SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Draft Staff Report
Proposed Amended Rule 1117 – Emissions from Container Glass Melting and Sodium Silicate Furnaces

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EXECUTIVE SUMMARY

The Regional Clean Air Incentives Market (RECLAIM) program was adopted in October 1993 under Regulation XX. RECLAIM is a market-based emissions trading program designed to reduce NOx and SOx emissions and includes facilities with NOx or SOx emissions greater than 4 tons per year. The 2016 Final Air Quality Management Plan (2016 AQMP) included Control Measure CMB-05: Further NOx Reductions from RECLAIM Assessment (CMB-05) to ensure the NOx RECLAIM program was achieving equivalency with command-and-control rules that are implementing Best Available Retrofit Control Technology (BARCT) and to generate further NOx emission reductions at RECLAIM facilities. The adoption resolution for the 2016 AQMP directed staff to achieve five tons per day of NOx emission reductions as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT as soon as practicable. On July 26, 2017 the Governor approved California State Assembly Bill 617, which required air districts to develop, by January 1, 2019, an expedited schedule for the implementation of BARCT no later than December 31, 2023 for industrial facilities that are in the State greenhouse gas cap-and-trade program with priority given to older higher polluting sources that need to install BARCT.

As facilities transition out of NOx RECLAIM, a command-and-control rule that includes NOx emission standards that reflect BARCT will be needed for all equipment categories. Rule 1117 – Emissions of Oxides of Nitrogen from Glass Melting and Sodium Silicate Furnaces is a command-and-control rule for facilities that operate furnaces used in the production of glass and sodium silicate. Proposed Amended Rule 1117 – Emissions from Container Glass Melting and Sodium Silicate Furnaces (PAR 1117) will update the existing rule to reflect current technologically-achieved emission levels that represent BACRT for NOx and SOx. PAR 1117 will also address operational concerns related to idling, startup, and shutdown of container glass melting and sodium silicate furnaces by including provisions and limitations for these unique situations. In addition, provisions that are no longer applicable will be removed.

Of the facilities in RECLAIM, two facilities will be affected by PAR 1117: one container glass manufacturer and one sodium silicate manufacturer. There are two furnaces operated at the container glass facility and one furnace operated at the sodium silicate facility that will be subject to PAR 1117. In addition, PAR 1117 will also incorporate the auxiliary combustion equipment associated with the container glass manufacturing lines. Initially, Rule 1117 applied to the container glass manufacturing process but did not apply to the sodium silicate process. However, with the transition of RECLAIM to a command-and-control regulatory structure, sodium silicate manufacturing has been included into PAR 1117 since its manufacturing process is similar to container glass.

In 2017, both container glass and sodium silicate facilities installed new air pollution control devices (APCDs) on each of their furnaces. Although the APCDs were installed prior to the adoption of PAR 1117, their impact on reducing NOx and SOx emissions will be evaluated and included as part of the rule development process to ensure NOx and SOx emission limits are met on an ongoing basis. Based on the success demonstrated in reducing NOx and SOx emission levels, PAR 1117 will reduce the NOx limit from the current rule level of 4.0 lbs of NOx per ton of glass

pulled to 0.75 lbs of NOx per ton of glass pulled for container glass furnaces and 0.50 lbs of NOx per ton of product pulled for sodium silicate furnaces. PAR 1117 will also establish a SOx emission level where no limit had been included previously in the rule. The SOx emission level for container glass furnaces and the sodium silicate furnace will be established at 1.1 lbs of SOx per ton of glass pulled based on current permitted conditions contained in the container glass facility's Permit to Operate and on a level representing Best Available Control Technology limits.

A cost-effectiveness analysis was completed for the NOx reduction associated with the 2017 installation of the APCDs at both the container glass and sodium silicate facilities, as well as future requirements pertaining to container glass auxiliary combustion equipment. The NOx emission reductions are 0.57 tpd and an overall cost-effectiveness of $22,700 per ton of NOx reduced was determined for the proposed emission limits. Although additional benefits from the reduction of other pollutants are expected, these other reductions were not considered at this time.

CHAPTER 1: BACKGROUND

BACKGROUND

In October 1993, Regulation XX- RECLAIM was adopted. The purpose of the RECLAIM program was to provide industry with a flexible, market-based approach to reduce NOx and SOx emissions. Participants were initially allocated RECLAIM Trading Credits (RTCs) based on emissions from their highest production level from 1989 to 1992. With the adoption of RECLAIM, furnaces that had been regulated under Rule 1117 were exempt from NOx emission standards.

Over the life of RECLAIM, allocations have been reduced twice, requiring businesses to either reduce emissions through installation of pollution controls or replacement if equipment or processes change; or purchase RTCs. In response to concerns regarding actual emission reductions and implementation of BARCT under RECLAIM, Control Measure CMB-05 of the 2016 AQMP committed to an assessment of the RECLAIM program in order to achieve further NOx emission reductions of five tons per day, including actions to transition the program and ensure future equivalency to command-and-control regulations. During the adoption of the 2016 AQMP, the adoption resolution directed staff to modify Control Measure CMB-05 to achieve the five tons per day NOx emission reduction as soon as feasible but no later than 2025, and to transition the RECLAIM program to a command-and-control regulatory structure requiring BARCT-level controls as soon as practicable.

In addition, on July 26, 2017, Governor Brown signed AB 617 which addressed non-vehicular air pollution. AB 617 was companion legislation to AB 398 which extended California's cap-and-trade program for reducing greenhouse gas emissions from stationary sources. RECLAIM facilities that are part of the cap-and-trade program are now also subject to the requirements of AB 617. AB 617 requires an expedited schedule for implementing BARCT for cap-and-trade facilities. Under AB 617, the State's air districts were to develop a schedule by January 1, 2019 for the implementation of BARCT no later than December 31, 2023. The highest priority would be given to older, higher polluting units that would need to install retrofit controls.

The October 5, 2018 amendment to Rule 2001 established procedures for facilities to opt out of RECLAIM provided the equipment at the facility met specified criteria.

Staff has been in discussions with the United States Environmental Protection Agency (USEPA) on all elements of transitioning RECLAIM sources to a command-and-control regulatory structure to ensure that the rules relating to the transition would be approved into the State Implementation Plan (SIP). USEPA expressed concern over facilities exiting RECLAIM before all command-and-control and New Source Review (NSR) requirements had been adopted to clearly demonstrate equivalency to the replaced program. Therefore, USEPA has recommended keeping facilities in RECLAIM until all the rules associated with the transition have been adopted and approved into the SIP.

As a result, on July 12, 2019, the opt-out provision was removed from Rule 2001 in consideration of USEPA's recommendation, and now prohibits facilities from exiting the RECLAIM program. Until facilities exit RECLAIM, they will continue to be subject to all RECLAIM requirements including Rule 2005 – New Source Review for RECLAIM, for permitting of new or modified NOx sources that undergo emission increases. In addition, these facilities will also be required to

comply with all the requirements in adopted and amended command-and-control rules that apply to RECLAIM facilities, including the implementation schedules and any NOx or SOx limitations. Staff will continue to work with USEPA on NSR for former RECLAIM facilities as well as on all the relevant command-and-control rules for the RECLAIM transition.

As facilities transition out of RECLAIM, a command-and-control rule that includes NOx and SOx emission standards that reflect BARCT will be needed. PAR 1117 is a command-and-control "landing" rule for RECLAIM facilities that operate container glass melting and associated combustion equipment, and sodium silicate furnaces. Equipment at existing RECLAIM facilities will be required to comply with the emission standards and with monitoring, reporting, and recordkeeping requirements contained in PAR 1117. In addition, PAR 1117 will address operational concerns related to idling, startup, and shutdown of container glass melting and sodium silicate furnaces by including provisions and limitations for these situations. Existing provisions that are no longer applicable will be removed.

REGULATORY HISTORY

On February 5, 1982, the South Coast AQMD Governing Board adopted Rule 1117 – *Emissions of Oxides of Nitrogen from Glass Melting Furnaces*. The rule was subsequently amended once on January 6, 1984. The rule set a single limit for NOx emissions at 4.0 lbs NOx per ton of glass pulled effective after December 31, 1992. However, the rule exempted furnaces used in the production of glass tableware, flat glass, or fiberglass.

The rule also allowed for the use of an alternative emissions control plan and an energy recovery NOx emissions factor. In addition, compliance determination was made using a three-hour averaging procedure unless a continuous emissions monitoring system was installed, in which case a 24-hour averaging could then be used.

In December 2015, Regulation XX was amended to implement Control Measure CMB-01 of the 2012 Air Quality Management Plan and to further reduce NOx from RECLAIM facilities. The amendment implemented NOx BARCT for various pieces of equipment. As part of the BARCT assessment, container glass melting and sodium silicate furnaces were evaluated and it was determined to be feasible to reduce NOx emissions by 80%, which was also verified by a third-party consultant. In response to the required NOx allocation reduction, both container glass and sodium silicate facilities installed air pollution control equipment to comply with this requirement.

AFFECTED FACILITIES AND EQUIPMENT

PAR 1117 impacts two facilities: a container glass and sodium silicate manufacturing facility. Both facilities are in the RECLAIM program and upon transitioning out of RECLAIM into a command-and-control regulatory structure, they will become former RECLAIM Facilities. There are no other facilities operating within the jurisdiction of the South Coast AQMD that are equipped with container glass melting or sodium silicate furnaces or similarly purposed equipment that would be subject to this proposed amended rule.

The container glass facility makes containers used in the food and beverage industries. It operates two container glass melting furnaces. Each furnace is rated at 68 MMBTU/hr and is equipped with oxy-fueled burners. The container glass facility also operates two manufacturing lines that each consists of a main melting furnace where molten glass is produced and auxiliary combustion equipment to keep the material flowing to pour stations where the bottles are formed. Once the bottles are formed, they are transported to smaller furnaces for annealing. The annealing step relieves any residual internal stress introduced in the manufacturing process which improves the durability of bottles. Typically, once the facility starts up, the container glass melting furnaces operate continuously for years at a time.

The sodium silicate facility produces a sodium silicate material in either solid or aqueous solution that is used in a variety of industrial or consumer products. It operates one furnace rated at 56.6 MMBTU/hr and is equipped with low-NOx burners. The sodium silicate furnace is a cross-fired regenerative furnace that cycles its firing from one side to the other, reversing direction on a periodic basis. The back-and-forth operation of this furnace allows for waste heat to be recovered and be used to preheat combustion air, improving efficiency and allowing for higher operating temperatures. Unlike the container glass facility, the sodium silicate facility operates for limited manufacturing runs of up to several months with significant down time in between runs where the furnace is not in operation.

PUBLIC PROCESS

The development of PAR 1117 was conducted through a public process. One Working Group meeting was held on August 1, 2019. Working Group meetings typically include staff and representatives from affected businesses, environmental groups, public agencies, consultants, and other interested parties. The purpose of the Working Group meetings is to discuss details of proposed amendments and to listen to concerns and issues with the objective to build consensus and to resolve key issues.

Staff has had meetings with stakeholders and has conducted multiple site visits at both facilities as part of this rulemaking process. Since this rule affects only two facilities, staff determined that it would be more beneficial and efficient to address specific issues with the facilities individually in lieu of conducting multiple working group meetings. A public workshop was held on March 19, 2020. Due to unique circumstances associated with COVID-19, the public workshop was held via videoconference. The purpose of the public workshop was to present the preliminary staff report and proposed rule language to the general public and to stakeholders, as well as to solicit feedback.

CHAPTER 2: BARCT ASSESSMENT

INTRODUCTION

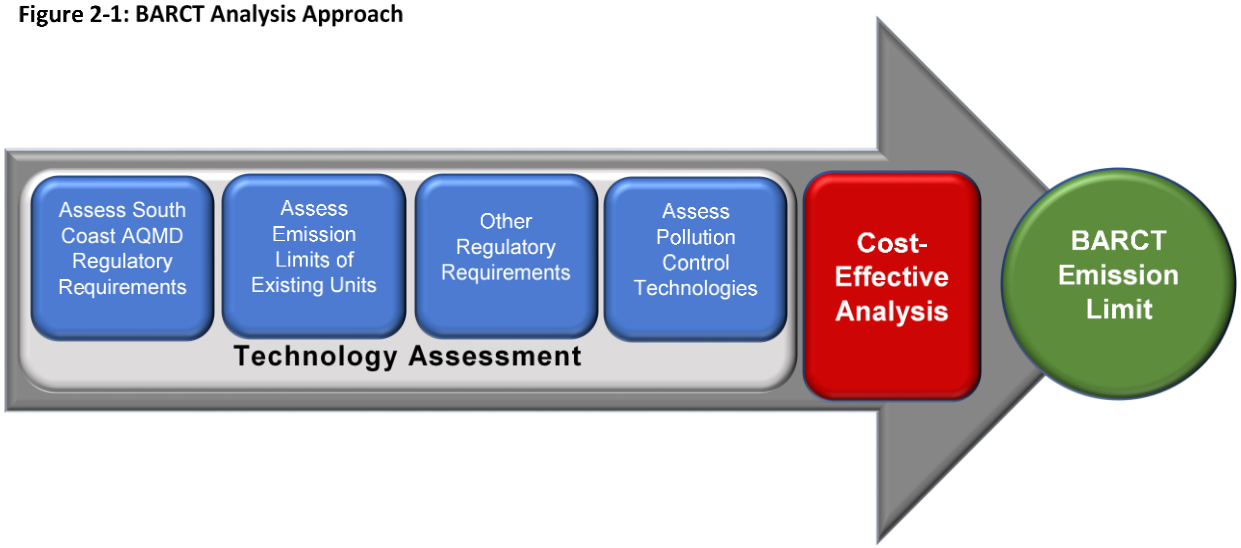
Staff conducted an assessment of the NOx and SOx emission limit under Rule 1117 to determine if it is still representative of BARCT for similar types of combustion equipment. BARCT analyses are periodically performed for equipment categories to assess technological changes that may reflect a lower emission limit. Rule 1117 was adopted in 1982 and last amended in 1984. Since that time, NOx emission limits for similar types of combustion equipment generally have been established lower than the current limit contained in Rule 1117. The lower limits have been due to the evolution of burner design and the addition of emission control systems.

