

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT <i>ENGINEERING DIVISION</i> APPLICATION PROCESSING AND CALCULATIONS	PAGES 11	PAGE 1
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	PROCESSED BY T. Iwata	CHECKED BY

Northrop Grumman
500 – 800 N. Douglas St.
El Segundo, CA 90245
ID No.: 18294

EQUIPMENT DESCRIPTION:

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
Process 5: FABRICATED METALS					
System 2: AUTOCLAVES, BLDG. WC 905					
AUTOCLAVE, 75 FT. L. X 15 FT. H., NATURAL GAS, <u>24.3</u> 39 MMBTU/HR, WITH <u>BURNER, NATURAL GAS, MAXON, MODEL KINEDIZER LE, 24.3 MMBTU/HR LOW-NOX BURNER</u> BURNER, ECLIPSE, MODEL NO. 16V MI-G-A LN20, 39 MMBTU/HR LOW NOX BURNER A/N 504172 458660	D225		NOx: PROCESS UNIT**	CO: 2000 PPMV NATURAL GAS [RULE 407], CO: 50 PPMV [RULE 1303(a)(1), NOX: 30 PPMV NATURAL GAS [RULE 2005, 2012], PM: 0.1 GRAINS/SCF NATURAL GAS [RULE 409], PM: [RULE 404]	C1.7 C1.17 D12.1 D28.3 D323.2 D328.1 K40.1

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
Process 5: FABRICATED METALS					
System 5: METAL FORMING					
METAL TUBE BENDING MACHINE, EATON LEONARD, MODEL VB30-GL, SERIAL NO. VB 30-109-GL, 20 KW ELECTRICALLY HEATED. A/N 503504	D229			VOC (5) [RULE 442]	A63.10 B27.6 H23.12

A/N 503586: Title V/RECLAIM facility permit revision

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CONDITIONS

A/N 504172 (autoclave):

C1.7: THE OPERATOR SHALL LIMIT THE HEAT INPUT TO NO MORE THAN 23000 MM BTU IN ANY ONE YEAR.

The purpose(s) of this condition is to ensure that this equipment qualifies as a process unit.

C1.17: THE OPERATOR SHALL LIMIT THE HEAT INPUT TO NO MORE THAN 8.658 MM CUBIC FEET IN ANY ONE CALENDAR MONTH.

D12.1: THE OPERATOR SHALL INSTALL AND MAINTAIN A(N) NON-RESETTABLE TOTALIZING FUEL FLOW METER TO ACCURATELY INDICATE THE FUEL USAGE OF THE EQUIPMENT.

D28.3: THE OPERATOR SHALL CONDUCT SOURCE TEST(S) IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

The test shall be conducted within 90 days after achieving maximum production rate, but no later than 180 days after initial start-up.

The test shall be conducted pursuant to a source test protocol that shall be submitted to the District no later than 60 days after the initial start-up of this equipment unless otherwise approved by the District. The protocol shall be approved in writing by the District before the test commences, include completed District forms ST-1 and ST-2, identify the testing lab, include a statement from the lab certifying it meets District Rule 304(k) and include a description of the sampling and analytical procedures to be used.

The test shall be conducted to determine oxides of nitrogen, carbon monoxide, volatile organic compounds, oxygen content, moisture content, flow rate and temperature at the exhaust of the autoclave.

The District shall be notified of the date and time of the test at least 14 days prior to the test.

The test shall be conducted by a testing lab certified by the California Air Resources Board in the required test methods for criteria pollutants to be measured and in compliance with District Rule 304 (no conflict of interest).

The test shall be conducted using sampling facilities that comply with the District guidelines for construction of sampling and testing facilities, pursuant to Rule 217.

D323.2: THE OPERATOR SHALL CONDUCT AN INSPECTION FOR VISIBLE EMISSIONS FROM ALL STACKS AND OTHER EMISSION POINTS OF THIS EQUIPMENT WHENEVER THERE IS A PUBLIC COMPLAINT OF VISIBLE EMISSIONS, WHENEVER VISIBLE EMISSIONS ARE OBSERVED, AND ON AN ANNUAL BASIS, AT LEAST, UNLESS THE EQUIPMENT DID NOT OPERATE DURING THE ENTIRE ANNUAL PERIOD. THE ROUTINE ANNUAL INSPECTION SHALL BE CONDUCTED WHILE THE EQUIPMENT IS IN OPERATION AND DURING DAYLIGHT HOURS.

