expected to continue to operate in compliance with this rule. The proposed modification will not effect this compliance determination.

Rule 402: Nuisance
5/7/76

This rule prohibits the discharge of air contaminants that cause injury, detriment, nuisance, or annoyance to a considerable number of persons; endanger the comfort, health, or safety of any person; or cause injury to property. Nuisance-causing emissions are not expected from the proposed modification.

Air Products is in compliance with and is expected to continue to operate in compliance with this rule. The proposed modification will not effect this compliance determination.

Rule 407: Liquid and Gaseous Air Contaminants
4/2/82

This rule limits atmospheric emissions of equipment.

(a)(1): CO Emissions

This subpart prohibits the discharge of CO emissions into the atmosphere greater than 2,000 ppmv averaged over 15 minutes.

The only potential CO emissions resulting from the proposed modification will occur during the monthly drier bed regeneration (see Process Description and Calculations sections above). These emissions are expected to be less than 1 ppmv CO. Existing periodic monitoring condition D332.1 will be tagged to the drier vessel to verify CO emissions meet this limit. If the periodic testing indicates that CO emissions are as low as Air Products claims, this periodic monitoring condition may be removed before converting the subject PC to PO. In addition new condition D28.x will require Air Products to test the regenerator vent at the first drier regeneration after construction to verify the emission estimates provided with the application.
Compliance with the emission limit of this subpart is expected.

(a)(2)(A): Sulfur Emissions

This subpart limits the sulfur emissions, measured as SO_2, to less than 500 ppmv in the South Coast Air Basin. Although this equipment is exempt from this subpart as a facility in compliance with Rule 431.1 per Rule 407(c)(2), no SO_2 emissions are expected.

Air Products is in compliance with and is expected to continue to operate in compliance with this rule. The proposed modification will not effect this compliance determination.

REG XI: SOURCE SPECIFIC STANDARDS

Rule 1173: Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants

2/6/09 The purpose of this rule is to control VOC leaks from components and releases from atmospheric process pressure relief devices. It applies to components at refineries, chemical plants, lubricating oil and grease re-finers, marine terminals, oil and gas production fields, natural gas processing plants, and pipeline transfer stations.

Air Products is subject to this rule for the equipment in the plant which contacts refinery fuel gas. The rest of the plant is not subject to the requirements of Rule 1173 per 1173(l)(1)(D), as these components handle fluids with a VOC content less than 10% by weight. In general, components upstream of the reformer reactor *are* subject to Rule 1173 because they contact refinery fuel gas, while components downstream of the reformer reactor *are not* subject to Rule 1173 because the hydrocarbons in the refinery fuel gas have been converted to hydrogen in the reformer reactor.

The new equipment to be installed as a result of the proposed modification will be installed downstream of the reformer reactor and will not be subject to Rule 1173, because they will not be in VOC service (i.e. new components will not come in contact with fluids with VOC content greater than 10%).

Air Products is in compliance with and is expected to continue to operate in compliance with this rule. The proposed modification will not effect this compliance determination.

Rule 1189: Emissions from Hydrogen Plant Process Vents

1/21/00 This rule limits VOC emissions from hydrogen plant process vents. It applies to all hydrogen plants that produce any hydrogen for use in petroleum refining operations.

(c)(3): Requirements for Existing Hydrogen Plants On or After January 1, 2003

This subpart limits hydrogen plants from emitting more than 2.5 lbs VOC per MMSCF hydrogen produced.

Air Products has reported annual emissions in compliance with this limit. The most recent test report for the source test conducted on June 18 thru 20, 2012 showed VOC emissions at 1.8 lbs VOC per MMSCF hydrogen produced, well below the rule limit stated above.

The proposed modification will not result in any new process vents subject to Rule 1189. The only vent to atmosphere during normal operation will be the drier regeneration vent, which is not expected to contain any VOCs (CH_4 does not meet the definition of VOC in Rule 102).This determination will be confirmed by requiring Air Products to coordinate the monthly drier regeneration with the first annual Rule 1189 test following construction and test the regeneration vent along

with other process vents at the plant. Should no VOCs be present in the vent stream, this vent will not be required to be included in subsequent Rule 1189 tests.

In addition, new condition D28.x requires Air Products to conduct a source test on the drier regeneration vent at the first regeneration following construction in order to confirm the estimates provided with their P/C application.

(e)(1-5): Monitoring, Reporting, and Recordkeeping Requirements
These subparts lay out the requirements to demonstrate compliance with the limits in this rule. Air Products has submitted annual reports since the adoption of Rule 1189. Continued compliance with the monitoring, reporting, and recordkeeping requirements is expected.

Air Products is in compliance with and is expected to continue to operate in compliance with this rule. The proposed modification will not effect this compliance determination.