Under California Health and Safety Code § 40406, BARCT is defined as:

> "… an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy, and economic impacts by each class or category of source."

The BARCT assessment for this rule development consisted of a multi-step analysis. The first four steps represent the technology assessment. First, staff evaluated current South Coast AQMD regulatory requirements, then assessed emission limits for existing units and then surveyed other air districts and agencies outside of the South Coast AQMD's jurisdiction to identify emission limits that exist for similar equipment. In the final step of the technology assessment, staff assessed pollution control technologies to determine what degree of reduction could be achievable for the affected sources. A cost-effectiveness analysis is then conducted. Based on the evaluation if the information, initial BARCT emission limits are recommended.

Figure 2-1: BARCT Analysis Approach



BARCT ANALYSIS APPROACH

Assessment of Current South Coast AQMD Regulatory Requirements

For this first step of the BARCT analysis, staff reviewed both existing South Coast AQMD Rule 1117 and recent permitting activities. Last amended in 1984, Rule 1117 currently limits NOx emissions to 4.0 lbs of NOx per ton of glass pulled and has no SOx emission limits. Although Rule 1117 applies to glass melting furnaces, it exempts emissions from furnaces used to melt glass to produce glass tableware, flat glass, and fiberglass. Rule 1117 specifically does not include, nor does it explicitly preclude, the operation of a sodium silicate furnace. There are currently no glass melting furnaces outside of RECLAIM that are subject to Rule 1117.

Container Glass

The current Rule 1117 NOx emission limit for container glass melting furnaces is 4.0 pounds of NOx per ton of glass pulled and has been in effect since December 31, 1992. In 2015, a BARCT assessment that included operations from container glass melting was conducted as part of the NOx RECLAIM amendments. In that assessment, staff concluded that an 80% NOx emission reduction or a target of 0.24 pound per ton of glass produced was feasible and cost effective. Furthermore, staff's conclusion was confirmed by a contracted third-party consultant. Based on the 2015 BARCT assessment, the current NOx limit in Rule 1117 is not representative of what has been demonstrated in for glass melting furnaces.

Currently, Rule 1117 does not have a SOx emission limit for container glass melting furnaces. However, in anticipation of a future transition of the RECLAIM SOx program to a command-and-control regulatory structure, PAR 1117 is including a SOx limit during this rulemaking effort.

Sodium Silicate

Rule 1117 currently does not include a NOx emission limit for sodium silicate furnaces. In 2015, a BARCT assessment that included operations from sodium silicate furnaces was conducted as part of the NOx RECLAIM amendments. In that assessment, staff concluded that an 80% NOx emission reduction or a target of 1.28 pound per ton of product pulled was feasible and cost effective. Furthermore, staff's conclusion was confirmed by a contracted third-party consultant.

Currently, Rule 1117 does not have a SOx emission limit for sodium silicate furnaces. However, in anticipation of a future transition of the RECLAIM SOx program to a command-and-control regulatory structure, PAR 1117 is including a SOx limit during this rulemaking effort. The furnace at the sodium silicate facility is currently included in the SOx RECLAIM program because it used to emit SOx.

Assessment of Emission Limits of Existing Units

The current permit for the container glass facility contains a NOx emission limit of 1.5 lbs NOx per ton of glass pulled. The permit limit was predicated on the addition of a post-combustion control system designed to provide at least an 80% reduction of NOx emissions in the exhaust gas exiting from the furnace. The post-combustion control system that was selected and installed was a ceramic-based catalyst system manufactured by Tri-mer. Additional consideration in selecting

the permit limit was also influenced by what other air districts and jurisdictions had determined to be attainable.

The container glass facility's permit also contains a SOx emission limit of 1.1 lbs of SOx per ton of glass pulled. The SOx emission limit was established based on Best Available Control Technology (BACT) limits and by what other air districts and jurisdictions have determined to be attainable. Staff intends to incorporate the current SOx emission limit as established by the container glass facility permit as well as in other jurisdictions into the proposed amended rule, which would be representative of current BARCT.

In contrast to the container glass facility's permit, the sodium silicate facility's Title V permit does not specify either a NOx or a SOx emission limit, but it does contain a throughput limit. Although not subject to a NOx emission limit, the sodium silicate facility installed a Tri-mer system similar to the container glass installation to reduce NOx emissions. Although the sodium silicate facility is included in the SOx RECLAIM program, it was exempt from reporting any SOx emissions because it uses 100% natural gas in its furnace and processes non-sulfate containing materials. Previously, the sodium silicate facility had the ability to fuel its furnace with No. 2 fuel oil, which resulted in SOx emissions, but it has since changed its fuel to exclusively natural gas and has removed all infrastructure to support the fuel oil system. In addition, the sodium silicate furnace no longer processes sulfate-containing material which was a source of process SOx. Because the furnace burns only natural gas and does not have process related SOx emissions, it is not considered a SOx source.

In general, since the installation of the Tri-mer systems, significant reductions in NOx emissions have been observed at both the container glass and sodium silicate facilities. In contrast to NOx emissions, staff has not observed significant SOx reductions, due in part because NOx reduction was the primary driver behind the installation of the emission controls equipment and because there is no SOx data from the sodium silicate facility. These observations and their significance will be discussed further under the section assessing air pollution control technologies.

Other Regulatory Requirements

For this BARCT assessment, staff compared Rule 1117 emission limits to limits for glass melting equipment in other air districts within California and jurisdictions outside of California.

In its initial review, staff noted that some air districts and jurisdictions distinguished between the type of glass manufacturing. For example, San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 4354 – *Glass Melting Furnaces* established emission limits for the production of either container glass, flat glass, or fiberglass (see Table 2-1). Similarly, State of Pennsylvania Code 25, Section 129 – *Standards for Sources Control of NOx Emissions from Glass Melting Furnaces* also established limits based on different glass production operations, distinguishing between container glass, fiberglass, flat glass, and pressed or blown glass (see Table 2-2).

In contrast to the SJVAPCD and the State of Pennsylvania, Bay Area Air Quality Management District (BAAQMD) Regulation 9, Rule 12, Section 9-12-301 – *Nitrogen Oxides from Glass Melting Furnaces* made no distinction in the type of glass manufacturing for its NOx emission

limit. The BAAQMD set a NOx emission limit of 5.5 lbs of NOx per short ton of glass pulled, averaged over any consecutive 3-hour period, making no distinction in the type of glass manufacturing.

Table 2-1: SJVAPCD Rule 4354
NOx Emission Limits
(lbs NOx per ton glass produced)

Container Glass	1.5[B]
Fiberglass	1.3[A,C] 3.0[A,D]
Flat Glass (Standard Option)	3.7[A] 3.2[B]
Flat Glass (Enhanced Option)	3.4[A] 2.9[B]

[A] Block 24-hour average
[B] Rolling 30-day average
[C] Not subject to California Public Resources Code Section 19511
[D] Subject to California Public Resources Code Section 19511

Table 2-2: Pennsylvania Code 25, Section 129
NOx Emission Limits[A]
(lbs NOx per ton glass produced)

Container Glass	4.0
Fiberglass	4.0
Flat Glass	7.0
Pressed or Blown Glass	7.0
All Other Glass	6.0

[A] Rolling 30-day average

In addition to comparing NOx emission limits set by other air districts and jurisdictions, staff also reviewed permits issued to glass melting facilities across the country to identify NOx emission limits for comparable operations. In one example, staff noted that a furnace operated at the Gallo Glass Company located in Modesto, California is permitted not to exceed 1.4 lbs NOx per ton of glass pulled. At this location, Gallo manufactures container glass and although it is within the jurisdiction of the SJVAPCD, the Gallo NOx emission limit was set lower than what is established in the SJVAPCD Rule 4354.

After reviewing other permits issued to glass melting facilities across the country, staff also evaluated actions taken by USEPA to identify other NOx emission limits established for comparable operations. Staff noted that in a settlement agreement with the Durand Glass Manufacturing Company which operates a tableware glass manufacturing facility in Millville, New Jersey, Durand was required to meet a NOx emission limit of 1.2 lbs of NOx per ton of glass produced on a 30-day rolling average and 1.0 lbs of NOx per ton of glass produced on a 365-day rolling average.

As was noted earlier, the South Coast AQMD permit for the sodium silicate facility does not have a NOx emission limit specifically written into it. However, staff noted that at other domestic Title V-permitted facilities operated by the same corporation that produces sodium silicate, NOx emission limits are included within the respective facility permit. For example, at two sodium silicate facilities, one operating in Baltimore, Maryland and another in Chester, Pennsylvania, the sodium silicate melting furnaces have permitted limits of 5.73 lbs of NOx per ton produced and 6.0 lbs of NOx per ton produced, respectively.

Assessment of Pollution Control Technologies

Current air pollution control technology for glass melting and sodium silicate furnaces can be divided into three commercially available systems. Each one will be described in the following sections:

- Regenerative burners
- Oxy-fueled burner technology
- Selective Catalytic Reduction (SCR), and
- Ceramic Catalyst Filtration (CCF)

- *Regenerative burners*

Glass melting furnaces can be configured in a standard configuration where burners are mounted in a side-port arrangement on both sides, and are fired continuously. Alternatively, a cross-fired regenerative furnace cycles its firing from one side to the other, reversing direction on a periodic basis. The cyclic operation of this furnace allows for waste heat to be recovered and used to preheat combustion air for the opposing side's burners, improving efficiency and allowing for lower NOx emissions.

- *Oxy-fueled Burner Technology*

Oxy-fueled combustion is a NOx reduction technology that uses oxygen-enriched air to combust fuel, instead of ambient air. By increasing the concentration of oxygen in the combustion air, two benefits are noted. The first is that the amount of fuel used in the combustion process can be reduced. Reducing the amount of fuel used can lead to less NOx emissions. Oxygen combusts with fuel releasing energy to heat the glass making or sodium silicate process. By having more oxygen in a given volume of air, oxy-rich air requires less overall air volume needed in the combustion

process compared with ambient air. In the combustion process, some of the energy released is used to also heat the overall volume of gas. Reducing the overall volume of air then in turn reduces the amount of fuel used. The second effect is that by increasing the concentration of oxygen in air, other constituents like nitrogen are displaced. With less nitrogen in air, less NOx from combustion is produced.

Typical NOx conversion efficiencies for oxy-fueled burners varies depending on operation and configuration. Although NOx reduction may be beneficial, costs associated with oxygen enrichment may make this option expensive relative to other technologies because of the additional equipment costs associated with the construction and operation an onsite plant to supply the oxygen.

- *SCR*

SCR is a commercially available air pollution control technology used to reduce NOx emissions from combustion sources. The SCR process works by chemically converting NOx into nitrogen and water vapor. Ammonia or a similar reagent is injected into the exhaust of a combustion source. The exhaust then passes through a fixed catalyst bed where NOx reacts with ammonia and is converted into nitrogen and water vapor as illustrated by the following equations:

$$6NO + 4NH_3 \rightarrow 5N_2 + 6H_2O \text{ (reduction of NO to } N_2)$$

$$6NO_2 + 8NH_3 \rightarrow 7N_2 + 12H_2O \text{ (reduction of } NO_2 \text{ to } N_2)$$

The catalyst is typically designed in a honey-combed lattice structure embedded with active metal-oxides sites. Catalyst efficiency relies on good dispersion, mixing, optimal temperature range, and catalyst activity. However, catalyst activity can be adversely affected by poisoning of the active sites from contaminants such as sulfur, by thermal sintering due to high temperature, or by plugging from particulate matter (PM) and salts. Typical conversion efficiencies for SCR systems can range between 90 – 95% for NOx. Although NOx conversion can be high using an SCR system, capital investment, operating cost, and increased reagent usage may make this option less cost-effective compared to other emission control technologies Additionally, consideration is required for the minimization of any excess unreacted ammonia past the SCR catalyst, otherwise known as ammonia slip.

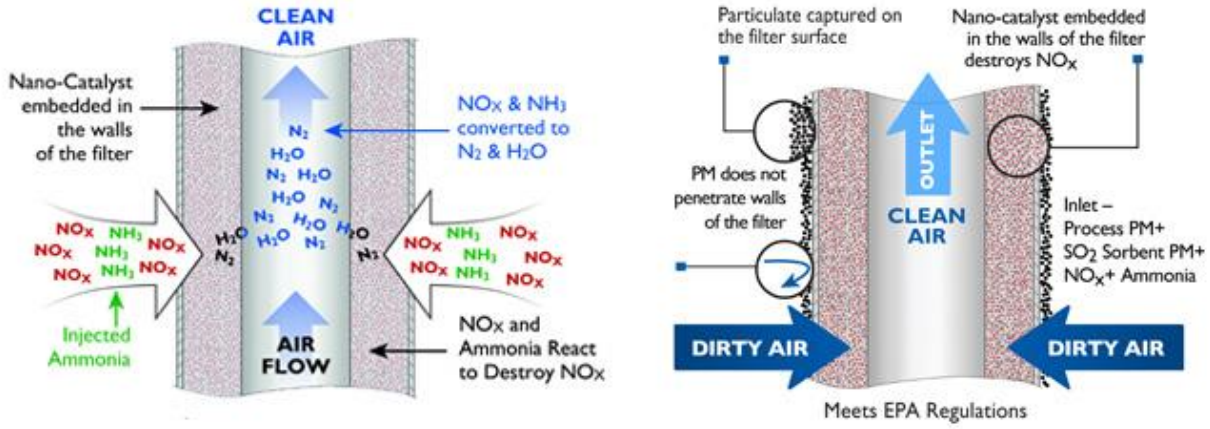
- *Ceramic Catalyst Filtration* (*CCF)*

CCF is a commercially available air pollution control system used to reduce NOx emissions from combustion sources. It is similar to SCR technology in that a reagent is injected into the exhaust gas from a combustion source. The exhaust then passes through a fixed catalyst bed where NOx reacts with ammonia and is converted into nitrogen and water vapor. Like an SCR, the catalyst bed in impregnated with metal oxides (See Figure 2-2). Unlike an SCR, however, the catalyst bed is configured into a cylindrical, ceramic filter element. Multiple filter elements are then arranged in an enclosed structure where the gas mixture passes through the element walls.