IF ANY VISIBLE EMISSIONS (NOT INCLUDING CONDENSED WATER VAPOR) ARE DETECTED THAT LAST MORE THAN THREE MINUTES IN ANY ONE HOUR, THE OPERATOR SHALL VERIFY AND CERTIFY WITHIN 24 HOURS THAT THE EQUIPMENT CAUSING THE EMISSION AND ANY ASSOCIATED AIR POLLUTION CONTROL EQUIPMENT ARE OPERATING NORMALLY ACCORDING TO THEIR DESIGN AND STANDARD PROCEDURES AND UNDER THE SAME CONDITIONS UNDER WHICH COMPLIANCE WAS ACHIEVED IN THE PAST, AND EITHER:

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- 1). TAKE CORRECTIVE ACTION(S) THAT ELIMINATES THE VISIBLE EMISSIONS WITHIN 24 HOURS AND REPORT THE VISIBLE EMISSIONS AS A POTENTIAL DEVIATION IN ACCORDANCE WITH THE REPORTING REQUIREMENTS IN SECTION K OF THIS PERMIT; OR
- 2). HAVE A CARB-CERTIFIED SMOKE READER DETERMINE COMPLIANCE WITH THE OPACITY STANDARD, USING EPA METHOD 9 OR THE PROCEDURES IN THE CARB MANUAL "VISIBLE EMISSION EVALUATION", WITHIN THREE BUSINESS DAYS AND REPORT ANY DEVIATIONS TO AQMD.

THE OPERATOR SHALL KEEP THE RECORDS IN ACCORDANCE WITH THE RECORDKEEPING REQUIREMENTS IN SECTION K OF THIS PERMIT AND THE FOLLOWING RECORDS:

- 1). STACK OR EMISSION POINT IDENTIFICATION;
- 2). DESCRIPTION OF ANY CORRECTIVE ACTIONS TAKEN TO ABATE VISIBLE EMISSIONS;
- 3). DATE AND TIME VISIBLE EMISSION WAS ABATED; AND
- 4). ALL VISIBLE EMISSION OBSERVATION RECORDS BY OPERATOR OR A CERTIFIED SMOKE READER.

D328.1: THE OPERATOR SHALL DETERMINE COMPLIANCE WITH THE CO EMISSION LIMIT(S) EITHER: (A) CONDUCTING A SOURCE TEST AT LEAST ONCE EVERY FIVE YEARS USING AQMD METHOD 100.1 OR 10.1; OR (B) CONDUCTING A TEST AT LEAST ANNUALLY USING A PORTABLE ANALYZER AND AQMD-APPROVED TEST METHOD. THE TEST SHALL BE CONDUCTED WHEN THE EQUIPMENT IS OPERATING UNDER NORMAL CONDITIONS TO DEMONSTRATE COMPLIANCE WITH THE CO LIMIT(S). THE OPERATOR SHALL COMPLY WITH ALL GENERAL TESTING, REPORTING, AND RECORDKEEPING REQUIREMENTS IN SECTIONS E AND K OF THIS PERMIT.

K40: THE OPERATOR SHALL PROVIDE TO THE DISTRICT A SOURCE TEST REPORT IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

Two completed copies of the source test reports shall be submitted to the District within 45 days after the source testing date. The test report shall include, but may not be limited to, all testing data required by this condition.

A/N 503504 (tube bender):

A63.10: THE OPERATOR SHALL LIMIT EMISSIONS FROM THIS EQUIPMENT AS FOLLOWS:

CONTAMINANT	EMISSIONS LIMIT	
VOC	LESS THAN 0.5 LBS IN ANY ONE DAY	

THE OPERATOR SHALL MAINTAIN DAILY RECORDS IN A MANNER ACCEPTABLE TO THE DISTRICT, TO DEMONSTRATE COMPLIANCE WITH THIS CONDITION.

