Working Group Meeting #6

PROPOSED RULE 1159.1 – CONTROL OF NOx EMISSIONS FROM NITRIC ACID TANKS (PR 1159.1)

South Coast AQMD

April 25, 2024

2:00 PM

Zoom webinar link:
https://scaqmd.zoom.us/j/95812953504
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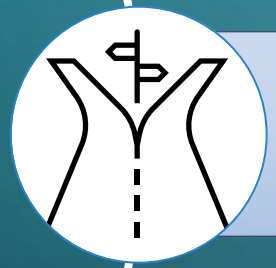
Dial-in Number: +1 669 900 6833
Zoom Webinar ID: 958 1295 3504

Agenda

Review of Early Rulemaking for PR 1159.1



Revised and New Approaches

Next Steps

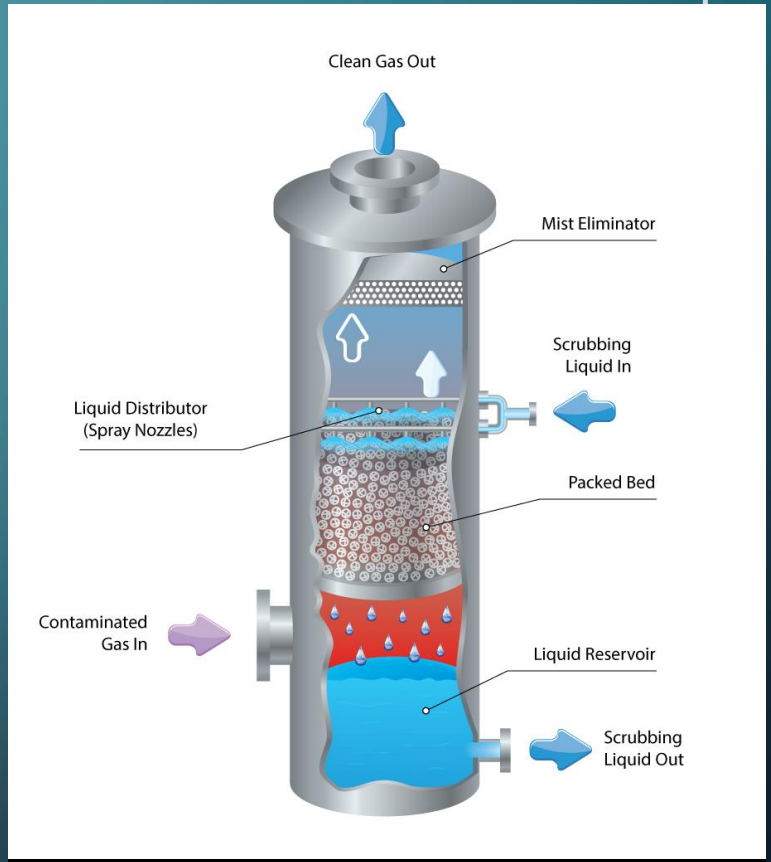
Background

- PR 1159.1 regulates NOx emissions formed from chemical reaction between nitric acid and a metal*
  - Addresses non-combustion NOx emissions from nitric acid tanks
  - Installation of controls is the only method to reduce NOx emissions
  - Last RECLAIM landing rule
  - Applies to about 250 facilities
- Best Available Retrofit Control Technology (BARCT) for NOx controls
  - BARCT requires installation of best air pollution control technology available to reduce air pollution from the facility's existing sources

* Except for one Expanded Graphite Foil Production facility

PR 1159.1 NOx Controls

- BARCT analysis included assessment of pollution control technologies (Link)
  - Most common technologies were specific to combustion-based NOx sources and not appropriate for PR 1159.1
- Packed bed scrubber is best control technology for PR 1159.1
  - Multiple units can be arranged in series to target multiple pollutants
  - Multi-stage scrubbers can achieve control efficiency as high as 99% and emission rate of 0.30 lb/hr



https://www.spray-nozzle.co.uk/spray-nozzle-applications/gas-scrubbing/packed-bed-scrubbers