Typical NOx conversion efficiencies for CCF systems are comparable to traditional SCR systems. In addition to NOx reduction, CCF systems can be designed to remove other air pollutants such as SOx and PM. Although NOx conversion can be high using a CCF system, capital investment, operating cost, and increased reagent usage may make this option less cost-effective compared to other emission control technologies. However, the potential to remove pollutants in addition to NOx may make this option attractive to install.

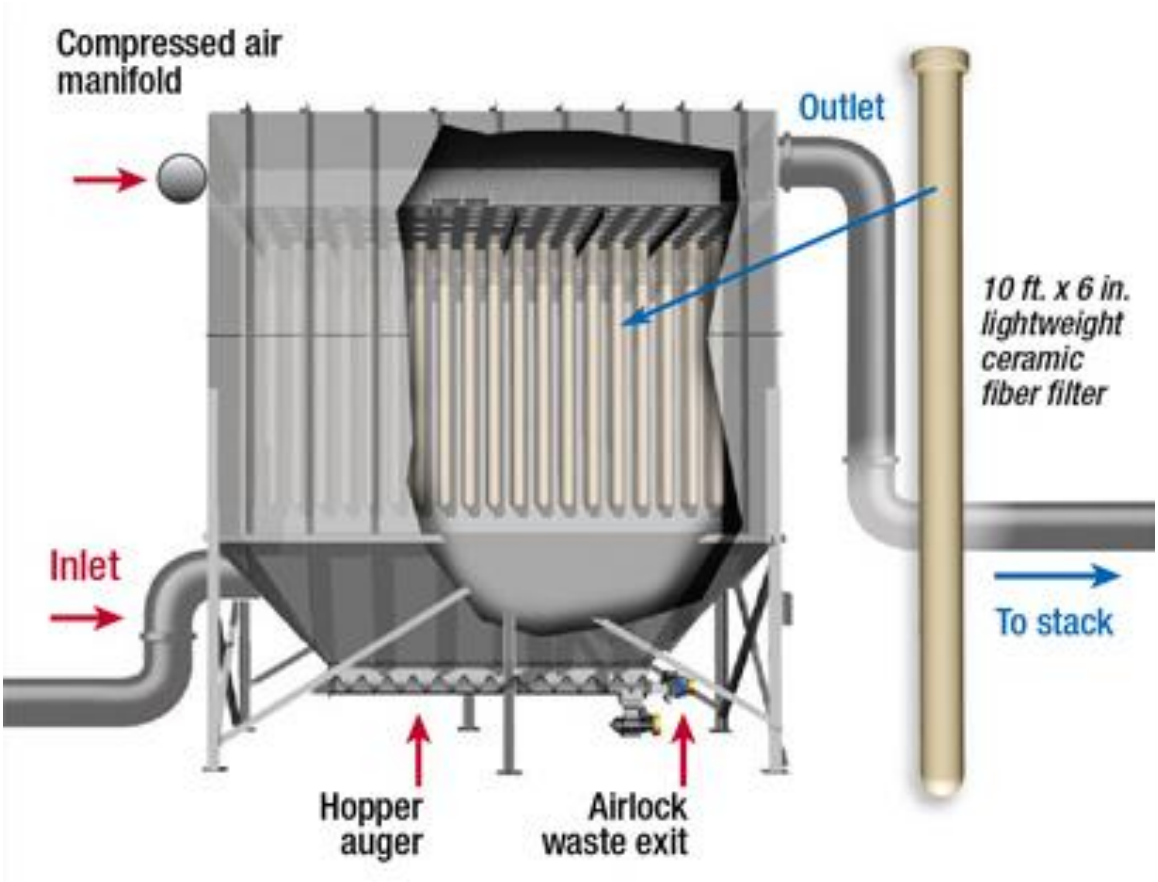
The sodium silicate facility uses regenerative burners in conjunction with the CCF system. The container glass facility utilizes oxy-fueled burners in conjunction with the CCF system. Staff did not identify any other facility that utilizes a combination of two different air pollution control equipment as seen at the container glass facility. Both facilities have achieved significantly lower NOx emissions through the utilization of the combined technologies

Figure 2-2: Ceramic Filter Control System*



*** Image courtesy of Tri-mer Corporation**

Figure 2-3: Tri-mer Ultracat Control System Baghouse*



*** Image courtesy of Tri-mer Corporation**

Cost-Effectiveness Analysis

Staff conducted a cost-effectiveness analysis based on the installation of the CCF systems and the operation of the air pollution control equipment and the reduction of NOx emissions. The overall cost-effectiveness was calculated to be $22,700 per ton of NOx reduced. Refer to Chapter 4 – Impact Assessment for additional details.

BARCT Emission Limit

Container Glass

Staff analyzed NOx emission data from 2016 through 2019 from the container glass melting furnaces at the affected facility. This analysis covered the time prior to and after the installation of the CCF pollution control equipment. Based on the emissions data, the container glass melting

furnaces are meeting at least an 80% reduction in NOx emissions and are sustaining operation at less than 0.25 pound of NOx per ton of glass pulled. Relying on what has been demonstrated in the operation of the container glass melting furnaces, staff initially recommended a NOx emission limit of 0.25 pounds of NOx per ton of glass pulled, averaged over a rolling 30-day period. Staff received stakeholders' concerns that the proposed limit of 0.25 pound of NOx per ton of glass pulled did not provide sufficient operational flexibility to account for equipment aging and associated performance degradation. In response to these concerns, staff extended their review of the facility's NOx emissions to include CEMS data reported to the South Coast AQMD from 2004 through 2015. Based on this additional review of twelve years of data, staff determined a NOx increase due to aging of approximately 0.017 pound of NOx per year per furnace. Over the course of fifteen years, this accounted for an average total increase of 0.30 pound of NOx per ton per ton of glass pulled per furnace. To provide operational flexibility and a sufficient compliance margin for potential NOx increases due to the aging of a furnace, staff revised its initial proposal from 0.25 pounds of NOx per ton of glass pulled to 0.75 pounds of NOx per ton of glass pulled. Additional detail how the NOx BARCT emission limit was established is provided in Appendix B.

To establish a SOx BARCT limit, staff determined that the emission limit contained in the permit to operate for the container glass melting furnaces of 1.1 pound of SOx per ton of glass pulled represents current BARCT limits.

Sodium Silicate

Staff analyzed NOx emission data from 2016 through 2019 from the sodium silicate furnace at the affected facility. This analysis covered the time prior to and after the installation of the CCF emissions control equipment. Based on the emissions data (see Appendix B), the sodium silicate furnace is meeting at least an 80% reduction in NOx emissions and is sustaining operation at less than 0.50 pounds of NOx per ton of glass pulled. Relying on what has been demonstrated in the operation of the sodium silicate furnace, staff is recommending a NOx emission limit of 0.50 pound of NOx per ton of product pulled, averaged over a rolling 30-day period.

Comparing the manufacturing of sodium silicate versus the manufacturing of container glass, staff notes that the sodium silicate manufacturing is a batch process versus a continuous, multi-year operation for the container glass manufacturing process. Since the sodium silicate furnace does not operate continuously for more than a few months at a time, staff considers that the effects of aging of the furnace and associated exhaust emissions control equipment can be addressed by the facility with repairs or upgrades between operational cycles. At this time, analysis of the emissions data and evaluation of the operational cycle does not indicate any potential NOx emissions increases for the sodium silicate furnace.

Although, the sodium silicate furnace is currently not a SOx source, staff intends to place a SOx emission limit in the event that the furnace operates on any fuel other than natural gas or produces process SOx. It is staff's intent to propose the same BARCT SOx emission limit as has been determined for container glass melting furnaces.

CHAPTER 3: PROPOSED AMENDMENTS TO RULE 1117

INTRODUCTION

PROPOSED AMENDMENTS TO RULE 1117

INTRODUCTION

PAR 1117 is a landing rule to transition facilities in RECLAIM to a command-and-control regulatory structure. It establishes NOx and SOx emission limits for container glass melting and sodium silicate furnaces and auxiliary combustion equipment used in the container glass manufacturing process. The proposed amendments establish Best Available Retrofit Control Technology (BARCT) emission limits for glass melting and sodium silicate furnaces.

PROPOSED AMENDMENTS TO RULE 1117

Rule 1117 was adopted on February 5, 1982 and was amended once on January 6, 1984. As part of this rulemaking effort, the rule not only will be revised to reflect BARCT NOx and SOx emission levels but it will also be amended to expand the applicability to include sodium silicate furnaces, to include new operational requirements, and address both NOx and SOx emissions. New sections and definitions are also added for clarity. Some provisions will be deleted as they are no longer applicable or relevant. Including a SOx emission limit as part of this rulemaking, helps to address the future transition of the SOx RECLAIM program. The rule title will be revised to: Emissions from Container Glass Melting and Sodium Silicate Furnaces.

New Purpose – Subdivision (a)

Previously, Rule 1117 did not have a subdivision that described the purpose of the rule. Consistent with other source-specific rules, a purpose was added. PAR 1117 adds the following language for the purpose of the rule.

- The purpose of this rule is to limit emissions of Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx) from facilities producing container glass and sodium silicate.

New Applicability – Subdivision (b)

Previously, Rule 1117 did not have a subdivision that described the applicability of the rule. Consistent with other source-specific rules, applicability was added to PAR 1117. Sodium silicate furnaces and auxiliary combustion equipment associated with container glass melting furnaces are proposed to be included in this rule. Currently, there are two facilities operating within the South Coast AQMD jurisdiction that PAR 1117 will apply to. Both facilities are currently in the RECLAIM program. The provisions of PAR 1117 will apply to these facilities while in RECLAIM and after they transition out of RECLAIM.

Although the operations at the two facilities are distinct enough to require different emission limits, it was determined that there was sufficient similarity to consolidate the sodium silicate furnace operation into PAR 1117 with the acknowledgement that there are distinct differences between the equipment, process, operation, and configuration.

PAR 1117 adds the following language to the applicability of the rule for clarity and for consistency with other South Coast AQMD rules.

- The provisions of this rule shall apply to the owner or operator of a RECLAIM facility or Former RECLAIM facility that operates a container glass melting furnace and associated auxiliary combustion equipment or that operates a sodium silicate furnace.

New and Modified Definitions – Subdivision (c)

Subdivision (c) was amended to reflect new and revised definitions and to delete obsolete terms. The definitions were rearranged to be in alphabetical order. The following new and modified definitions reflect the proposed changes.

- *AUXILIARY COMBUSTION EQUIPMENT means, for the purposes of this rule, any combustion equipment associated with the conveyance system or annealing equipment used in the container glass production process.*

  This definition was added since the container glass facility operates other combustion sources related to the manufacturing process. The container glass production line also includes heated conveyance systems (forehearths/refiners) and annealing furnaces. It is the intent of staff to have this type of equipment covered in PAR 1117 to streamline compliance under one industry-specific rule.

- *CONTAINER GLASS MELTING FURNACE means any furnace used to melt material in the production of food and beverage type containers manufactured by pressing, blowing in molds, drawing, rolling, or casting glass. Container glass does not include flat glass that is used in windows, windshields, plate glass, etc., and which is produced by the float, sheet, rolled, or plate glass process.*

  The definition for container glass melting furnaces was updated to differentiate this type of furnace from sodium silicate furnaces. It was also was updated to list exclusions to the definition of container glass melting furnaces. By combining exclusions to flat glass and glass tableware operations, this revision allows the removal of these two processes from the exemption portion of the rule. Although other types of glass melting furnace operations existed under RECLAIM in the past, these facilities have since shut down.

- *CULLET means recycled and scrap glass which is added to the formulation being charged to a container glass melting furnace.*

  This definition was modified to clarify that the addition of recycled and scrap glass applies to the container glass melting process.

- *DAY means the continuous 24-hour period from 12:00 am through 11:59 pm.*

  This definition was added to clarify what is considered one day of operation. This becomes relevant when following the proposed averaging provisions in PAR 1117.

- *FORMER RECLAIM FACILITY means a facility, or any of its successors, that was in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX,*

that has received a final determination notification, and is no longer in the RECLAIM program.

This definition was added to clarify when a facility is no longer referenced as a "RECLAIM facility" which will occur once the facility transitions out of RECLAIM.

- *FURNACE means, for the purpose of this rule, either a container glass melting furnace or sodium silicate furnace.*

  Unless specifically referenced as a "container glass melting furnace" or "sodium silicate furnace," the term furnace will apply to both types of furnaces.

- *IDLING means the operation of a furnace at less than 25 percent of the production capacity as stated on the Permit to Operate and where the furnace is not undergoing startup or shutdown.*

  Additional language was added to differentiate idling activities from startup and shutdown activities. The rule is being amended to restrict activities associated with idling, startup, and shutdown activities, which is detailed in another subdivision of PAR 1117. Examples of activities that may necessitate periods of idling can include: a product compositional change, a temporary pause in operation known as a "hot hold", or short-term periods of time where a furnace is kept warm while maintenance of pollution control equipment is performed.

- *NOx EMISSIONS means the sum of nitric oxides and nitrogen dioxides emitted, calculated as nitrogen dioxide.*

  This definition was added for clarity.

- *PRODUCTION CAPACITY means a container glass or sodium silicate pull limit found in a Permit to Operate for the applicable furnace.*

  This definition was added for clarity.

- *PULL or PULLED means the amount of product produced by a furnace, expressed in short tons per day*.

  This definition was modified for clarity. The rule previously defined pull as a term applied to the removal of glass from a glass melting furnace, generally expressed in tons. Stakeholders expressed concerns that sodium silicate was different than glass and that the previous definition did not include the sodium silicate process. Staff revised the definition so that the term "product" would refer to refer to either glass or sodium silicate.