B27.6: THE OPERATOR SHALL NOT USE MATERIALS, WITH THE EXCEPTION OF METHYL ETHYL KETONE, XYLENE, TOLUENE, ISOPROPYL ALCOHOL, METHANOL AND ETHYL BENZENE, CONTAINING ANY TOXIC AIR CONTAMINANTS (TACS) IDENTIFIED IN THE SCAQMD RULE 1401, AS AMENDED 06/05/2009.

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H23.12: THIS EQUIPMENT IS SUBJECT TO THE APPLICABLE REQUIREMENTS OF THE FOLLOWING RULES OR REGULATIONS:

CONTAMINANT	RULE	RULE/SUBPART
VOC	DISTRICT RULE	442

BACKGROUND:

On 7/7/2006, Northrop Grumman submitted application no. 458660 to permit a new 39 MMBtu/hr natural gas-fired autoclave (device no. D225). The autoclave was to operate similarly to Northrop’s five other autoclaves with the exception that it would be used to manufacture larger composite parts that don’t fit in the other autoclaves.

On 1/11/2007 , a PC was issued for a/n 458660. The PC included a condition to conduct testing in order to verify compliance with the stated emission limits from the burner manufacturer, Eclipse. The limits for NOx and CO were based on an emissions guarantee signed by Eclipse and provided to Northrop. Eclipse guaranteed the burner could achieve 30 ppmv of NOx and 50 ppmv of CO, both corrected to 3 percent oxygen. Eclipse later stated that the aforementioned levels were achievable in a “lab” environment and were not applicable to the way the burner was installed in the autoclave.

Once the autoclave was constructed, a tune-up was performed to prepare for the source test. The results of the tune-up showed that the autoclave would have difficulty meeting the NOx and CO concentrations. After Eclipse engineers looked at the combustion chamber drawings, they concluded that due to the autoclave’s unique configuration the emission’s guarantee of 30/50 ppmv was not valid. Eclipse made some modifications to the damper system in hopes of lowering CO emissions, but these modifications proved to be unsuccessful.

After completing performance tests on the autoclave, it was apparent that the burner could not operate at the 30/50 ppmv concentrations. By October 2009, Northrop decided to remove the burner and replace it with a smaller (24.3 MMBtu/hr), low-NOx burner manufactured by Maxon. A burner operates most efficiently when fired at or near full capacity. The original burner was too large for their process and was fired well below full capacity. By switching to a smaller burner, Northrop will hopefully be able to fire the burner closer to full capacity with less emissions. A source test will determine actual emissions.

Northrop will also redesign the combustion chamber and install a “smart” controller to optimize air-to-fuel ratios. On 12/4/2009, Northrop submitted application no. 504172 to make these modifications to the autoclave in order to meet the NOx and CO limits. To date, the autoclave was never placed in full operation mode.

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Along with the modification application for the autoclave, Northrop submitted application no. 503504 to permit an existing tube bending machine. The tube bending machine is used to slightly heat and bend tubes into various shapes. The lubricant that is used has a VOC content of 5.96 lb/gal and since that exceeds 50 g/l, the machine is not exempt from permitting under Rule 219 (e)(11).

Northrop Grumman is a Title V facility. A Title V renewal permit was issued to this facility on May 9, 2005. Northrop Grumman has proposed to revise their Title V renewal permit, under application no. 503586, by modifying a autoclave (device no. D225) and adding a new tube bending machine (device no. D229). This permit revision is considered as a “de minimis significant permit revision” for non-RECLAIM pollutants or hazardous air pollutants (HAPs), and a “minor permit revision” for RECLAIM pollutants to the RECLAIM/Title V permit for this facility, as described in the Regulation XXX evaluation.

PROCESS DESCRIPTION:

Northrop Grumman is an aircraft manufacturing facility. They primarily design and build the F/A-18’s center and aft fuselages. They will also be involved in the future production of the new F-35 Joint Strike Fighter. The new F-35 Joint Strike Fighter is the next generation strike fighter that has been designed using cutting-edge technologies. It will replace a wide range of aging fighter and strike aircraft, such as the F16, F/A18, A-6 and A-10, used by the U.S. Air Force, Navy, Marine Corps and allied defense forces worldwide. Due to advancements made in composite structure technology, the aircraft was designed with fewer individual structural components to minimize structural weight and complexity of assembly. As an example, the wingbox section integrates the wing and fuselage section into one piece. These components, however, are much larger than comparable components found on older aircraft and as a result, the components cannot be made in Northrop Grumman’s existing autoclaves because they are physically too small. The autoclave will be used to combine and strengthen layers of composite materials to form parts under heat and pressure. The approximate operating schedule is 16 hrs/day, 5-7 days/wk and up to 52 wks/yr.