REG XIII: NEW SOURCE REVIEW (NSR)

This regulation applies to new, modified, or relocated sources that increase emissions of any nonattainment air contaminants, ammonia, or ozone-depleting compounds. The South Coast Air Basin is currently in attainment for NO_2, SO_2, CO, PM10[1] and lead, but nonattainment for ozone and PM2.5. VOC and NO_x are precursors for ozone, while VOC, NO_x, and SO_x are precursors for PM2.5. Therefore, emissions of NO_x, SO_x, PM2.5 and VOC are evaluated for compliance with NSR.

The proposed modification will not result in an increase of any nonattainment pollutants, but may be considered an NSR event due to the definition of a "physical modification" in Rule 1302. Therefore, analysis of Rule 1303 is included below for completeness.

Rule 1303: Requirements
12/6/02

(a)(1): Best Available Control Technology
The proposed modification will only result in emission increases of CO and GHGs, both attainment pollutants that are evaluated under PSD rather than NSR. See Reg. XVII evaluation below. No BACT requirements are triggered as the proposed modification will not result in an emission increase of any nonattainment pollutants or precursors. Note that new condition D28.x will require Air Products to perform a source test following construction to verify emission estimates provided with their application and confirm no emissions of nonattainment pollutants will occur during drier regeneration.

[1] *PM10 was recently approved for re-designation to 'In Attainment' by the EPA, effective July 26, 2013. Additional information can be obtained at http://www.gpo.gov/fdsys/pkg/FR-2013-06-26/html/2013-15145.htm*

(b)(1): Modeling

N/A – no emission increase of nonattainment pollutants or precursors.

(b)(2): Offsets
N/A – no emission increase of nonattainment pollutants or precursors.

(b)(3): Sensitive Zone Requirements
N/A. No ERCs required.

(b)(4): Facility Compliance
N/A – no emission increase of nonattainment pollutants or precursors.

(b)(5) Major Polluting Facilities
N/A. The proposed project does not meet the definition of Major Modification in Rule 1302. The requirements of this section do not apply.

Continued compliance is expected.

REG XIV: TOXIC AIR CONTAMINANTS

Rule 1401: New Source Review of Toxic Air Contaminants
This rule specifies limits for MICR, cancer burden, and non-cancer acute/chronic hazard index for new permit units, relocations, or modifications to existing permit units which emit toxic air contaminants listed in Table I of this rule.

(d) Requirements
This subdivision limits the calculated health risk resulting from increased toxic emissions to a MICR of less than 1 in a million, cancer burden less than 0.5, and acute and chronic health indices less than 1.0.

(g)(1)(B) Modification with No Increase in Risk
This subparagraph exempts projects which cause a reduction or no increase in calculated health risk from the requirements of subpart (d). The proposed modification is not expected to result in an increase in toxic emissions or calculated health risk and is therefore exempt from the requirements of subdivision (d).

Air Products is in compliance with and is expected to continue to operate in compliance with this rule. The proposed modification will not effect this compliance determination.

REG XVII: PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

The goal of PSD is to ensure that air quality in clean areas does not significantly deteriorate while maintaining a margin for future industrial growth. It applies to net emission increases of criteria air pollutants that are currently in attainment. The District recently signed a new Limited PSD Delegation agreement with EPA (effective July 26, 2007) that gives the District limited responsibility for PSD. The South Coast Air Basin is currently in attainment for NO_2, SO_2, CO and lead. As mentioned under REG XIII discussion above, EPA's redesignation of PM10 from nonattainment to attainment is expected to take effect on July 26, 2013.

A recent EPA Endangerment Finding for greenhouse gases (GHG) means that emissions of GHG need to be evaluated under PSD. Note that ambient air quality standards have not yet been released for GHG. Therefore, as the South Coast Air

Basin is *not* in *non*attainment, GHG emissions are also subject to PSD in South Coast.

The newly-promulgated Tailoring Rule specifies that GHG emissions must be evaluated under PSD for permits issued after January 2nd, 2011 for projects at existing PSD or Title V sources in South Coast according to a phased-in applicability time frame. The subject equipment is located at a Title V facility (AP Wilmington was issued an initial Title V permit effective 2/2/09). Note that because this modification will take place after July 1, 2011, the Tailoring Rule Step 2 applies. This means that a significant emission increase of GHGs can itself trigger PSD for modifications (rather than only being evaluated as a part of "anyway" modifications that trigger PSD due to increases in other regulated pollutants).

The increase in annual emissions on a ton per year basis as a result of the proposed project is shown below in Table 3, along with the PSD modification significance thresholds. See Calculations section above for more details.