- *RECLAIM FACILITY means a facility, or any of its successors, that was in the Regional Clean Air Incentives Market as of January 5, 2018, as established in Regulation XX.*

  This definition was added for clarity. It defines what facilities are RECLAIM facilities.

- *SHUTDOWN means that period of time during which a furnace is allowed to cool from operating temperatures to a furnace temperature below 200°F.*

  This definition was modified to add language to differentiate shutdown activities from idling and startup activities. Previously, the rule considered a shutdown to occur when a furnace was "allowed to cool from operating temperature to a lower temperature". There was no consideration of what cooling to a lower temperature meant. In this revised definition, a shutdown is considered the process of cooling a furnace from an operating temperature with the intent of reaching a temperature near ambient air temperature. For example, an operator may cut production and furnace temperature, but still keep a furnace hot enough to ramp production back up. This "hot standby" or "hot hold" mode should not be considered a shutdown, but rather an idling activity. In addition, a shutdown period is considered to start when product from the furnace is no longer being pulled. Staff has defined the threshold temperature of 200ºF based on stakeholder feedback.

- *SODIUM SILICATE FURNACE means any furnace used to melt material in the production of various water-soluble substances obtained in the form of crystals, glasses, powders, or aqueous solutions, used in a variety of industrial and consumer products.*

  Previously, there had been no definition for a sodium silicate furnace. This definition was added to differentiate this type of furnace from container glass melting furnaces. The definition is referenced in part from the online Merriam Webster dictionary at: https://www.merriam-webster.com/dictionary/sodium%20silicate.

- *SOx EMISSIONS means sulfur dioxides emitted.*

  This definition was added for clarity.

- *STARTUP means that period of time during which a furnace is heated to operating temperatures from a furnace temperature below 200°F.*

  The definition was modified to add language to differentiate startup activities from idling and shutdown activities. Previously, the rule considered a startup to occur when a furnace was "heated to operating temperature from a lower temperature". There was no consideration of what heating to an operating temperature meant. In this revised definition, a startup is considered the process of heating a furnace with the intent of reaching an operating temperature starting from a temperature near ambient conditions. As mentioned previously, an operator may cut production but keep a furnace hot enough to ramp production back up. Ramping back up from this "hot standby" or "hot hold" mode should not be considered a startup but rather an idling activity. In addition, a startup is considered to end once product is being pulled from the furnace. Staff has defined the threshold temperature of 200ºF based on stakeholder feedback.

- The definition for *ENERGY RECOVERY* was removed because it is no longer applicable. The definition for *FURNACE REBUILD* was also removed because the proposed amended rule no longer requires this distinction.

Revised Requirements – Subdivision (d)

- *Previous* (d)(1) – (d)(6)

  The previous subparagraphs were no longer considered applicable and were removed and replaced with the following provisions.

- *New* (d)(1) – NOx and SOx emission limits for container glass melting furnaces

  Based on staff's BARCT assessment, PAR 1117 proposes the following NOx emission limit for container glass melting furnaces:

  (d)(1)(A) –Except during periods of idling, startup, or shutdown, the owner or operator of a container glass melting furnace shall not operate a furnace in a manner that exceeds:

  0.75 pound of NOx per ton of glass pulled, averaged over a rolling 30-day period

  Based on staff's BARCT assessment, PAR 1117 proposes the following SOx emission limit for container glass melting furnaces:

  (d)(1)(B) – Except during periods of idling, startup, or shutdown, the owner or operator of a container glass melting furnace shall not operate a furnace in a manner that exceeds:

  1.1 pounds of SOx per ton of product pulled, averaged over a rolling 30-day period

  Currently, Rule 1117 sets the averaging time for compliance determination at 3 hours, except if an operator installs and maintains a continuous NOx monitor, the averaging time may be extended to 24 hours. As staff reviewed emissions data, it was noted that a 24-hour averaging period may not be an adequate period of time for facilities to address operational variability. Therefore, staff looked at other jurisdictions for guidance on averaging times for compliance determination. In a majority of instances, staff found that a rolling 30-day averaging was common. In a few circumstances, a rolling 365-day averaging provision was also used as a complement to a 30-day rolling averaging provision. For example, the Durand Glass Manufacturing plant in Millville, New Jersey has a NOx permitted limit of 1.2 pounds of NOx per ton of glass pulled on a 30-day rolling average and a concurrent limit of 1.0 pounds of NOx per ton of glass pulled on a 365-day rolling average. Based on the averaging periods in other jurisdictions and to recognize the operational variability of facilities, staff proposes that compliance determination be based on a rolling 30-day average.

  Initially, staff considered an emission limit based on a concentration-based standard (parts per million by volume, dry). Staff reviewed how emissions are reported and regulated by other jurisdictions and found that the conventional reporting standard is pounds of pollutant per ton of glass pulled. PAR 1117 proposes to keep the emission compliance standard on a pounds of pollutant per ton of glass pulled basis, instead of changing to a concentration-based standard,

because it is consistent with how other jurisdictions establish emission limits for glass melting furnaces and provides an emission limit per amount of product produced.

- *New* (d)(2) – NOx and SOx emission limits for sodium silicate furnaces

  Based on staff's BARCT assessment, PAR 1117 proposes the following NOx emission limit for sodium silicate furnaces:

  (d)(2)(A) – Except during periods of idling, startup, or shutdown, the owner or operator of a sodium silicate furnace shall not operate a furnace in a manner that exceeds:

  0.50 pound of NOx per ton of product pulled, averaged over a rolling 30-day period

  Based on staff's BARCT assessment, PAR 1117 proposes the following SOx limit for sodium silicate furnaces:

  (d)(2)(B) – Except during periods of idling, startup, or shutdown, the owner or operator of a sodium silicate furnace shall not operate a furnace in a manner that exceeds:

  1.1 pounds of SOx per ton of product pulled, averaged over a rolling 30-day period, if not fired on 100% natural gas

  The proposed provision for SOx places a limit in the event that a fuel other than natural gas is used.

  As discussed for container glass furnaces, similar averaging considerations were extended to sodium silicate furnaces. In addition, compliance determination on a pound per pollutant per ton of product pulled is similarly recommended.

- *New* (d)(3) – Operational restrictions

  <u>(d)(3)(A) – Idling</u>

  Previously, furnace idling had been exempt from Rule 1117. However, concern that furnace idling may lead to unrestricted emissions with no limitations prompted staff to consider provisions to limit emissions during furnace idling. Staff also recognized the need to provide operational flexibility for instances where a facility may require a temporary transitional period, where shutting down and restarting a furnace would be more emissive and may not be warranted. For example, a product change may necessitate a period of time of furnace idling as the manufacturing line transitions from one product to another.

  Facilities idle their furnaces because it may be inefficient to shut down and start up the furnace again. Furthermore, this shutdown and startup process takes several days to complete and could result in greater emissions than furnace idling. In general, staff noted that idling is defined as the operation of a furnace at less than 25% of the permitted glass production capacity. In other jurisdictions, during idling, emissions are not counted towards complying with an emission limit. However, when regulated, idling emissions may be capped for a given operation. For

example, SJVAPCD Rule 4354 does not count idling emissions for compliance determination but it does limit idling emissions using the following formula:

$$E_{i,max} = E_i \times \text{Capacity}$$

where, $E_{i,max}$ = maximum daily emission of pollutant i during idling
E_i = applicable emission limit
Capacity = furnace's permitted glass production rate

Similarly, in Title V permits issued to the PQ Corporation in Chester, Pennsylvania and the Gallo Glass Company in Modesto, California, NOx emissions are not counted towards compliance determination. However, emissions are limited during idling events such that PQ (Chester) and Gallo have idling NOx emission limits of 1,670 lbs/day and 780 lbs/day, respectively.

While there are examples of furnace idling emissions being regulated to a specified emission level, staff did not find examples where the length of idling time was regulated. Staff is concerned that a furnace may be at idling conditions for an undetermined length of time. To address this potential unlimited amount of idling time, PAR 1117 proposes the following provisions.

- Except when the exhaust emission control is in operation, the owner or operator shall not operate a furnace for more than: 240 consecutive hours per event and 960 cumulative hours in any rolling 365-day period during periods of idling.

Based on discussions with the affected facilities, a limit of 240 hours or 10 days of idling was established for a product transition event as well as scheduled idling events that occur annually. Moreover, setting a limit of 960 cumulative hours gives operators flexibility to have multiple idling events during a rolling 365-day period yet at the same time, limiting the emissions from this type of activity. Idling emissions are not to be counted towards compliance determination, which is consistent with other jurisdictions. PAR 1117 also would not count the time when the exhaust emission control system is in operation against the proposed 240 consecutive hours per idling event and 960 cumulative hours in any rolling 365-day period. If the exhaust emission control system is in operation, then emissions from the furnace are controlled, which addresses the concern of staff of uncontrolled emissions.

(d)(3)(B) – Startup

Under Rule 1117, there were no restrictions associated with starting up a furnace. PAR 1117 defines a startup as initiating furnace operation from a temperature of at least 200°F. The end of a startup period occurs once product is being pulled from the furnace. Concern that unlimited and unregulated startups may lead to unrestricted emissions with no limitations or cap has prompted staff to incorporate provisions to minimize emissions during furnace start up. At the same time, staff recognizes the need to provide flexibility to operators during startups.

In other jurisdictions, emissions during furnace startups are not counted towards complying with an emission limit. Under SJVAPCD Rule 4354, startups from a furnace rebuild are regulated on a case-by-case basis to maximum time between 70 – 100 days for a container glass melting furnace. There is, however, no restriction on the amount of time for a startup from a non-furnace rebuild startup event.

Staff is concerned that a furnace may be at startup conditions for an undetermined length of time. To address this unlimited amount of startup time, PAR 1117 proposes the following similar, but more restrictive provision than SJVAPCD's rule:

- Except when the exhaust emission control is in operation, the owner or operator shall not operate a furnace for more than: 720 hours per startup period.

Based on discussions with representatives of the container glass facility, setting a limit of 720 hours or 30 days for a furnace startup is appropriate based on normal startup procedures. Moreover, staff encourages the use of the associated exhaust emissions control equipment wherever appropriate. It is anticipated that within 30 days of the initiation of a startup, the associated emissions control equipment will be in service. Once the 30 day allotment for a startup is reached, subsequent emissions shall be counted towards and averaged over a rolling 30-day average. In addition, staff proposes to not count the time when the exhaust emission control system is in operation against the proposed 720 hours per startup event. If the exhaust emission control system is in operation, then emissions from the furnace are controlled, which addresses the concern of staff of uncontrolled emissions.

(d)(3)(C) – Shutdown

Rule 1117 currently has no restrictions associated with shutting down a furnace. Staff has proposed defining a shutdown as stopping furnace operation and cooling towards a temperature below 200°F. A shutdown period should be considered to be initiated once product from the furnace is no longer pulled. Concern that unlimited and unregulated startups may lead to unrestricted emissions with no limitations or cap has prompted staff to consider implementing measures to limit emissions from this type of activity. At the same time, staff recognizes the need to provide flexibility to operators during shutdowns.

In other jurisdictions, emissions during shutdowns are not counted towards complying with an emission limit. Under SJVAPCD Rule 4354, shutdowns are limited not to exceed 20 days once the furnace is below an idling threshold of 25% of the permitted glass production rate. PAR 1117 would require a similar but more restrictive limitation to the shutdown of a furnace:

- Except when the exhaust emission control is in operation, the owner or operator shall not operate a furnace for more than: 240 hours per shutdown period.

Although PAR 1117 allows less time for shutdowns than what is contained in SJVAPCD Rule 4354, 20 days in SJVAPCD Rule 4354 versus 10 days or 240 hours in PAR 1117, this amount of time is reasonable, based on discussions with the affected facilities. In addition, PAR 1117 does not count the time when the exhaust emission control system is in operation against the

proposed 240 hours per shutdown event. If the exhaust emission control system is in operation, then emissions from the furnace are controlled, which addresses the concern of staff of uncontrolled emissions.

- *New* (d)(4) – Operation of emission control equipment

  When Rule 1117 was last amended in 1984, the glass melting and sodium silicate furnaces did not have any added emission control equipment like a CCF system. Since 2017, both the container glass and sodium silicate facilities installed CCF systems to control NOx emissions. As a result, PAR 1117 includes a requirement that states:

  - During operation of a furnace including periods of idling, startup, or shutdown, the owner or operator of a furnace shall maintain in operation any exhaust emission control systems, including the injection of any associated chemical reagent into the exhaust stream to control NOx, if the temperature of the gas to the inlet of the emission control system is greater than or equal to 450ºF.

  This provision mirrors what has been observed in other jurisdictions. For example, in the SJVAPCD Rule 4354, during idling, startups, or shutdowns, the emission control system shall be in operation whenever technologically feasible.

  Staff notes what is "technologically feasible" requires further clarification. Currently, the CCF systems are permitted to operate within a normal temperature operating window between 450ºF and 900ºF. The intent of this provision is to explicitly require that the emission control equipment be in operation and injecting ammonia or similar reagent when the temperature of the exhaust from the furnace to it is above a minimum operational temperature, even if the furnace is idling, in startup, or in the process of a shutdown.

- *New* (d)(5) – Auxiliary combustion equipment

  One of the objectives of PAR 1117 is to provide container glass melting and sodium silicate facility operators with a single industry-specific rule that would encompass relevant combustion sources at their facilities. Staff recognized that the container glass facility's process lines include such auxiliary combustion equipment. This subparagraph limits emissions from this equipment to emission levels currently established for comparable equipment regulated by South Coast AQMD Rule 1147 – NOx Reductions from Miscellaneous Sources.