The tube bending machine will also be used as part of Northrop’s manufacturing process. The machine will be used to bend pipes into various shapes. The pipes are slightly heated using the machine’s 20kW heater before bending. A lubricant is used in the bending process. It has a VOC content of 5.96 lb/gal. An average of 0.5 gallons and maximum of 2.5 gallons will be used in a month. The bending machine will be operated 8-24 hrs/day, 5-7 days/wk and up to 52 wks/yr.

EMISSION CALCULATIONS:

A/N 504172

Emissions from the autoclave due to the combustion of natural gas are determined using NOx, CO, and ROG estimates from the burner manufacturer, while PM10 and SOx emissions are

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calculated using AQMD emission factors. Hourly emissions are based on the maximum rating of the equipment, daily emissions on the fuel usage limit of 8.657 MM ft³/month, and the annual emissions on the maximum annual fuel usage limit of 23,000 MMBtu/yr.

New Heat input: 24.3 MM Btu/hr = 0.02314 MM ft³/hr
 Previous Heat input: 39 MMBtu/hr = 0.03714 MM ft³/hr
 Gross heating value: 1,050 Btu/ ft³
 Max. monthly fuel rate = 8.658 MM ft³/month
 Max. annual fuel rate = 23,000 MMBtu/yr x 1 ft³/1,050 Btu = 21.9 MM ft³/yr
 ROG emission factor = 2.25 lb/ MMft³ (5 PPM)
 NOx emission factor = 38.4 lb/ MMft³ (30 ppmv)
 CO emission factor = 39.37 lb/ MMft³ (50 ppmv)
 SOx emission factor = 0.83 lb/MMft³
 PM10 emission factor = 7.5 lb/MMft³

New Emissions:

Autoclave Emissions	ROG	CO	PM10	NOx	SOx
Hourly (lb/hr)	0.052	0.91	0.173	0.88	0.019
Daily (lb/day)	0.65	11.35	2.16	11.2	0.23

Previous Emissions:

Autoclave Emissions	ROG	CO	PM10	NOx	SOx
Hourly (lb/hr)	0.084	1.44	0.28	1.4	0.03
Daily (lb/day)	2.02	34.6	2.16	33.7	0.7

A/N 503504

VOC content of lubricant = 5.96 lb/gal
 Max. usage = 2.5 gal/mon
 Operating schedule: 8-24 hrs/day, 5-7 days/wk and up to 52 wks/yr.
 Monthly VOC emissions = 5.96 x 2.5 = 14.9 lb/mon
 Daily VOC emissions = 14.9 ÷ 30 day/mon = 0.49 lb/day
 Hourly VOC emissions = 0.49 ÷ 24 hr/day = 0.02 lb/hr

RISK ASSESSMENT:

A/N 504172

A Rule 1401 Risk Assessment was performed to determine the health risk from the toxic air contaminants that are emitted from the autoclave due to the combustion of natural gas. The risk was based on: (1) an annual natural gas usage limit of 23,000 MMBtu/yr, (2) an operating

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schedule of 24 hrs/day, 7 days/wk and 52 wks/yr, and (3) receptor distance of 300 meters and 200 meters for residential and commercial, respectively. The assessment indicates that there will not be a cancer risk equal or greater than one in a million or an acute or chronic hazard index risk equal to 1. The Risk Assessment sheets are included in application no. 504172.

A/N 503504

A risk assessment was also performed for the tube bending machine since the lubricant contains toxic air contaminants. The assessment was performed using the maximum weight percent values for each contaminant. The results indicate that the acute and chronic health hazard risks are well below 1. The assessment sheets are included in application no. 503504.

RULE ANALYSIS:

RULE 212: Public notification is not necessary because: (1) the emissions associated with the equipment is not greater than the daily maximums of subdivision (g), (2) the facility is not located within 1,000 feet of a public school and (3) there will not be a cancer risk equal or greater than one in a million. The following are the emissions associated with the equipment and the allowable limits of subdivision (g).

