PROPOSED AMENDED RULE 1117

EMISSIONS OF OXIDES OF NITROGEN FROM GLASS MELTING FURNACES

Working Group Meeting #1

August 1, 2019

Dial-in: (866) 705-2554
Passcode: 203733
AGENDA

• Background
• Proposed Facilities
• BARCT Assessment
• Current Control Technology
• Areas to Address Under PAR 1117
• Next Steps
BACKGROUND
RECLAIM BACKGROUND

• 2016 Air Quality Management Plan
  • Adoption Resolution called for further NOx reductions from an assessment of the RECLAIM program, including:
    • 5 ton per day NOx reduction to be achieved no later than 2025; and
    • Transitioning RECLAIM to a command-and-control regulatory structure

• 2017 – AB 617
  • Applicable to facilities in the state greenhouse cap and trade program
  • Develop implementation schedule by 1/1/2019
  • Best Available Retrofit Control Technology (BARCT) implementation by 12/31/2023, prioritizing older, higher emitting units
NEED FOR PAR 1117

- Two facilities need a landing rule in transition from RECLAIM to command-and-control
  - Rule 2002 provides framework for facilities transitioning out of RECLAIM
- NOx emission limits in Rule 1117 do not represent current BARCT
  - NOx limits achieved by both RECLAIM facilities are well below the Rule 1117 NOx limits
- Evaluate the following elements:
  - Determine if NOx emission limits achieved by facilities in RECLAIM are representative of BARCT
  - Convert NOx limits from pounds of NOx per ton of glass pulled to NOx concentration (ppm @ 3% O₂)
  - Limitations for start-up/shutdown
  - NOx averaging periods
  - Exemption level
RULE 1117 BACKGROUND

• Adopted February 1982, amended January 1984

• Applicability specific to glass melting furnaces (e.g. container glass, flat glass)

• NOx emission limit: 4 lbs NOx/ton of glass pulled
  • Unconventional units for emission limit
  • NOx limits usually expressed as:
    • Concentration (ppm) or
    • Process rate (lb/hr)

• All facilities subject to Rule 1117 were subsumed under RECLAIM
RULE DEVELOPMENT PROCESS

1. Information Gathering – Meet with Stakeholders
2. Define Rule Objective and Scope
3. Develop Rule Concepts
4. Draft Proposed Rule Language
FACILITIES SUBJECT TO PAR 1117
PROPOSED UNIVERSE

• One container glass melting facility would be subject to Rule 1117

• One additional facility producing sodium silicate (water glass) in a similar melting process
  • Would also be subject to PAR 1117 as no command-and-control rule currently exists

• Several small craft facilities
  • Not expected to be regulated by proposed amended rule
  • Current exemption level set at furnaces producing <15 lbs NOx/hr
GLASS MELTING FACILITY
(CONTAINER GLASS)

- 2 glass melting furnaces
  - (2) 68 MMBtu/hr furnaces
- Oxy-fuel furnaces
  - Lower NOx formation than air-fueled furnaces
- Controlled by Tri-Mer control system
  - Installed 2016/2017
  - Controls NOx, SOx and PM
  - NOx emissions: 0.11 lbs/ton of glass pulled (source test)

- Glass conveyance system
  - ~1200 small burners keep glass at elevated temperature for working properties
  - Burners are uncontrolled
- 24/7/365 operating schedule
SODIUM SILICATE MANUFACTURING FACILITY

• Sodium silicate is a commodity used for grouting (subways, sewers), textile/lumber processing, refractory ceramics, surfactants, detergents

• Furnace operation cycles every 30 minutes
  • Higher NOx emissions during ~10 minute cycling event

• Operating schedule: Cyclic schedule
  • Based on existing product demand
  • 24/7 operating schedule while operating
SODIUM SILICATE MANUFACTURING
FACILITY EQUIPMENT DETAILS

• 1 furnace
  • Air-fueled
  • 60 MMBtu/hr
  • 2-stage combustion
  • Controlled by Tri-Mer control system (Installed 2017)

• NOx emissions:
  • 2015 – 31.5 TPY
  • 2016 – 40.0 TPY
  • 2017 – 8.8 TPY (Tri-Mer control system installed)
  • 2018 – 6.3 TPY
BARCT ASSESSMENT
BARCT ASSESSMENT

BARCT analysis conducted for each equipment category

- Assessment of South Coast AQMD Regulatory Requirements
- Assessment of Emission Limits of Existing Units
- Other Regulatory Requirements
- Assessment of Pollution Control Technologies
- Initial BARCT Emission Limit and Other Considerations
- Cost-Effective Analysis

Technology Assessment
RECLAIM EMISSION FACTORS

• RECLAIM BARCT emission factors are not necessarily permit limits
  • Used to determine future year allocations

• RECLAIM default emission factors represent a maximum reporting value for process units
  • 130 lbs$_{\text{NO}_x}$/ MMSCF is default emission factor for external combustion equipment (natural gas-fired)
  • Lower levels can be demonstrated with source testing or manufacturer’s verification