  The conveyance system burners located along the forehearths and refiners coming out of the glass melting furnace for the production of container glass are numerous. They number in the hundreds and the types of burners are of a standard open flame type that have no viable method for emissions testing because they are not enclosed and vent to the atmosphere. The container glass facility underwent a rebuild on both of their furnace lines in 2017, so the proposed provision would require the replacement of these burners at the time of a subsequent furnace rebuild with burners that are certified by the manufacturer to meet either 30 ppm at 3% O2 dry or 0.036 pound of NOx per million BTU of heat input. Staff proposes at time interval of 15 years from the date of amendment.

Equipment manufacturers have stated that the ability to test and certify these types of burners could be achieved in the near future. Similarly, the container glass facility operates several annealing furnaces (Lehr furnaces) that are natural gas fired. It should be noted that the container glass facility also has installed Lehr ovens that are electric and not natural gas fired. The proposed provision would also require compliance with either NOx limit by 15 years from the date of amendment.

Currently under RECLAIM, these combustion devices are only required to report their mass emissions by using a default emission factor of 130 lbs of NOx per standard cubic foot, roughly equivalent to 101 ppm, corrected to 3% oxygen. This proposed provision would state:

- On or before [*15 years after Date of Amendment*], the owner or operator of a container glass facility shall not operate the auxiliary combustion equipment used in the manufacture of container glass that exceeds a NOx emission limit of 30 ppmvd at 3% O2, dry or 0.036 lb/MMBTU heat input.

<u>*Revised* Compliance Determination – Subdivision (e)</u>

- *Previous* (e)(1) and (e)(2)

  The previous subparagraphs were no longer considered applicable and were removed and replaced with the following provisions.

- *New* (e)(1) – CEMS requirements

  Staff recognizes that CEMS requirements differ between the RECLAIM program regulated by Rules 2011 and 2012 and a command-and-control regulatory structure regulated by Rules 218 and 218.1. This section is added to facilitate the transition of the applicable monitoring, reporting, and recordkeeping requirements specified in RECLAIM versus a command-and-control system. The provision reads:

  The owner or operator of a container glass melting furnace or sodium silicate furnace shall:

  - Excluding emissions during periods of idling, startup, or shutdown, determine compliance with the emission limits in paragraphs (d)(1) and (d)(2) on a rolling 30-day average using a Continuous Emissions Monitoring System (CEMS), except if a furnace operates for fewer than 30 days, then compliance with the emissions limits in paragraph (d)(1) and (d)(2) will be determined based on the average for the actual days of operation. A facility owner or operator shall comply with the applicable monitoring, reporting, and recordkeeping requirements specified in:

    (A) Rules 2011 and 2012 for RECLAIM facilities; or

    (B) Rules 218 and 218.1 for former RECLAIM facilities.

The current version of Rule 1117 requires a facility owner or operator to determine compliance with an emission limit averaged over a 3-hour period for a furnace not equipped with a NOx continuous monitor. For furnaces equipped with a NOx continuous monitor, averaging may be allowed over a 24-hour period. A 24-hour averaging basis to determine compliance was something that staff further evaluated.

Staff also reviewed emissions data for both the container glass and sodium silicate facilities from 2016 through 2019. In their review, staff had noticed spikes in the data corresponding to transient operational issues. Some of these issues were identified as actions taken to comply with a permitted ammonia limit. When staff applied a rolling 30-day averaging to the data, these transient spikes were not as significant as to affect the compliance determination.

Therefore, to provide the operator with flexibility to respond to transient operational issues, PAR 1117 includes a provision that requires compliance determination to be made on a 30-day rolling average basis. Averaging on a 30-day rolling average basis is consistent with how other jurisdictions determine compliance for similar processes and equipment. Moreover, recognizing that the sodium silicate facility operates a batch process where a rolling 30-day period may not be achievable, the provision also allows averaging over the actual days of operation.

Emissions from idling, startups, and shutdowns are not proposed to be included in the rolling 30-day average up to the proposed time limits for each type of event. For example, if a container glass melting furnace was operated at a pull rate of 20% of the limit set by its permit to operate and the exhaust emission control equipment was not in service, then this would be considered an event where the amount of time to idle would be restricted to no more than 240 consecutive hours. During this idling period, emissions would not be included in the rolling 30-day averaging. If the furnace was idling beyond 240 consecutive hours for the same event, then the emissions after 240 hours would be included in the rolling 30-day averaging.

- *New* (e)(2) – Auxiliary equipment provision

Included in subparagraph (d)(5), auxiliary combustion equipment will be covered under the provisions of PAR 1117. The proposed limits mirror what is currently contained in Rule 1147 and would have applied to this type of equipment. However, staff recognizes that there are challenges for the verification of the proposed limits. Specifically, there is concern with the configuration of the conveyance system at the container glass facility – it does not allow for accurate and verifiable emissions testing. What staff proposes, in lieu of a source test, is to accept certification from the original equipment manufacturer (OEM) that the burners used in the conveyance system have been tested and can meet the proposed emissions levels. For annealing furnaces that are combustion sources, this equipment can either be source tested to demonstrate compliance or the operator can provide OEM certification.

Once the equipment has met the verification requirement under this subparagraph, there is no additional testing that would be required.

New Recordkeeping – Subdivision (f)

PAR 1117 adds a recordkeeping section to this rule so that records to demonstrate the pounds of pollutant per ton of product pulled are maintained. These records include the total hours of operation, the quantity of product pulled from each furnace, and the requirement that the pollutant emission rate be kept on a pounds of pollutant per ton of product pulled, as applicable, on a rolling 30-day average. Here, it should be noted that product refers to either container glass product or sodium silicate product. Currently, NOx and SOx are the pollutants regulated by PAR 1117; however, in the case of the sodium silicate facility, the SOx limit would not apply if it continues to operate on 100% natural gas.

In addition, a provision requiring a facility owner or operator to retain all data, records, and other information required by this rule for at least five years and make available for inspection by the Executive Officer is added. For current RECLAIM facilities, any reporting requirements under Regulation XX will still be in effect until the facility exits the RECLAIM program.

Revised Exemptions – Subdivision (g)

Rule 1117 previously listed exemptions under subdivision (d). With the addition of new subdivisions, the exemptions sections is now listed under subdivision (g).

- *Revised* (g)(1) – Reduce applicability threshold to provide relief only to small operators

  Currently, the rule exempts furnaces which are limited by their permit to operate to 15 lbs of NOx per hour which equates to 360 lbs of NOx per day. With the addition of the CCF systems, the NOx emission levels from the container glass melting and sodium silicate furnaces have been observed to be under this threshold.

  PAR 1117 proposes to change the exemption to apply to furnaces that are limited to less than 100 tons of product per year as specified in a South Coast AQMD permit. Staff does not anticipate the owner of a RECLAIM facility or Former RECLAIM facility to construct or operate a container glass melting or sodium silicate furnace below this production level.

  The proposed exemption threshold of 100 tons of product per year would be equivalent to 0.046 lbs of NOx per hour at the current NOx emission level of 4.0 lbs of NOx per ton of product pulled.

  Calculation:

$$\frac{100\ tons\ of\ product\ pulled}{year} \text{ x } \frac{1\ year}{365\ days} \text{ x } \frac{1\ day}{24\ hours} \text{ x } \frac{4.0\ lbs\ of\ NOx}{ton\ of\ product\ pulled} = 0.046 \text{ lb of NOx per hour}$$

- *Previous* (g)(3) and (g)(4) – Remove glass tableware and flat glass exemptions

These two exemptions were removed from this section and incorporated in the definition for container glass furnace for exclusion.

- *Revised* (g)(5) – Revision of fiberglass exemption

  Additional description of what is fiberglass was added for clarity.

- *Previous* (f)(6) – Remove idling exemption

  As stated earlier, staff is concerned that idling should not be allowed to occur for an unlimited amount of time. Provisions have been included to regulate what is considered idling and how long idling would be allowed to occur.

CHAPTER 4: IMPACT ASSESSMENTS

INTRODUCTION

In December 2015, Regulation XX was amended to implement Control Measure CMB-01 of the 2012 Air Quality Management Plan and to further reduce NOx from RECLAIM facilities. The amendment implemented NOx BARCT for various pieces of equipment by reducing RECLAIM allocations for certain facilities. As part of the BARCT assessment, container glass melting and sodium silicate furnaces were required to reduce NOx emissions by 80%. Subsequently, Control Measure CMB-05 of the 2016 AQMP required the RECLAIM program to achieve further NOx emission reductions of five tons per day and to include actions to transition the program to a command-and-control regulatory structure as soon as feasible but no later than 2025.

In 2017, the container glass and sodium silicate facilities installed air pollution control equipment in response to CMB-01. Since the installation of the control equipment, there has been a NOx reduction of at least 80% from the furnaces at both facilities. The costs of installation and operation of the control equipment from the 2017 installation of pollution control equipment will be used to the calculate the cost-effectiveness of PAR 1117.

EMISSION REDUCTIONS

In 2017, both facilities installed air pollution control equipment for each of their furnaces. At the container glass facility, a combination of oxy-fueled burners and a ceramic catalyst filtration system was installed. Staff did not identify any other facility that utilizes a combination of two different air pollution control equipment as seen at the container glass facility. At the sodium silicate facility, a ceramic catalyst filtration system was installed. As a result, NOx emissions have been reduced by approximately 0.65 tons per day for furnaces at both facilities based on NOx emissions data for calendar years 2016 and 2018.

In 2016, the total NOx emissions from the two furnaces at the container glass facility and the one furnace at the sodium silicate facility were 0.693 tons per day (tpd). At the limits proposed by PAR 1117, the expected remaining NOx emission levels for the three furnaces is 0.14 tpd. This reduction in NOx emissions represents a decrease of 0.56 tpd when compared to 2016 NOx emissions.

For the auxiliary combustion equipment, staff also reviewed NOx reductions based on equipment that would meet the NOx emission limits established in PAR 1117 paragraph (d)(5). Currently, the auxiliary combustion equipment is classified as RECLAIM process units and are allowed to report emissions based on a NOx default emission factor of 130 lb/mmscf of gas fired (or approximately 101 ppmvd). The combined annual NOx emissions based on fuel usage from this equipment is 7.5 tons per year or 0.021 tpd. Therefore, the emission reductions for the auxiliary equipment would be 0.015 tpd. The basis of reduction in NOx emissions assumes a starting concentration level of 101 ppmvd and an ending concentration level of 30 ppmvd.

The NOx emission reductions that will be achieved with PAR 1117 for all affected equipment total 0.57 tpd.

Table 4-1: Comparison of NOx Emissions (tons/day)			
	2016 Baseline*	**At Proposed Limit (Remaining)**	**Emission Reductions**
Container Glass Furnaces	0.58	0.12	0.46
Sodium Silicate Furnace	0.12	0.02	0.10
Container Glass Auxiliary Equipment	0.021	0.006	0.015
Total	0.72	0.15	0.57
* Based on audited RECLAIM NOx emissions data			

COST-EFFECTIVENESS

Staff conducted a cost-effectiveness analysis for the installation and operation of the control equipment and the reduction in NOx emissions observed after installation. To assist in the analysis, actual cost information for the installation and operation of the CCF system was requested and received from both the container glass and the sodium silicate facilities. In addition, the operational costs associated with the oxygen plant located at the container glass facility were included as an on-going cost to reflect the costs to operate both emissions control technologies.

Capital costs included cost for the emissions control system, infrastructure, engineering services, and installation costs. Annual operating costs included estimates for electricity, natural gas, oxy-fuel generation for container glass only, reagent, operation and maintenance, waste disposal, system costs, and replacement elements for the CCF system.

The operating cost for the oxygen plant at the container glass facility was included in the analysis. Adding this operational cost increased the annual costs from $620,000 to $6 million for the container glass facility. The installed cost for an oxygen production plant was not included, and staff notes that this added installation cost, if factored in, would also have increased the cost-effectiveness for the container glass facility.

In the calculation, staff assumed a uniformed series present worth factor (PWF) at a 4% interest rate and a 25-year equipment life expectancy. The uniform series present worth factor for these assumption is 15.622.

$$PWV = TIC + (PWF \times AC)$$

PWV = present worth value ($)
TIC = total installed cost ($)
AC = annual cost ($)
PWF = uniform series present worth factor (15.622)

Table 4-2: PAR 1117
Cost Effectiveness Analysis

Category	TIC ($ MM)	AC ($ MM)	PWV ($ MM)	NOx Reductions (tpd)	CE ($/ton)
Glass Melting (Container Glass)	19.0	6.0	112.7	0.46	26,600
Sodium Silicate Manufacturing	4.0	0.10	5.56	0.10	6,600
Auxiliary Equipment (Container Glass)	N/A	N/A	N/A	0.015	N/A
			Total	0.57	22,700

Since the auxiliary combustion equipment for container glass is expected to be replaced upon the next furnace rebuild, this is not expected to incur any incremental cost associated with PAR 1117.

The overall cost-effectiveness for PAR 1117 is calculated to be approximately $22,700 per ton of NOx reduced.

SOCIOECONOMIC ASSESSMENT

The two facilities affected by PAR 1117 are both categorized within the manufacturing sector. More specifically, one facility is classified under the North American Industry Classification System (NAICS) code 327213 – Glass Container Manufacturing, and the remaining facility is classified under NAICS code 325180 - Other Basic Inorganic Chemical Manufacturing. Based on available facility data on revenue and employees[1], neither of these facilities meet the criterion to be classified as a small business as defined by the Small Business Administration, federal Clean Air Act Amendments, or the South Coast AQMD.

[1] Dun & Bradstreet Enterprise Database, 2019.

The two affected facilities have previously implemented controls and are currently operating in compliance with the PAR 1117 proposed emission limits. Staff anticipates that facilities will not incur any additional future capital or recurring costs due to the adoption of PAR 1117. As a result, no adverse socioeconomic impacts are expected, and therefore, no socioeconomic analysis is required under California Health and Safety Code Sections 40440.8 and 40728.5.