Background on Exemption from Controls

- Both technological feasibility and cost-effectiveness are considered in establishing control requirements
- Tanks may not be cost-effective to control if emissions are low
- Low-usage tanks could be identified based on nitric acid additions

Proposal required recording nitric acid additions, such as:

REPLENISHMENTS

•Periodic additions of nitric acid to a tank to maintain required specification for in-tank concentration of nitric acid

REPLACEMENTS

•Additions of nitric acid during creation of new tank solution to replace old tank solution, that are no longer used and are treated or shipped out for disposal

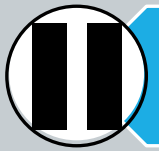
SUMMARY OF EARLY RULEMAKING FOR PR 1159.1

PR 1159.1 Rulemaking Timeline

Key Events Related to 1159.1 rulemaking:

Aug 2021 to Aug 2022 – Five Working Group Meetings held with stakeholders

Sept 2022 – Public Workshop



PR 1159.1 rulemaking paused

Dec 2022 – AQMP NOx cost-effectiveness changed: $50,000/ton → $325,000*/ton reduced

Jan 2023 – Second survey sent to collect additional data for other approaches

* Based on 2021 dollars

2022 Proposal

- Public Workshop was held September 2022
- BARCT emission limit determined based on available source tests after controls (use of scrubbers, see Working Group Number #3 for details, click here)
  - 0.30 lb/hr of NOx; or
  - 99% control efficiency
- Proposed exemption threshold (gallons per month) based on 2016 AQMP cost-effectiveness $50K per ton NOx reduced
- Estimated to impact one facility
  - Majority of universe determined to be not cost-effective to require installation of controls

PR 1159.1 – Post Public Workshop in 2022

- Draft 2022 AQMP included proposed changes to NOx cost-effectiveness threshold using health-based approach
  - $50,000 per ton of NOx → $325,000 per ton of NOx reduced
  - Cost-effectiveness threshold adjusted annually for California consumer price index (CPI)
  - AQMP, with change in cost-effectiveness threshold, was adopted in December 2022
- AQMP change in threshold impacted PR 1159.1 and affected universe
  - Decreased cost-effectiveness-based low-usage thresholds by factor of 6.5
  - Exemption based on monthly addition threshold exemption would decrease
    - Nitric acid tank - 66 gallons → 10.5 gallons
    - Facility-wide - 198 gallons → 30.5 gallons
- Rule development paused to evaluate approach and potential impact

REVISED AND NEW APPROACHES

Revised/New Approaches

- Staff re-evaluated approach to set the threshold to require installation of controls
  - Second facility survey sent out to evaluate financial, operational, and process information
  - Extensive permit and application evaluation for facilities that submitted survey responses
  - Assessment of economic, operational, processes, and equipment information

Approaches Considered and Preliminary Analysis

Approaches Considered	Preliminary Findings
Revised cost-effectiveness using 2022 AQMP threshold	Low-usage limits would need to be reassessed
Economic factors / small business	Small facilities could also be large emission sources
Types of metals processed in tanks	Lack of available emission data to base an exemption
Facility-wide emission limit	Potential exemption proposed and will be discussed today as **Approach 1A and Approach 1B**
Tank type	Potential exemption proposed and will be discussed today as **Approach 2**

APPROACH 1
FACILITY-WIDE EMISSION BASED LIMIT

Background

- BARCT emission limit for nitric acid units was determined to be either:
  - 0.30 lb/hr or
  - 99% control efficiency
- Facility-wide with uncontrolled NOx emissions from tanks that are

  1) more than 0.30 lb/hr shall install control

  2) equal to or less than 0.30 lb/hr would be operating equivalently to BARCT emission limit
     - Low amount of nitric acid reacted or a tank type where there is limited chemical reaction would result in a limited formation of NOx emissions