• Staff conducted a BARCT assessment in 2015 for both glass melting furnaces and sodium silicate manufacturing
2015 RECLAIM BARCT ASSESSMENT FOR CONTAINER GLASS MELTING FURNACES

• Emission factor (lbs\textsubscript{NOx}/ton of glass pulled) reduced by 70% in 2000 and a further 80% (94% overall) in 2015:
  • Rule 1117 existing limit – 4 lbs\textsubscript{NOx}/ton of glass pulled
  • Ending Tier I EF (2000) – 1.2 lbs\textsubscript{NOx}/ton of glass pulled *
  • Ending EF (2022) - 0.24 lbs\textsubscript{NOx}/ton of glass pulled **

• Looking at other sources of information for updated emission factors

*Rule 2002, Table 1
**Rule 2002, Table 6
## COMPARISON OF CONTAINER GLASS MELTING FURNACE AND PROCESS UNIT EMISSIONS

### RECLAIM Major Source (Furnace B)
- 68 MMBtu/hr
- 44 lbs/day

<table>
<thead>
<tr>
<th>Emission Factor</th>
<th>Emissions*</th>
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<td>0.11 lbs/ton of glass pulled</td>
<td>44 lbs/day</td>
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### Process Unit (Glass Conveyance System)
- Uses 685 burners: Cumulative burner ratings 15.1 MMBtu/hr
- 45 lbs/day

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<th>Emission Factor</th>
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<td>130 lb/MMscf</td>
<td>45 lbs/day</td>
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Furnace and process unit emissions on same order of magnitude

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* Based on source test, October 2017, and maximum permitted throughput
** Default RECLAIM reporting value for natural gas fired external combustion equipment, assumes 24/7/365 days operation
### COMPARISON OF CONTAINER GLASS MELTING FURNACE AND PROCESS UNIT EMISSIONS

**RECLAIM Major Source (Furnace C)**
- 68 MMBtu/hr
- 37 lbs/day

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<td>0.11 lbs/ton of glass pulled</td>
<td>37 lbs/day</td>
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**Process Unit (Glass Conveyance System)**
- Uses 543 burners: Cumulative burner ratings 11.6 MMBtu/hr
- 24 lbs/day

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Furnace and process unit emissions on same order of magnitude

* Based on source test, October 2017, and maximum permitted throughput
** Default RECLAIM reporting value for natural gas fired external combustion equipment, assumes 24/7/365 days operation
2015 RECLAIM BARCT ASSESSMENT FOR SODIUM SILICATE MANUFACTURING

- Emission factor ($\text{lbs}_{\text{NOx}}$/ton of glass pulled) reduced by 80% in 2015:
  - Ending Tier I EF (2000) – 6.4 $\text{lbs}_{\text{NOx}}$/ton of glass pulled *
  - Ending EF (2022) - 1.28 $\text{lbs}_{\text{NOx}}$/ton of glass pulled **

- Looking at other sources of information for updated emission factors

*Rule 2002, Table 1
**Rule 2002, Table 6
CURRENT CONTROL TECHNOLOGY
BACKGROUND

• Both facilities potentially subject to PAR 1117 installed Tri-Mer technology (~2017)
  • UltraCat catalyst-embedded filters
    • Flue gas control from 350 to 700°F
    • Controls PM, NOx, SO₂
    • Up to 95% NOx control with ammonia injection
    • Over 90% SO₂ removal with dry sorbent injection
    • PM removal <0.001 gr/dscf

• Source tests demonstrate:
  • Glass melting facility
    • 0.11 lbₜₐₜₙ₀ₓ/ton of glass pulled
    • Concentration requires additional data to correct to 3% O₂
  • Sodium silicate manufacturing facility
    • NOx concentrations: 48 ppm (raw), 74 ppm @3% O₂
TRI-MER ULTRACAT CONTROL SYSTEM*

*Image courtesy of Tri-Mer Corporation
CERAMIC FILTER CONTROL SYSTEM

*Image courtesy of Tri-Mer Corporation*
AREAS TO ADDRESS UNDER PAR 1117
PAR 1117 – AREAS TO ADDRESS

• Applicability of Rule 1117 to include sodium silicate manufacturing
  • Rule 1117 – Emissions of Oxides of Nitrogen from Glass Melting Furnaces and Sodium Silicate Manufacturing

• Continue assessment for Best Available Retrofit Control Technology (BARCT)
  • Conduct separate BARCT assessments for glass melting and sodium silicate manufacturing

• Consider establishing NOx rule limits as concentrations (ppm @ 3% O₂)
  • Current limits set as production level (lbs NOx/ton of glass pulled)

• Consider limitations for start-up/shutdown operations

• Consider NOx averaging periods

• Consider reducing current exemption level (furnaces producing <15 lbs NOx/hr)
NEXT STEPS

• Continue discussions with facilities and vendors
• Continue BARCT assessment
• Additional Working Group Meetings
• Public Workshop – September 2019 (tentative)
• Set Hearing – November 2019 (tentative)
• Public Hearing – December 2019 (tentative)
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