CALIFORNIA ENVIRONMENTAL QUALITY ACT ANALYSIS

Proposed Amended Rule 1117 has been reviewed pursuant to California Environmental Quality Act (CEQA) Guidelines Section 15002(k) – General Concepts, the three-step process for deciding which document to prepare for a project subject to CEQA, and CEQA Guidelines Section 15061 – Review for Exemption, procedures for determining if a project is exempt from CEQA. Since the proposed project does not contain any project elements requiring physical modifications that would cause an adverse effect on the environment, it can be seen with certainty that there is no possibility that the proposed project may have a significant adverse effect on the environment. Therefore, the proposed project is exempt from CEQA pursuant to CEQA Guidelines Section 15061(b)(3) – Common Sense Exemption. A Notice of Exemption has been prepared pursuant to CEQA Guidelines Section 15062 – Notice of Exemption. If the project is approved, the Notice of Exemption will be electronically filed with the State Clearinghouse to be posted on their CEQAnet Web Portal. Once the Notice of Exemption is posted, members of the public may access it via the following weblink: https://ceqanet.opr.ca.gov/search/recent. In addition, the Notice of Exemption will be electronically posted on the South Coast AQMD's webpage which can be accessed via the following weblink: http://www.aqmd.gov/nav/about/public-notices/ceqa-notices/notices-of-exemption/noe---year-2020. The electronic filing and posting of the Notice of Exemption is being implemented in accordance with Governor Newsom's Executive Order N-54-20 issued on April 22, 2020 for the State of Emergency in California as a result of the threat of COVID-19.

DRAFT FINDINGS UNDER CALIFORNIA HEALTH AND SAFETY CODE SECTION 40727

Requirements to Make Findings

California Health and Safety Code Section (H&SC) 40727 requires that prior to adopting, amending or repealing a rule or regulation, the South Coast AQMD Governing Board shall make findings of necessity, authority, clarity, consistency, non-duplication, and reference based on relevant information presented at the public hearing and in the staff report.

Necessity

PAR 1117 is needed for equipment under the RECLAIM program that will be transitioning to a command-and-control regulatory structure to establish NOx and SOx emission limits for furnaces and auxiliary combustion equipment that are representative of BARCT, as well as monitoring, reporting, and recordkeeping requirements. PAR 1117 is needed to meet the requirements of AB

617, which requires an expedited schedule for implementing BARCT for cap-and-trade facilities and to develop a schedule by January 1, 2019 for the implementation of BARCT no later than December 31, 2023. PAR 1117 is also needed as it is in part implementing Control Measure CMB-05: Further NOx Reductions from RECLAIM Assessment (CMB-05) to ensure the NOx RECLAIM program is achieving equivalency with command-and-control rules that are implementing Best Available Retrofit Control Technology (BARCT) and to generate further NOx emission reductions at RECLAIM facilities.

Authority

The South Coast AQMD obtains its authority to adopt, amend, or repeal rules and regulations pursuant to H&SC Sections 39002, 39616, 40000, 40001, 40440, 40702, 40725 through 40728, 40920.6, and 41508.

Clarity

PAR 1117 is written or displayed so that their meaning can be easily understood by the persons directly affected by them.

Consistency

PAR 1117 is in harmony with and not in conflict with or contradictory to, existing statutes, court decisions or state or federal regulations.

Non-Duplication

PAR 1117 will not impose the same requirements as any existing state or federal regulations. The proposed amended rules are necessary and proper to execute the powers and duties granted to, and imposed upon, the South Coast AQMD.

Reference

In amending these rules, the following statutes which the South Coast AQMD hereby implements, interprets or makes specific are referenced: H&SC Sections 39002, 40001, 40702, 40440(a), and 40725 through 40728.5.

COMPARATIVE ANALYSIS

Under H&SC Section 40727.2, the South Coast AQMD is required to perform a comparative written analysis when adopting, amending, or repealing a rule or regulation. The comparative analysis is relative to existing federal requirements, existing or proposed South Coast AQMD rules and air pollution control requirements and guidelines which are applicable to container glass melting and sodium silicate furnaces.

Staff reviewed existing federal requirements that regulate glass melting furnaces to compare these requirements with PAR1117. Based on the review, staff determined that PAR 11117 does not conflict with any NOx or SOx emission limits or recordkeeping requirement established in the Code of Federal Regulations (CFRs) for glass manufacturing facilities. In general, the CFRs do not regulate NOx or SOx emissions. See Table 4-3.

Table 4-3: Comparative Analysis of PAR 1117 with the Code of Federal Regulations (CFR)

CFR Title	Part	Subpart	Title of Regulation	Pollutant (s) Regulated
40	60	CC	Standard of Performance for Glass Melting Furnaces	Particulate matter
40	63	SSSSSS	National Emission Standards for Hazardous Air Pollutants for Glass Manufacturing Area Sources	Particulate matter and metal
41	61	N	National Emission Standard for Inorganic Arsenic Emissions from Glass Manufacturing Plants	Arsenic

Staff also reviewed other South Coast AQMD rules relative to PAR 1117. No conflicts were noted between the two.

Table 4-4: Comparative Analysis of PAR 1117 with Existing South Coast AQMD Rules

Rule Element	PAR 1117	RECLAIM
Applicability	• Container glass melting furnaces • Container glass auxiliary combustion equipment • Sodium silicate furnaces	Facilities regulated under the NOx and SOx RECLAIM program (SCAQMD Reg. XX)
Requirements	• Container glass melting furnaces NOx: 0.25 lb/ton pulled SOx: 1.1 lb/ton pulled • Container glass auxiliary combustion equipment 30 ppmvd @ 3% O_2 • Sodium silicate furnaces NOx: 0.50 lb/ton pulled SOx: 1.1 lb/ton (if not on 100% natural gas)	• Major Source NOx/SOx: None • Process Unit NOx: 130 lb/mmscf
Reporting	• Maintain data to be used for compliance determination	• Daily electronic reporting for major sources • Monthly to quarterly reporting for large sources and process units • Quarterly Certification of Emissions Report and Annual Permit Emissions Program for all units

Monitoring	• A continuous in-stack NOx monitor subject to: ➢ South Coast AQMD Rules 2011 and 2012 for RECLAIM facilities ➢ South Coast AQMD Rules 218 and 218.1 for former RECLAIM facilities	• A continuous in-stack NOx monitor for major sources Source testing once every 5 years for process units
Recordkeeping	• All data required by this rule shall be maintained for at least five years and made available for inspection by the Executive Officer	• Quarterly log for process units • < 15-min. data = min. 48 hours; ≥ 15-min. data = 3 years (5 years if Title V) • Maintenance & emission records, source test reports, RATA reports, audit reports and fuel meter calibration records for Annual Permit Emissions Program = 3 years (5 years if Title V)

APPENDIX A: LIST OF FACILITIES AFFECTED BY PAR 1117

Two facilities are affected by PAR 1117: Owens-Illinois located in Vernon, California and the PQ Corporation located in South Gate, California.

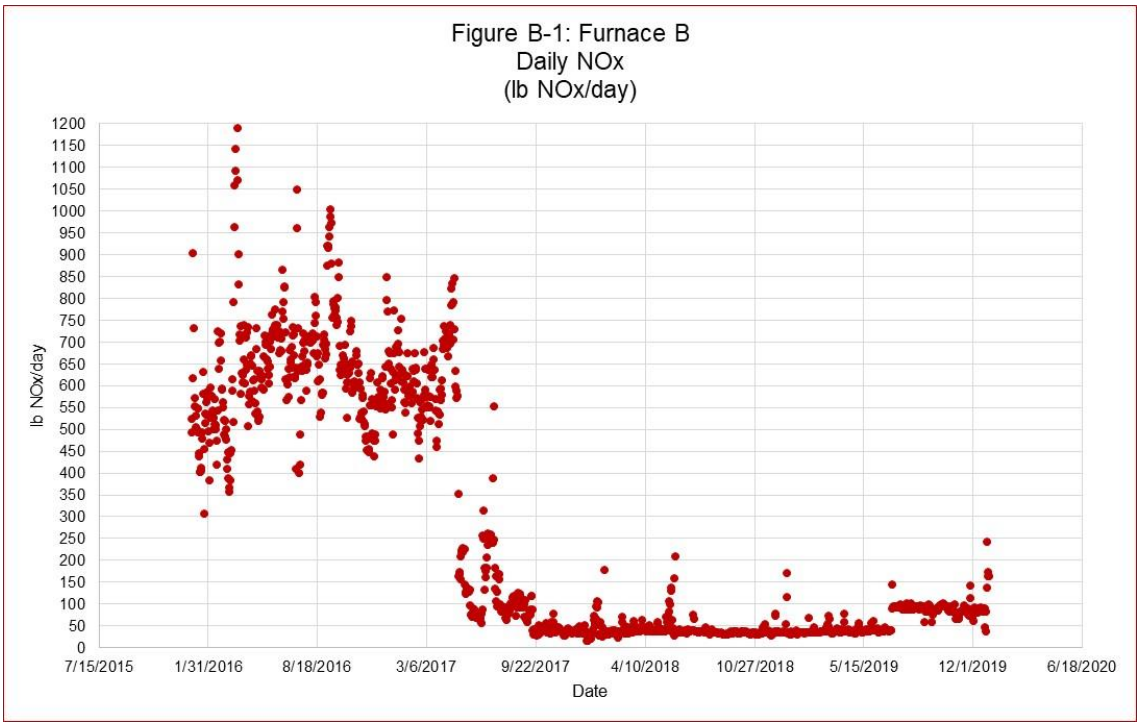
Table A-1: Facilities Affected by PAR 1117

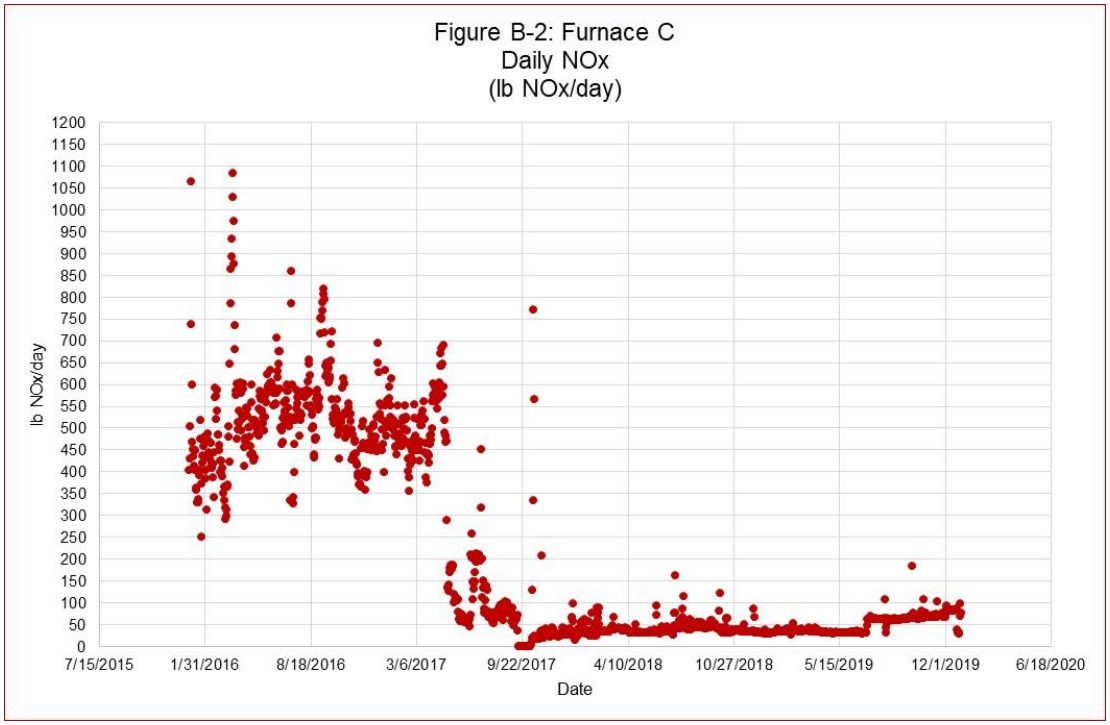
ID	Facility Name
7427	Owens-Illinois
11435	PQ Corporation

APPENDIX B: EMISSION LIMIT DETERMINATION

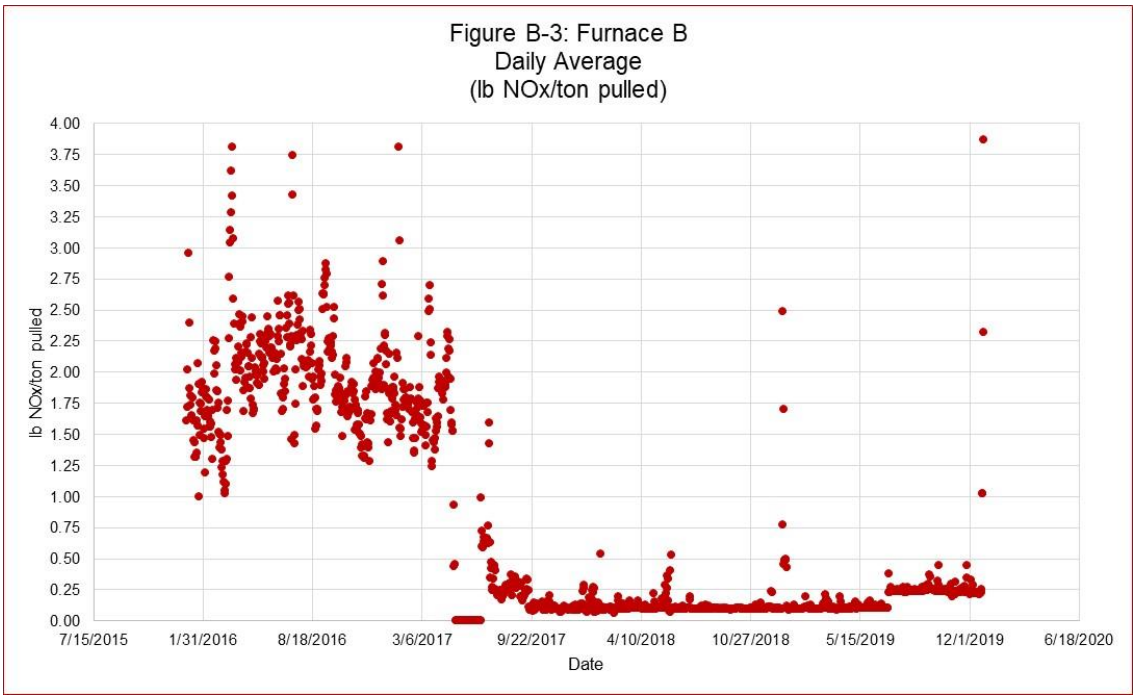
Presentation of NOx Emissions from Furnace Operations

