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% O_2)
  - 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

Information Gathering – Meet with Stakeholders

Define Rule Objective and Scope

Develop Rule Concepts

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

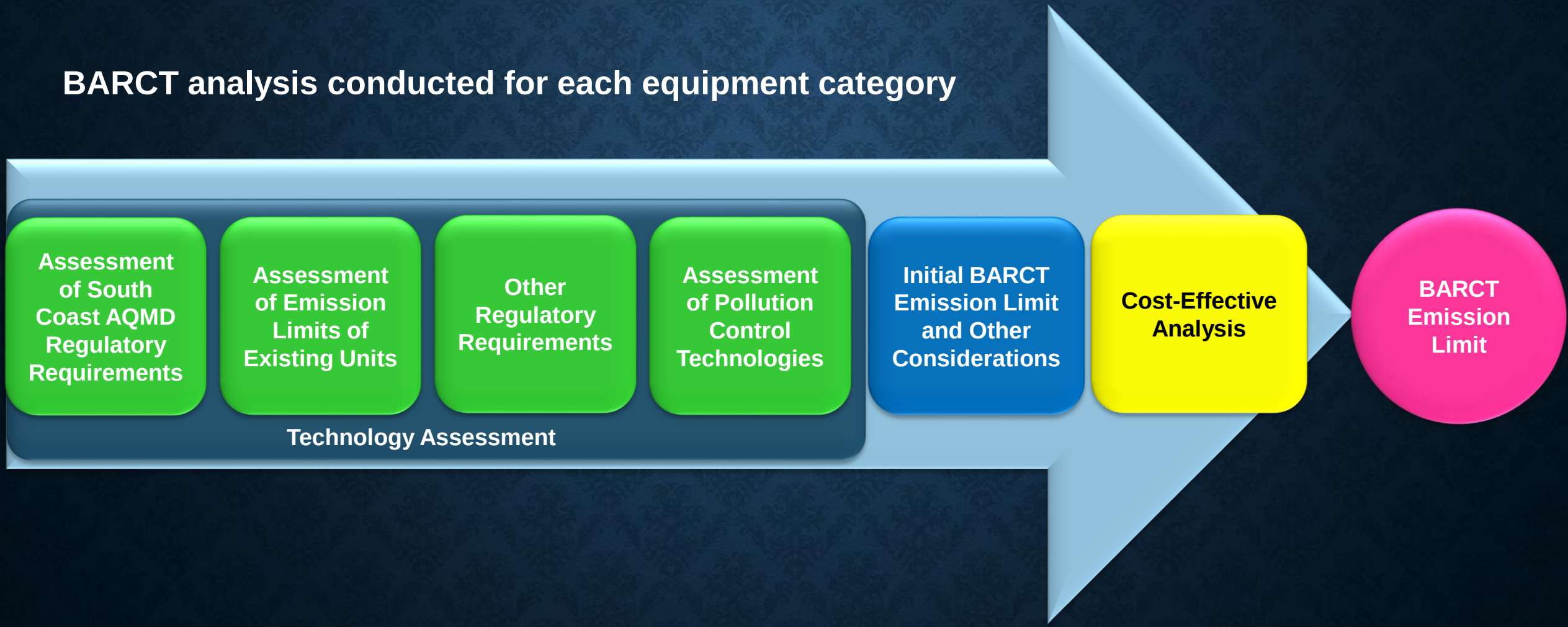
SODIUM SILICATE MANUFACTURING FACILITY EQUIPMENT DETAILS

- 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



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

Emission Factor	Emissions*
0.11 lbs/ton of glass pulled	44 lbs/day

Process Unit (Glass Conveyance System)

- Uses 685 burners: Cumulative burner ratings 15.1 MMBtu/hr
- 45 lbs/day

Emission Factor	Emissions**
130 lb/MMscf	45 lbs/day

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

COMPARISON OF CONTAINER GLASS MELTING FURNACE AND PROCESS UNIT EMISSIONS

RECLAIM Major Source (Furnace C)