Rule 212	ROG	CO	PM10	NO_x	SO_x
Daily Emissions (lb/day)	1	11	2	11	0
Allowable limits (lb/day)	30	220	30	40	60

RULE 401: With proper operation and maintenance visible emissions are not expected from the equipment.

RULE 402: With proper operation and maintenance nuisance is not expected from the operation of the equipment.

RULE 404: The total PM concentration discharged from the autoclave will not exceed the allowable limit found in this rule. The total PM concentration discharged from the autoclave is 0.0048 gr/ft³, based on an exhaust flow of 4,119 ft³/min. The allowed maximum PM concentration at 4,119 ft³/min is 0.11 gr/ft³. Total PM concentration is calculated as follows:

$$\text{PM concentration} = (0.17 \text{ lb/hr})(7000 \text{ gr/lb})(\text{hr}/60 \text{ min})(\text{min}/4,119 \text{ ft}^3) = 0.0048 \text{ gr/ft}^3$$

RULE 407: The concentration of CO emissions from the autoclave is expected to be less than the 2000 ppmv limit of this rule.

RULE 431.1: Northrop Grumman is expected to operate the autoclave using natural gas that complies with this rule's requirements.

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RULE 442: The tube bending machine uses VOC containing material. The operation is not subject to any VOC emission limits in Regulation XI and as a result, this operation is subject to Rule 442 requirements. The equipment will be limited to less than 0.5 pounds of VOC per days which is less than the limit of this rule. Compliance with this rule is expected.

REGULATION XIII: Though Northrop Grumman is a NOx RECLAIM facility, compliance with Reg. XIII is still required.

RULE 1303(a): With the current configuration of the autoclave the applicant was unable to meet the proposed NOx and CO limits of the permit. After further review of the design of the autoclave, the applicant identified three areas to modify that would effect the emissions in order to meet the proposed NOx and CO limits. This includes the replacement of the 39 MMbtu/hr burner with a 24.3 MMbtu/hr low-NOx burner, modifications to the combustion chamber, and the use of an air-to-fuel ratio controller. The proposed modification of the autoclave is expected to help in achieving compliance with the limits. A source test condition is imposed on the permit to demonstrate compliance with the limits.

RULE 1303(b)(1): Modeling for CO or PM10 is not required since the hourly emissions are less than the allowable limits.

Modeling Analysis	CO (lb/hr)	PM10 (lb/hr)
Hourly Emissions	0.913	0.173
Allowable Limit	69.3	7.6

RULE 1303(b)(2): The proposed modification to the autoclave will result in no increase in PM10 emissions and reduction in ROG, NOx, and SOx emissions. Further, CO is an attainment air contaminant and the facility is a minor source for CO, PM10, and SOx emissions. The proposed installation of the bending machine will result in an increase of 0.49 pounds per day of VOC emissions.

RULE 1303(b)(4): The facility is expected to be in full compliance with all applicable rules and regulations of the District.

RULES 1303(b)(5)(A) & 1303(b)(5)(D): The proposed project is exempt from CEQA according to the responses Northrop Grumman provided on Form 400-CEQA for this project. Their responses in "Review of Impacts Which May Trigger CEQA" on Form 400-CEQA were all marked "No".

RULE 1303(b)(5)(C): A modeling analysis for plume visibility is not required since the net emission increase from the proposed project does not exceed 15 ton/yr of PM10 or 40 ton/yr of NOx.

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RULE 1401: The natural gas-fired autoclave will emit toxic air contaminants. A Risk Assessment was performed for the proposed project and the results indicate that there will not be a cancer risk equal or greater than one in a million and the acute and chronic hazard index risks are below 1. Compliance.

RULE 2005: Northrop Grumman is a NOx RECLAIM facility. The proposed modification will not result in NOx emissions increase.

RULE 2005(c)(1)(A): With the current configuration of the autoclave the applicant was unable to meet the proposed NOx and CO limits of the permit. After further review of the design of the autoclave, the applicant identified three areas to modify that would effect the emissions in order to meet the proposed NOx and CO limits. This includes the replacement of the 39 MMbtu/hr burner with a 24.3 MMbtu/hr low-NOx burner, modifications to the combustion chamber, and the use of an air-to-fuel ratio controller. The proposed modification of the autoclave is expected to help in achieving compliance with the limits. A source test condition is imposed on the permit to demonstrate compliance with the limits.