Exemption Approach #1 – Verification of Facility-Wide Limit

Emission Measurements

- Directly measures from the equipment
  - Continuous Emission Monitoring
  - Source Testing
- Costly to conduct and sampling protocols may not have been developed

Indirect Measurements

- Calculate NOx emissions from amount of nitric acid reacting with metals
- Conservatively represents NOx emissions by assuming all nitric acid reacts with metals

- Approaches 1A and 1B proposed to indirectly measure facility-wide NOx emissions based on nitric acid reactions forming NOx emissions

Maintenance of In-Tank Nitric Acid Concentrations

- Approach 1A and 1B focuses on the operational parameters of the individual tanks to establish eligibility for the exemption
- Facilities maintain nitric acid concentration by conducting combination of tank replenishments and/or tank replacements

ADDITIONS OF NITRIC ACID CHEMICALS

Approach 1A

- Based on the amount of nitric acid added (either through replenishments or replacements)

Approach 1B

- Based on operating limits of tanks (replacements only)

REPLENISHMENTS

•Periodic additions of nitric acid to a tank to maintain required specification for in-tank concentration of nitric acid

REPLACEMENTS

•Additions of nitric acid during creation of new tank solution to replace old tank solution, that are no longer used and are treated or shipped out for disposal

Approach 1A

Concepts – Nitric Acid Additions

- Focuses on additions of nitric acid to tanks that include both replenishments and replacements of the tank solution
  - Similar to 2022 approach for low-usage exemption
- Establishing an annual facility-wide addition limit of 263 gallons/year of nitric acid at 68WT%
  - One gallon of nitric acid (68WT%) generates five pounds of NOx emissions
  - Annual limit based on the volume of nitric acid added to be equivalent to the daily BARCT emission limit (0.30 lb/hr x 12 hrs/day* = 3.6 lbs/day)
  - 3.6 lbs/day of NOx translates to 0.72 gallons of nitric acid (68WT%) per day or 263 gallons per year