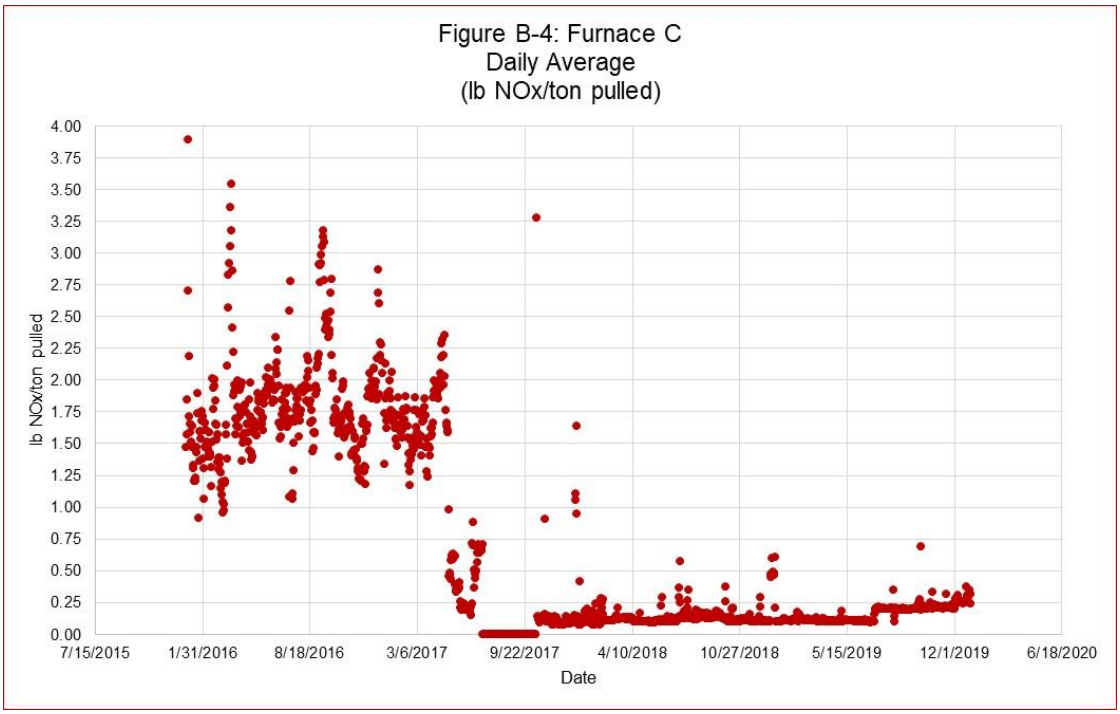
Figures B-1 and B-2 illustrate the NOx emissions on a lbs per day basis reported by the container glass facility for its container glass melting furnaces from CY 2016 to CY 2019.



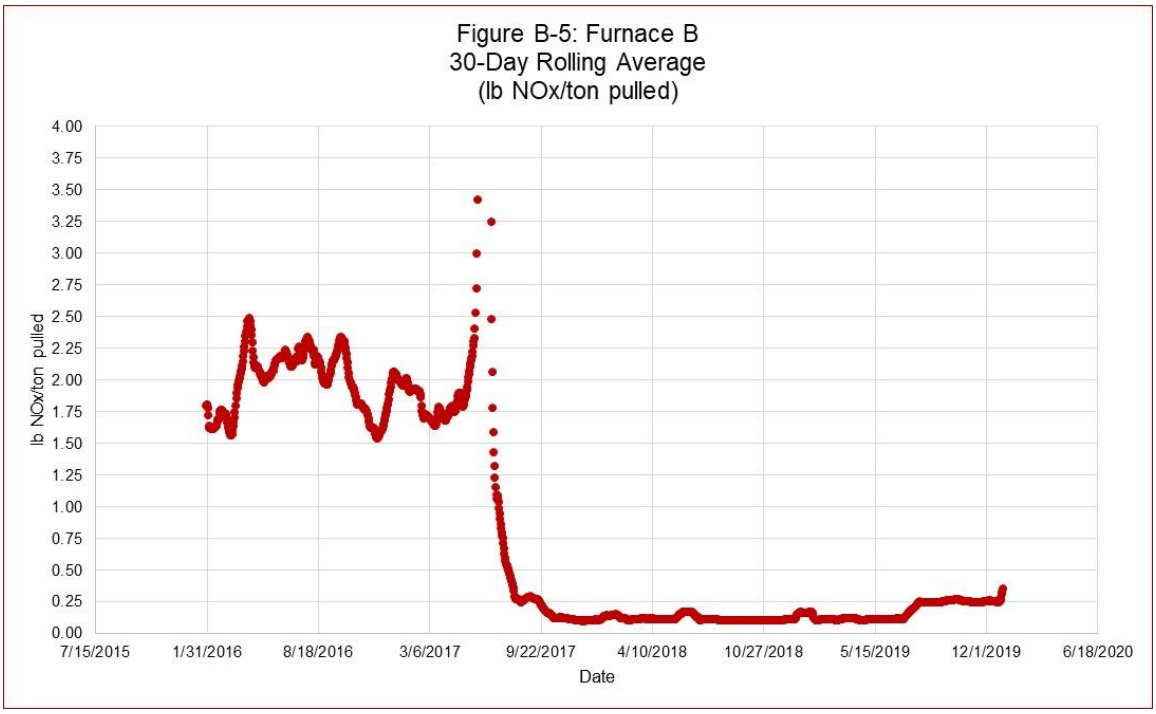


Figures B-3 and B-4 illustrate the NOx emissions per day based on the ratio of emissions to glass pulled for the container glass melting furnaces from CY 2016 to CY 2019.





Figures B-5 and B-6 illustrate the NOx emissions on a rolling 30-day average based on the ratio of emissions to glass pulled for the container glass melting furnaces from CY 2016 to CY 2019.



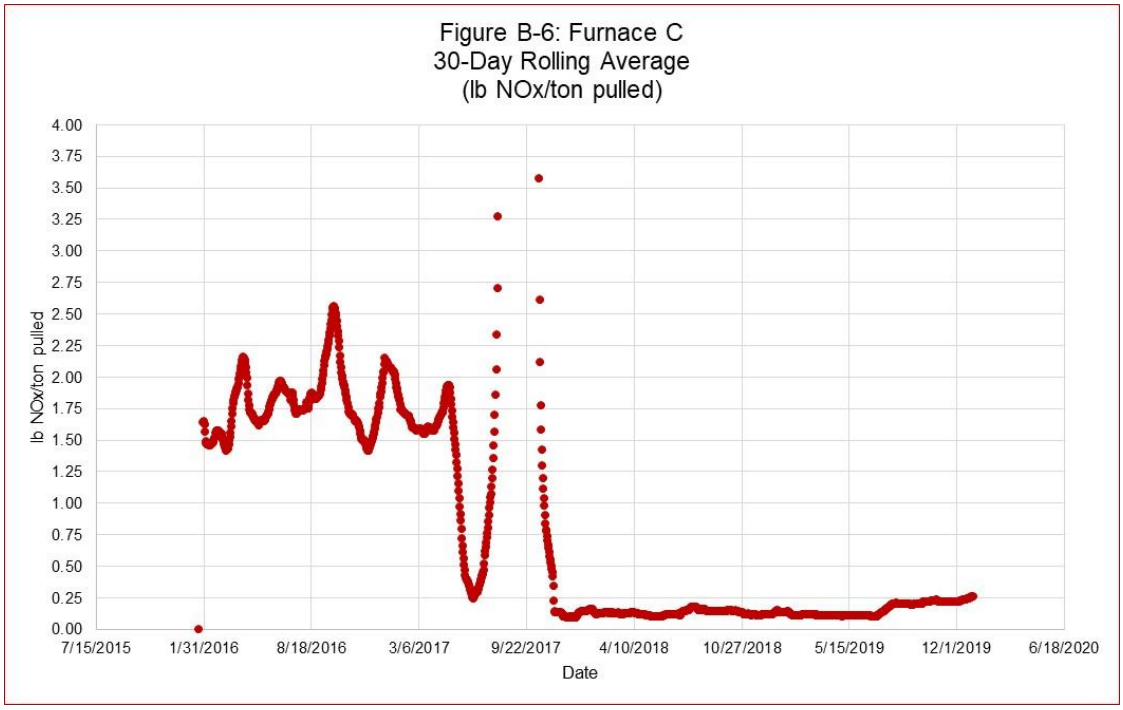
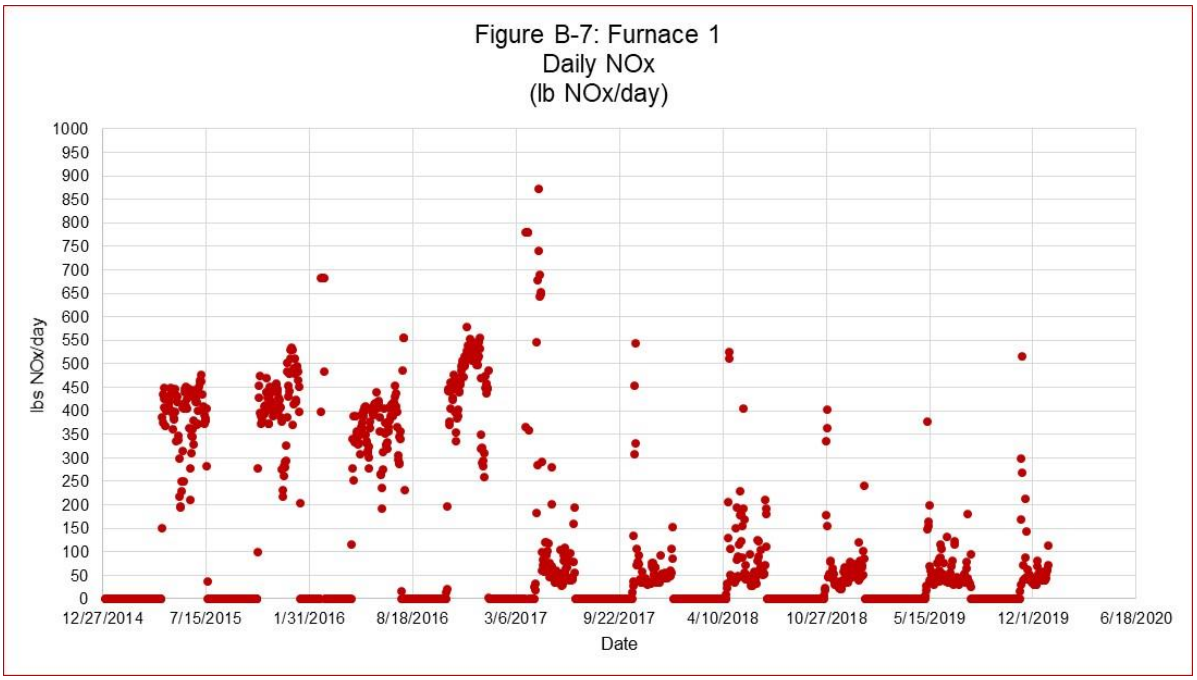
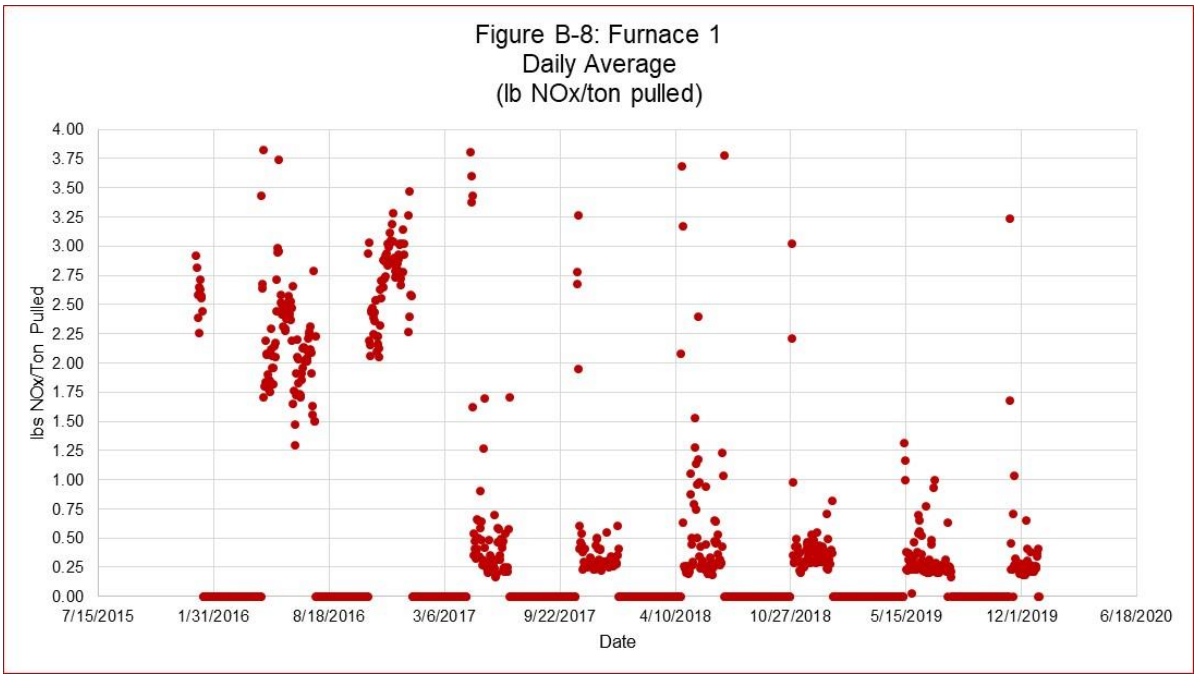