- 68 MMBtu/hr
- 37 lbs/day

Emission Factor	Emissions*
0.11 lbs/ton of glass pulled	37 lbs/day

Process Unit (Glass Conveyance System)

- Uses 543 burners: Cumulative burner ratings 11.6 MMBtu/hr
- 24 lbs/day

Emission Factor	Emissions**
130 lb/MMscf	24 lbs/day

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 (lbs_{NOx}/ton of glass pulled) reduced by 80% in 2015:
  - Ending Tier I EF (2000) – 6.4 lbs_{NOx}/ton of glass pulled *
  - Ending EF (2022) - 1.28 lbs_{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, SO_2
    - Up to 95% NOx control with ammonia injection
    - Over 90% SO_2 removal with dry sorbent injection
    - PM removal <0.001 gr/dscf
- Source tests demonstrate:
  - Glass melting facility
    - 0.11 lb_{NOx}/ton of glass pulled
    - Concentration requires additional data to correct to 3% O_2
  - Sodium silicate manufacturing facility
    - NOx concentrations: 48 ppm (raw), 74 ppm @3% O_2

TRI-MER ULTRACAT CONTROL SYSTEM*

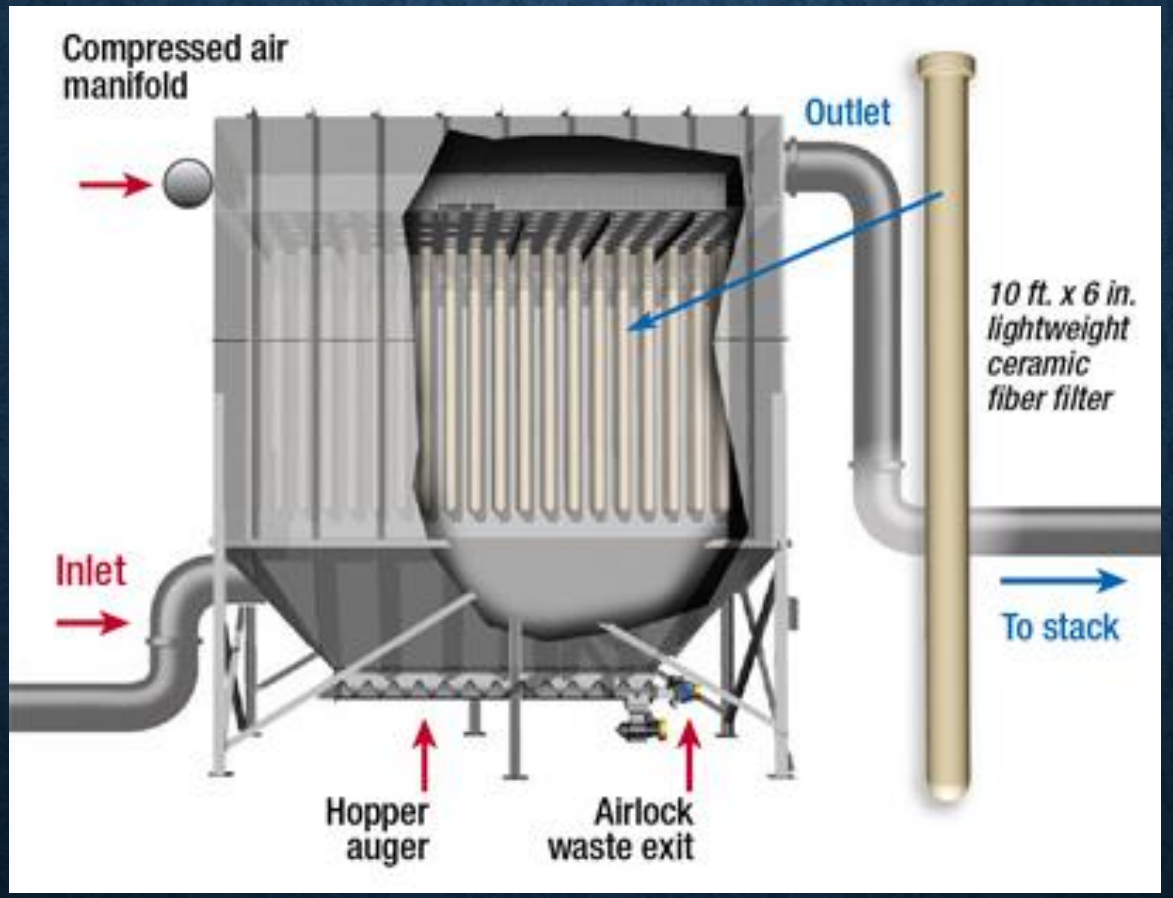


*Image courtesy of Tri-Mer Corporation

CERAMIC FILTER CONTROL SYSTEM

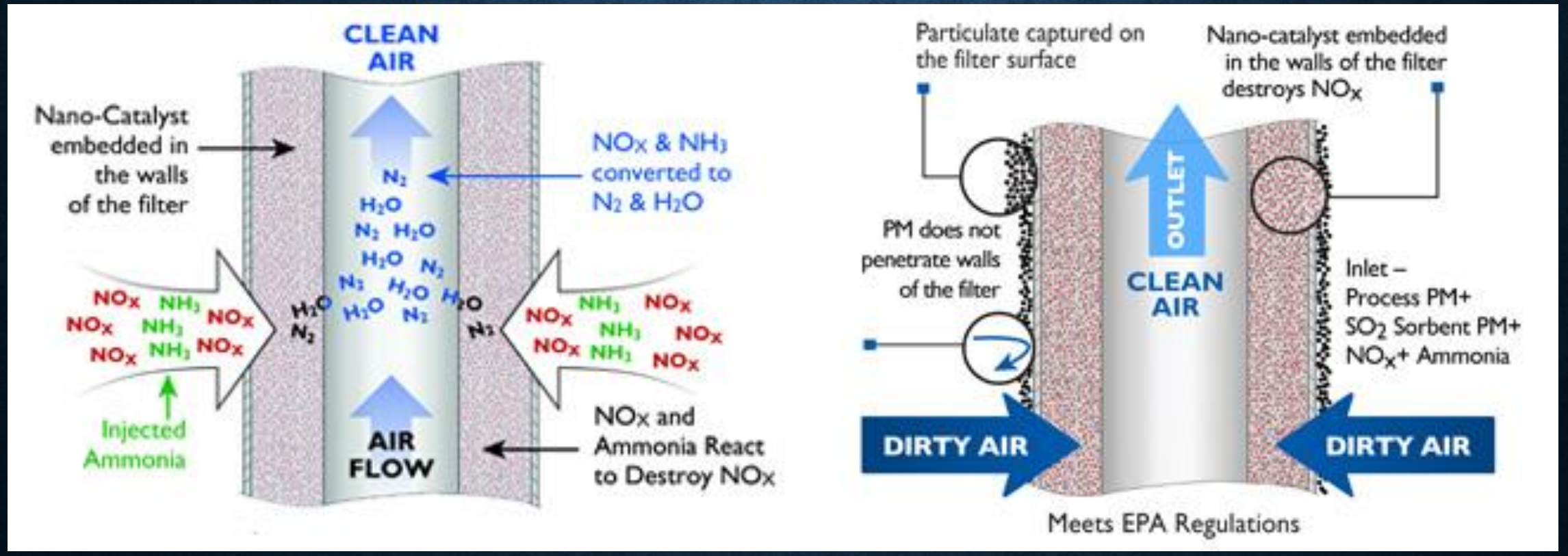


*Image courtesy of Tri-Mer Corporation

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% O_2)
  - 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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