*Based on survey data

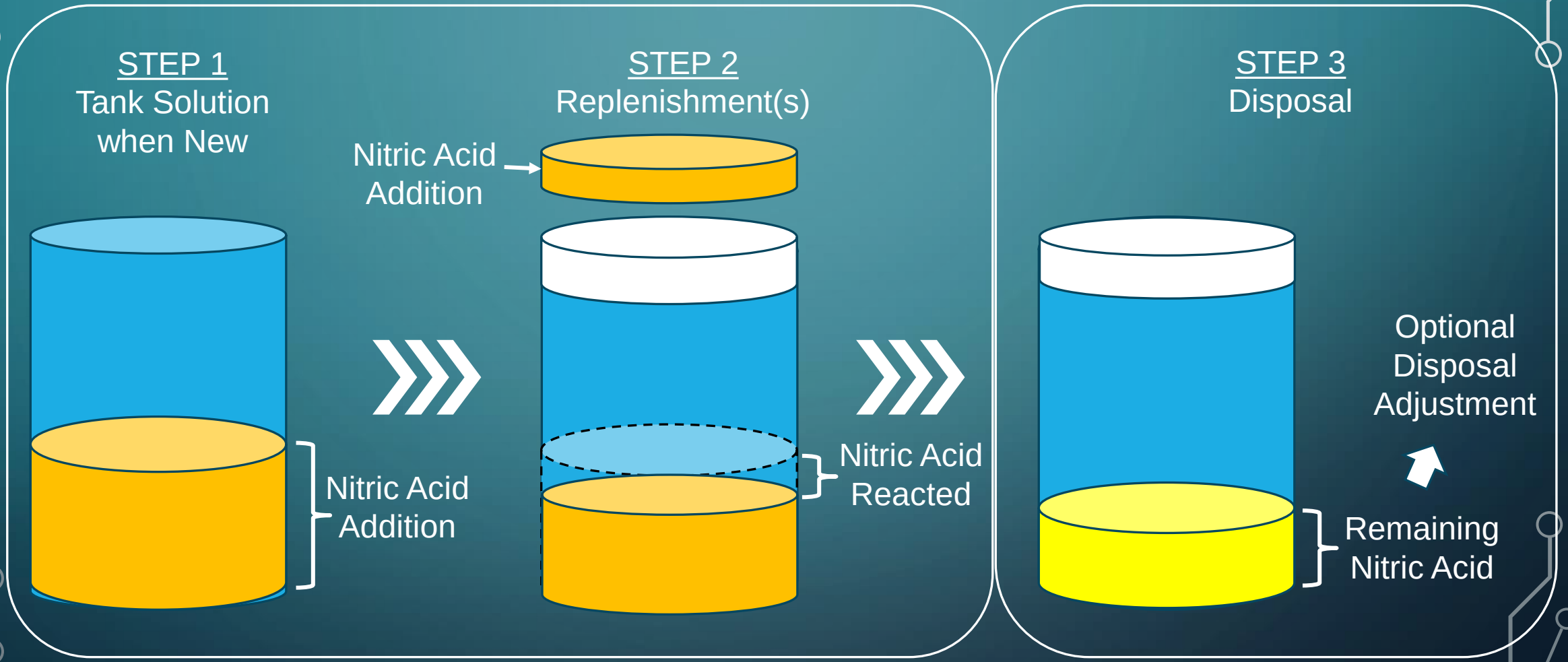
Approach 1A

Concepts – Optional Disposal Adjustments

- Facilities may dispose tank solutions containing unreacted nitric acids that did not form NOx emissions
- Propose provision to allow facility to deduct unreacted nitric acid from the nitric acid additions, provided:
  - Amount of unreacted nitric acid is calculated by:
    - Analyzing the nitric acid concentration in the tank solution to be disposed
    - Measuring the volume of tank solution to be disposed
  - Records kept of analysis, disposal, measurement, and the amount of unreacted nitric acid are maintained
- Not allowed if disposed tank solution is recycled for re-use in another tank

Approach 1A

Overview of Additions and Disposals



Example Facility A – Additions Only

- Facility with three tanks makes additions using nitric acid (68WT%) only
- Facility kept records for all nitric acid additions to the three tanks

Summary of Additions of Nitric Acid 68WT% (gallons)													
Tank Number	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	*10*	-	*12*	-	*8*	-	*11*	-	*9*	-	*12*	-	62
2	*9*	-	-	*10*	-	-	*8*	-	-	-	*11*	-	38
3	*100**	-	-	-	-	-	*100**	-	-	-	-	-	200
Total Nitric Acid (68WT%) added during the year→													**300**

** Addition made for replacement of tank solution*

- Based on additions, facility not eligible for facility-wide exemption because it exceeded the 263 gallons per year threshold
  - However, disposal adjustments are allowed (see next slide)

Example Facility A *(cont'd)* – Disposal Adjustments

- Facility A made additions of 300 gallons of nitric acid (68WT%) per year, exceeding the exemption threshold of 263 gallons per year
- Facility A performed two replacements and determined that the amount of unreacted nitric acid is 63 gallons per replacement based on:
  - Nitric acid concentration of old tank solution through laboratory analysis
  - Volume of old solution pumped out of tank
- Facility A performed a disposal adjustment calculation, using the amount of unreacted nitric acid, to determine the adjusted total of additions of nitric acid

Total Nitric Acid Additions *Unreacted Nitric Acid* *Adjusted Total*

$$300\ gal - \left(2 * (63\ gal)\right) = 174\ gal$$

- Facility A is eligible for exemption because 174 gallons < 263 gallons exemption threshold

Approach 1A

Demonstration of Compliance

- Recordkeeping for each nitric acid tank:
  - Additions of nitric acid (tank name, date, gal, and WT%)
  - Disposal adjustments, if any (tank name, date, analyses, volume, and calculation)
  - Monthly facility-wide total
  - Calendar year to date facility-wide total each month

OPERATING LIMITS OF TANKS

Approach 1A

- Based on the amount of nitric acid added (either through replenishments or replacements)