Table 3 – PSD Applicability Determination

Pollutant	Emissions Increase (tpy)	PSD Significance Threshold (tpy)	Exceed Threshold?
CO	0.002	100	No
GHG (CO_2e)	1.00	75,000	No

Because all emission increases for attainment pollutants are far below the significance thresholds, PSD is not triggered for the proposed modification. Further analysis under Reg. 17 is not required. Note that Air Products will be required to perform a source test per new condition D28.x at the first drier regeneration following construction in order to confirm the emission estimates provided with their application. In addition, new condition E336.x ensures that drier regeneration does not occur more than once per day. The source test required by D28.x will confirm that emissions of attainment pollutants do not exceed the PSD thresholds and the operational limitation of E336.x provides assurance that emissions of nonattainment pollutants will not exceed these thresholds in the future.

REG XX: REGIONAL CLEAN AIR INCENTIVE MARKET (RECLAIM)

RECLAIM is a market incentive program designed to allow facilities flexibility in achieving emission reduction requirements for NOx and SOx. Air Products is currently subject to RECLAIM requirements for NOx only as a Cycle 2 facility.

The subject hydrogen production equipment does not generate emissions of either NOx or SOx and is therefore not subject to any RECLAIM requirements. The reformer heater at the plant is subject to RECLAIM requirements, but is permitted separately from the subject equipment. The proposed modification will not effect this compliance determination.

REG XXX: TITLE V PERMITS

The Title V Permit system is the air pollution control permit system required to implement the federal Operating Permit Program as required by Title V of the federal Clean Air Act as amended in 1990. This regulation defines permit application and issuance procedures as well as compliance requirements associated with the program. Air Products Wilmington was issued an initial Title V permit effective 2/2/09.

Because the proposed modification does not result in an emission increase of any HAPs or pollutants subject to Reg. XIII, and does not result in an increase of GHGs greater than 75,000 tpy, this application qualifies as a Title V **Minor Revision** per Rule 3000(b)(15). This means that EPA review of the draft permit is required, per Rule 3003(j)(1)(A). Public review is not required, per 3006(b). A copy of the final permit will also be submitted to the EPA within 5 working days of its issuance, per Rule 3003(j)(1)(E).

PART II: STATE REGULATIONS

CEQA: CALIFORNIA ENVIRONMENTAL QUALITY ACT

CEQA requires that the environmental impacts of proposed projects be evaluated and that feasible methods to reduce, avoid, or eliminate identified significant adverse impacts of these projects be considered. CEQA defines "significant" by the following net emission increase thresholds (all in lbs/day):

ROG: 55 PM_{10}: 150 CO: 274

The proposed modification will not result in a significant emission increase. As verified by the 400-CEQA screening checklist and additional information submitted by Air Products, **the proposed modification does not trigger further CEQA analysis**. Note that because CEQA is evaluated on a project basis, initial discussions of this modification included the fueling stations to be installed and upgraded throughout the South Coast Air Basin. However, additional discussion and information submitted by Air Products resulted in the determination that the fueling stations be considered a separate project under CEQA because they can be operated completely independently of the proposed modification at the Wilmington plant. The two existing stations are currently serviced via delivery of liquid hydrogen from another Air Products facility in Sacramento. The new fueling stations could in theory be serviced in the same manner (and in fact, under the CEC grant funding, Air Products would be required to service the new stations in this manner should the modifications at Wilmington not be completed and/or delayed). See email from Steve Smith (CEQA Team Program Supervisor) dated 3/28/13 supporting this conclusion.

Note that because SCAQMD permits are not required for the fueling stations, CEQA would be addressed for that project by the appropriate city building department or equivalent as part of the permitting process for the construction or modifications of the stations (and not by SCAQMD). See additional emails between District staff and Air Products over the period of November 2012 through January 2013 for more details.

PART III: FEDERAL REGULATIONS

40CFR: PROTECTION OF ENVIRONMENT

Part 60: **Standards of Performance for New Stationary Sources (NSPS)**

Subpart VV/VVa: *Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry*

This plant produces hydrogen, and thus is not subject to the requirements of Subpart VV. The proposed modification will not effect this compliance determination.

Subpart GGG/GGGa: *Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries*

The Air Products hydrogen plant is not subject to these petroleum refinery-specific regulations. The plant is subject to (and in compliance with) the equipment leak standards in District Rule 1173. The proposed modification will not effect this compliance determination.

Part 68: **Chemical Accident Prevention Provisions**

This part sets out the requirements for owners or operators of stationary sources concerning the prevention of accidental releases. This plant is subject to the requirements of this rule. This part requires eligible facilities to submit a Risk Management Plan (RMP) to EPA. Facility condition F24.1 requires Air Products to submit statements (including any relevant EPA certification of its RMP) as part of an annual compliance certification process. Air Products is currently in compliance with this condition, as they have submitted annual statements since construction certifying that they are in compliance with all requirements of Part 68.

Air Products is expected to continue to operate in compliance with this rule. The proposed modification will not affect this compliance determination.

CONCLUSIONS & RECOMMENDATIONS:

The proposed modifications are expected to comply with all applicable District, State, and Federal rules and regulations. Permit to Construct under A/N 547681 is recommended with the conditions listed in the Conditions section above.