RULE 2005(c)(1)(B): Modeling is not required since the estimated hourly NOx emissions of 0.89 lb/hr is below the allowable limit of 1.26 lb/hr.

RULE 2005(c)(2): Northrop Grumman holds sufficient RTCs to offset the NOx emission increase of 851 lb/yr.

RULES 2005(g)(2) & 2005(g)(3): The proposed project is exempt from CEQA according to the responses Northrop Grumman provided on Form 400-CEQA for this project. Their responses in “Review of Impacts Which May Trigger CEQA” on Form 400-CEQA were all marked “No”.

RULE 2005(g)(4): A modeling analysis for plume visibility is not required since the net emission increase from the proposed project does not exceed 40 ton/yr of NOx.

REGULATION XXX:

This facility is in the RECLAIM program. The proposed project is considered as a “de minimis significant permit revision” for non-RECLAIM pollutants or hazardous air pollutants (HAPs), and a “minor permit revision” for RECLAIM pollutants to the RECLAIM/Title V permit for this facility.

Non-RECLAIM Pollutants or HAPs

Rule 3000(b)(6) defines a “de minimis significant permit revision” as any Title V permit revision where the cumulative emission increases of non-RECLAIM pollutants or HAPs from these permit revisions during the term of the permit are not greater than any of the following emission threshold levels:

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Air Contaminant	Daily Maximum (lbs/day)
HAP	30
VOC	30
NO _x *	40
PM10	30
SO _x *	60
CO	220

* Not applicable, RECLAIM pollutant

To determine if a project is considered as a “de minimis significant permit revision” for non-RECLAIM pollutants or HAPs, emission increases for non-RECLAIM pollutants or HAPs resulting from all permit revisions that are made after the issuance of the Title V renewal permit shall be accumulated and compared to the above threshold levels. This proposed project is the 7th permit revision to the Title V renewal permit issued to this facility on May 9, 2005. The following table summarizes the cumulative emission increases resulting from all permit revisions since the Title V renewal permit was issued:

Revision	HAP	VOC	NO _x *	PM10	SO _x	CO
Previous Permit Revision Total	0	2	0	7	0	35
7 th Permit Revision; modify autoclave (device no. D225), add tube bending machine (device no D229).	0	0	0	0	0	0
Cumulative Total	0	2	0	7	0	35
Maximum Daily	30	30	40*	30	60	220

*RECLAIM pollutant, not subject to emission accumulation requirements

Since the cumulative emission increases resulting from all permit revisions are not greater than any of the emission threshold levels, this proposed project is considered as a “de minimis significant permit revision” for non-RECLAIM pollutants or HAPs.

RECLAIM Pollutants

Rule 3000(b)(12)(A)(v) defines a “minor permit revision” as any Title V permit revision that does not result in an emission increase of RECLAIM pollutants over the facility starting Allocation plus nontradeable Allocations, or higher Allocation amount which has previously undergone a significant permit revision process.

Since NO_x is a RECLAIM pollutant for this facility, a separate analysis shall be made to determine if the proposed permit revision is considered a “minor permit revision” for RECLAIM

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pollutants. Section B of the Title V permit shows that this facility’s NOx starting Allocation plus the non-tradable Allocation is 15,104 pounds. The proposed modification of the autoclave is not expected to result in a NOx emission increase. As a result, this proposed project is considered as a “minor permit revision” for RECLAIM pollutants.

RECOMMENDATIONS

The proposed project is expected to comply with all applicable District Rules and Regulations. Since the proposed project is considered as a “de minimis significant permit revision” for non-RECLAIM pollutants or hazardous air pollutants (HAPs), and a “minor permit revision” for RECLAIM pollutants, it is exempt from the public participation requirements under Rule 3006(b). A proposed permit incorporating this permit revision will be submitted to EPA for a 45-day review pursuant to Rule 3003(j). If EPA does not have any objections within the review period, a revised Title V/RECLAIM permit will be issued to this facility.