REPLENISHMENTS

- Periodic additions of nitric acid to a tank to maintain required specification for in-tank concentration of nitric acid

Approach 1B

- Based on operating limits of tanks (replacements only)

REPLACEMENTS

- Additions of nitric acid during creation of new tank solution to replace old tank solution, that are no longer used and are treated or shipped out for disposal

Approach 1B

Rule Concept – Operating Limits for Facilities using Replacements Only

- Facility required to operate all nitric acid tanks at the facility within strict operating parameters to not exceed annual equivalent to 3.6 lbs/day
- A facility-wide exemption threshold would be based on three parameters
  1. In-tank concentration range – starting (upper WT%) and ending (lower WT%) concentrations
     - Greater change means more nitric acid reacted between replacements
  2. Replacement frequency – how often the tank solution is replaced (e.g., monthly)
     - Greater frequency means more usage
  3. Volume of tank – individual tank's capacity in gallons
     - Larger volume means potential increase in the amount of nitric acid in tank solution
- Lookup Table created to account for different combinations of operating parameters

Development of Lookup Table

STEP 1: Identified most common operating parameters:

1. Change in in-tank concentration range – based on specification/standards and information from facilities
2. Replacement frequency – based on survey data and information from facilities
3. Volume of tank – based on permit and survey information

STEP 2: Developed the tank volume representing the exemption threshold

- Calculated the corresponding tank volume value to ensure the facility is below the annual equivalent to 3.6 lbs/day

In-Tank Concentration Range	**Total Tank Volume Threshold (gallons) Based on Replacement Frequency**			
Upper WT% = when solution is new *Lower WT% = when old solution disposed*	*Weekly*	*Bi-weekly*	*Monthly*	*Quarterly*
25WT% to 20WT%	*[Volume 1]*	*[Volume 2]*	*[Volume 3]*	*[Volume 4]*
35WT% to 20WT%	*[Volume 5]*	*[Volume 6]*	*[Volume 7]*	*[Volume 8]*

Lookup Table to Determine Exemption Eligibility

For Each Tank

Step 1

Obtain tank volume value from Lookup Table based on <u>both</u>:

1. In-tank concentration range
2. Replacement frequency

Step 2

Calculate Weighted Threshold % for Each Tank

(Individual tank volume ÷ tank volume value) * 100 = Weighted Threshold %

For All Tanks

Step 3

Determine Exemption Eligibility

Sum All Tanks Weighted Threshold %

ELIGIBILE if sum **≤ 100%**

INELIGIBLE if sum **> 100%**

Example 1: Facility with One Tank

Lookup Table for tanks:

In-Tank Concentration Range	Total Tank Volume Threshold (gallons) Based on Replacement Frequency			
Upper WT% = when solution is new *Lower WT% = when old solution disposed*	*Weekly*	*Bi-weekly*	*Monthly*	*Quarterly*
25WT% to 20WT%	*100*	*170*	*360*	*1,070*
35WT% to 20WT%	*30*	*60*	*120*	*340*

Form with calculation for example facility:

Tank Number	Replacement Frequency	In-Tank Concentration Range	Individual Tank Volume	Table Threshold	% of Threshold
Tank 1	Bi-weekly	25WT% to 20WT%,	150 gallons ÷	*170 gallons* x 100	= 88.2%
			√ (Facility would qualify for exemption)		**88.2%**

Example 2: Facility with Three Tanks

Lookup Table for tanks:

In-Tank Concentration Range	Total Tank Volume Threshold (gallons) Based on Replacement Frequency			
Upper WT% = when solution is new *Lower WT% = when old solution disposed*	*Weekly*	*Bi-weekly*	*Monthly*	*Quarterly*
25WT% to 20WT%	*100*	*170*	*360*	*1,070*
35WT% to 20WT%	*30*	*60*	*120*	*340*

Form with calculations for example facility:

Tank Number	Replacement Frequency	In-Tank Concentration Range	Individual Tank Volume		Table Threshold		% of Threshold
Tank 1	Monthly	25WT% to 20WT%,	60 gallons	÷	*360 gallons*	x 100 =	16.7%
Tank 2	Quarterly	25WT% to 20WT%	200 gallons	÷	*1,070 gallons*	x 100 =	18.7%
Tank 3	Monthly	35WT% to 20WT%	60 gallons	÷	*120 gallons*	x 100 =	50.0%
Is total for tanks ≤100% of Threshold? →			√ (Facility would qualify for exemption)				**85.4%**

Approach 1B

Demonstration of Compliance

- Incorporate operating parameters for each nitric acid tank into an enforceable document (e.g., plan or permit)
  - Tank volume (gal)
  - In-tank concentration range
  - Replacement frequency
- Create a summary form that includes the following for each nitric acid tank:
  - Operating parameters
  - Calculations of threshold percentages
- Conduct a laboratory analysis to determine in-tank concentration for each:
  - New tank solution
  - Tank solution disposed
- Recordkeeping for each nitric acid tank
  - Date of tank solution replacement
  - Laboratory analyses
- Prohibits replenishments between replacements

AREAS SEEKING INPUT

Are there other operating parameters that staff should consider for Lookup Table?

- Seek information on facility's nitric acid tank's
  - In-tank concentration range
  - Replacement frequency
  - Supporting documentation (e.g., MIL-SPEC, laboratory analysis)
- Deadline to provide information – May 31, 2024

APPROACH 2
TANK TYPE

Approach 2

Exemption Approach – Tank Types

- Focuses on tank types (e.g., purpose, function of tank) that potentially have limited or no NOx emissions as there is limited or reaction with the metal substrate
- Considered metal finishing processes that only react at the surface of the metal and not intended to remove metal unlike emissive processes (e.g., precious metal reclamation, chemical milling, etching)
- Evaluated metal finishing literature, information included in application submittals, and applicable source tests for cleaning, passivation, desmutting, and deoxidation tanks
- Exempted tanks would have no potential to form NOx or data shows that tanks are non-emissive if purpose or function calls for reaction with metal substrate

Approach 2

Preliminary Analysis and Proposal

Tank Type	Description	Preliminary Findings	Conclusion
Cleaning	Removal of dirt, oil, and grease at beginning of metal finishing lines	Non-emissive as there should be no chemical reaction with metal	• Exempt
Passivation	Purpose is to chemically react to form a protective metal oxide layer	Chemical reaction involved and no individual source testing data available to evaluate emissions	• Not Exempt
Desmutting	Removal of unwanted alloyed metals formed from earlier tanks such as etching	Source test result determined that tank type is a source of NOx	• Not Exempt
Deoxidation	Removal of unwanted metal oxides such as from heat treating	Literature indicates tank type potentially more emissive than desmutting	• Not Exempt

- Proposing to exempt Cleaning Tanks

AREAS SEEKING INPUT

Are there any non-emissive or low emissive processes that should be considered to be exempt from controls?

- Seeking testing data such as source tests (complete report)
- Deadline to provide justification/explanation – May 31, 2024

Summary of New Proposed Approaches

Three Potential Exemptions

ADDITIONS OF NITRIC ACID

- Uses nitric acid additions (gallons per year) to determine exemption eligibility
- Disposal adjustments allowed

OPERATING LIMITS OF TANKS

- Uses Lookup Table based on tank volume(s) to determine exemption eligibility

TANK TYPE

- Uses tank type to exempt certain tanks based on their operations and ability to react with metals to create NOx

NEXT STEPS

WGM#7
Second Preliminary Draft Rule Language

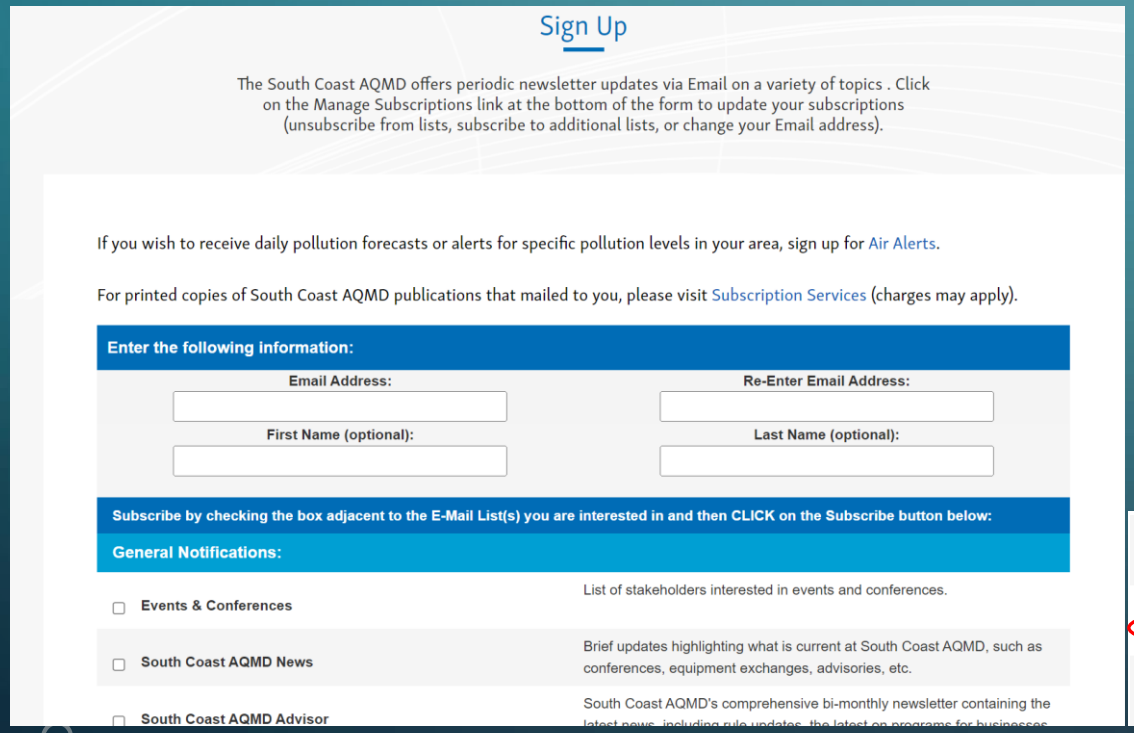
Public Workshop
Preliminary Draft Rule Language & Staff Report

30-Day Documents
Draft Rule Language & Staff Report

4TH QUARTER
Public Hearing for PR 1159.1

Staying Updated with PR 1159.1

- Sign up and receive email updates via *http://www.aqmd.gov/sign-up*



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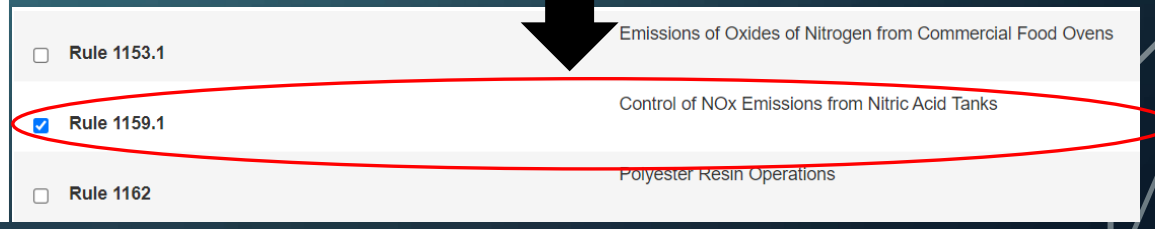

☐ Rule 1153.1	Emissions of Oxides of Nitrogen from Commercial Food Ovens
☑ Rule 1159.1	Control of NOx Emissions from Nitric Acid Tanks
☐ Rule 1162	Polyester Resin Operations

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