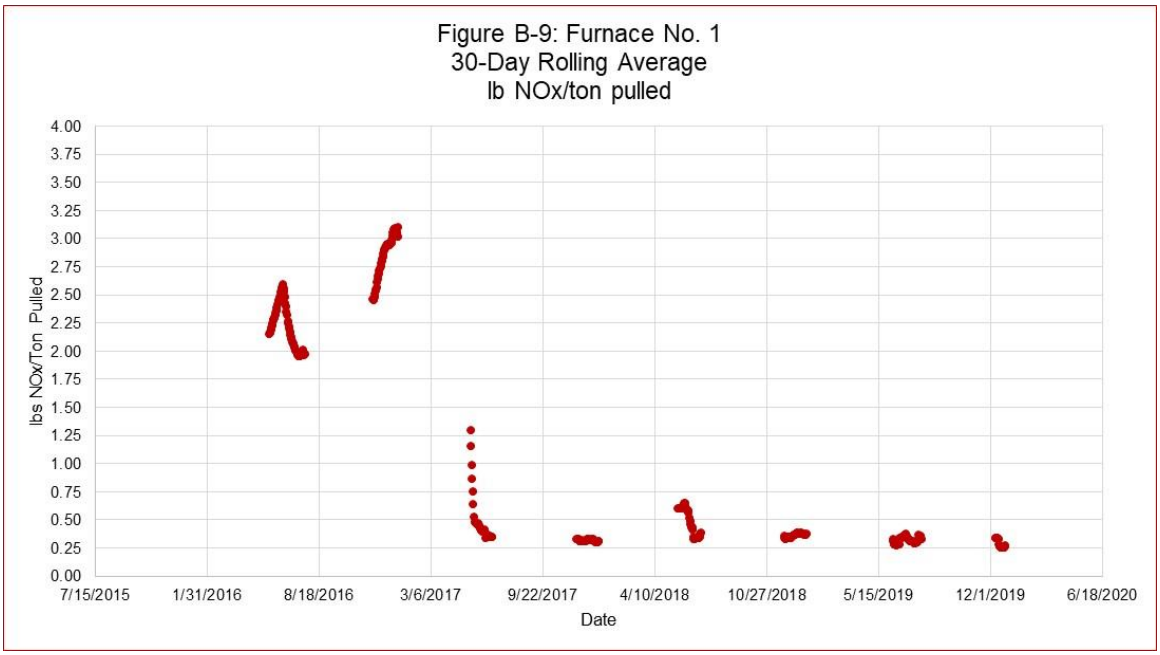
Figure B-7 illustrates the NOx emissions on a lbs per day basis reported by the sodium silicate facility for its sodium silicate furnace from CY 2016 to CY 2019.



Figures B-8 illustrates the NOx emissions per day based on the ratio of emissions to glass pulled for the sodium silicate furnace from CY 2016 to CY 2019.



Figures B-9 illustrates the NOx emissions on a rolling 30-day average based on the ratio of emissions to glass pulled for the sodium silicate furnace from CY 2016 to CY 2019.



NOx Data Analysis

Staff analyzed the NOx emissions data from the container glass furnaces and noted a significant drop in NOx emissions when comparing data from before and after 2017. In 2017, the container glass facility installed a CCF emission control systems on the exhaust gas exiting their container glass melting furnaces. It also should be noted that this facility had previously installed oxy-fueled burners on their container glass melting furnaces. Staff believes that the combination of the CCF and the oxy-fueled burners accounted for the significant drop in NOx emissions.

Through discussions with the container glass facility, staff learned that after the installation of the CCF systems, there was a period of time where the operator had to fine tune the operation of the equipment. During this time, the CCF system experienced unexpected breakage of filter elements. The operator also had to experiment with ammonia injection rates to optimize NOx emission reductions versus their permitted ammonia slip limit of 5 ppmvd. Initially after startup of the CCF system, to maximize NOx reductions, the CCF control system was operated at a NOx emission level of 0.15 lb of NOx per ton of glass pulled ratio. Later as operational issues were resolved, the targeted emission level was adjusted up to 0.22 lb of NOx per glass pulled, which occurred around July 2019. This adjustment helped to resolve ammonia slip concerns where the current ammonia slip is less than 1 ppmvd.

Through site visits to the container glass facility, staff noted that the CCF system as installed is a robust system consisting of four units per furnace. According to its permit, the facility is required to operate a minimum of two units per furnace line. However, running three units at a time with a sufficient ammonia injection appears to minimize NOx emissions as well as balance their ammonia

slip concerns. With a fourth unit online, it was reported that there was not much difference observed in the amount of NOx reduction compared to three units.

When the NOx emission data was analyzed on a 30-day rolling average by staff, many transient data spikes that had been initially observed became less significant.

Staff analyzed the NOx emissions data from the sodium silicate furnaces and noted a significant drop in NOx emissions when comparing data from before and after 2017. In 2017, the sodium silicate facility installed a CCF emission control system on the exhaust gas exiting their furnace. Since installation of the CCF system, a noticeable reduction in NOx emissions was observed.

As with the container glass facility, the sodium silicate facility also experienced a period of time where the operators had to learn how to fine tune the operation of the equipment. During this time, they too experienced unexpected breakage of filter elements. They also had to experiment with ammonia injection rates to optimize NOx emission reductions versus their permitted ammonia slip limit of 10 ppmvd. In general, the sodium silicate furnace operates at about 0.4 lb of NOx per ton of product pulled and also does not have the same level of redundancy as the container glass facility does by having multiple units.

During site visits to the sodium silicate facility, it was observed that there were frequent transient spikes in ammonia slip. It was also observed that these spikes may be correlated to how the furnace switches its crossflow flow periodically from one side of the furnace to the other. These transients forced ammonia injection adjustments which appeared to affect their overall NOx control. A combination of tuning issues with the ammonia injection and the range of the ammonia analyzer may be adding to this issue.

When the NOx emission data was analyzed on a 30-day rolling average, many transient data spikes that had been initially observed became less significant.

Increase of NOx Emissions Over Time

During the rule development process, stakeholders for the container glass facility expressed concern that furnace degradation over an extended run length would lead to the generation of additional NOx emissions. Staff was told that as a furnace ages, decreases in burner efficiency or increases in air leakage into the furnace may require more fuel to maintain process conditions. With more fuel being combusted, the amount of NOx generated could potentially increase.

To investigate this issue, staff compiled NOx emission data beginning in 2004 through 2015 for the two furnaces operating at the container glass facility. NOx emission information was collected from daily CEMS emissions data reported by the facility to the South Coast AQMD as part of the RECLAIM program requirements. Due to the configuration of the CEMS units, however, individual emissions from each furnace could not be separated from the aggregate. As such, staff analyzed the total NOx emissions from both furnaces as one unit.

Figure B-10 shows that over a twelve year span, the total combined NOx emissions from both furnaces have trended upwards. It should be noted that pull rate data was not available for the

period of time prior to 2010 and so the pull rate was not factored into this data review. Therefore, it is possible that the increased NOx emissions may also have been due to an increase in production from 2004 through 2015.

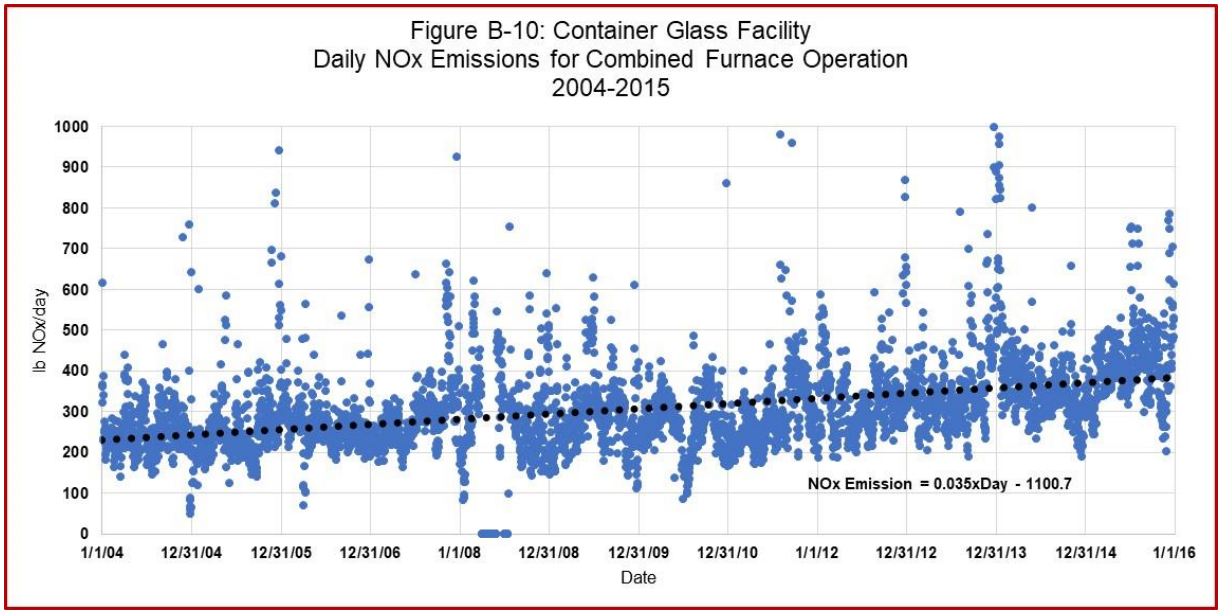


Figure B-10, NOx is seen to have increased approximately 0.035 lbs of NOx per day over a twelve year period. Since this represents two furnaces in operation, the corresponding NOx emissions increase per furnace would be approximately 0.0175 lbs of NOx per day or 6.4 lbs per year per furnace. The expected NOx increase due to the aging experienced by a furnace may be approximately 96 lbs over a 15 year operational cycle.

To present this on a pounds of NOx per ton of glass pulled basis, staff used the averaged pull rate for the two furnaces from 2010 to 2015 because staff did not have the pull rates from 2004 to 2009. The pulled amounts were 285 tons and 354 tons for an average of 319.5 tons. Based on this analysis, this would correspond to an average increase of 0.30 lbs of NOx per ton of glass pulled (96 lbs ÷ 319.5 tons). This increase does not take into consideration the addition of the CCF system in 2017. With the addition of the CCF system, staff expects that any effect due to NOx increases over time to be mitigated.

Proposed NOx Emission Limits

Based on the data analysis and observations made by staff, the following NOx emission limits are proposed:

- For the container glass melting furnaces, NOx emissions should not exceed 0.75 lb NOx per ton of glass pulled on a rolling 30-day average.
- For the sodium silicate furnace, NOx emissions shall not exceed 0.50 lb NOx per ton of product pulled on a rolling 30-day average.

Presentation of SOx Emissions from Container Glass Melting Furnace Operations

As was previously noted in this staff report, although the sodium silicate facility is in the SOx RECLAIM program, it does not report SOx emissions.

The following SOx information illustrates SOx emissions from the container glass melting furnaces.

Figure B-11 illustrates the SOx emissions on a lbs per day basis reported by the container glass facility for its container glass melting furnaces from CY 2016 to CY 2019.

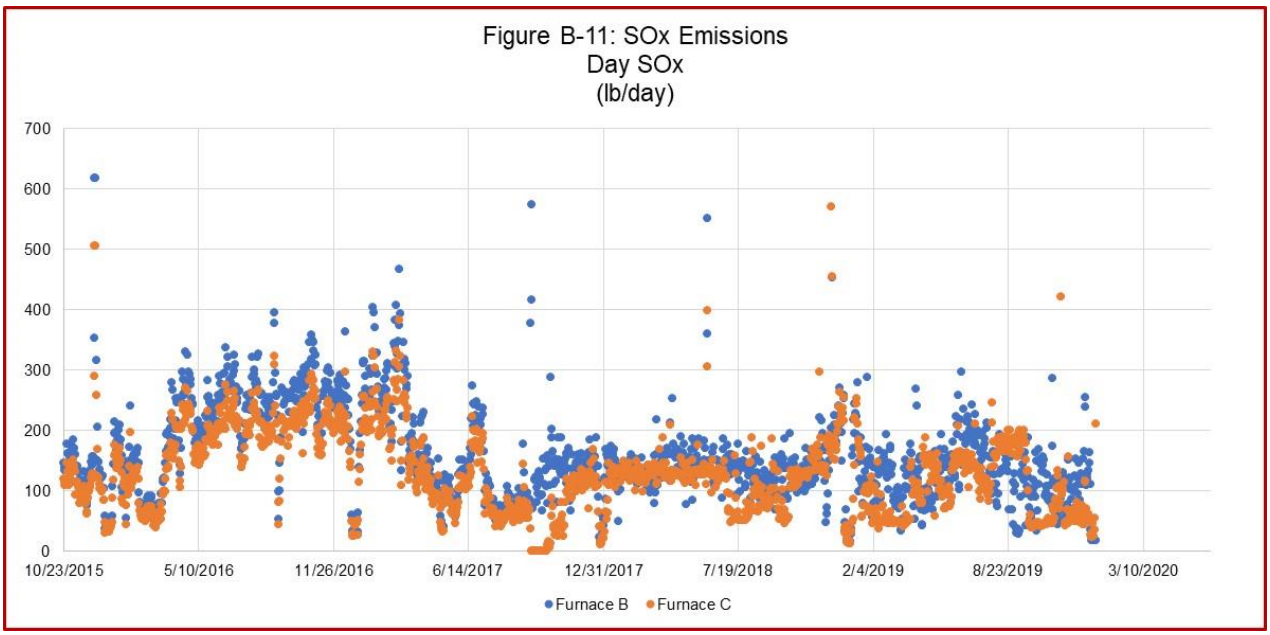
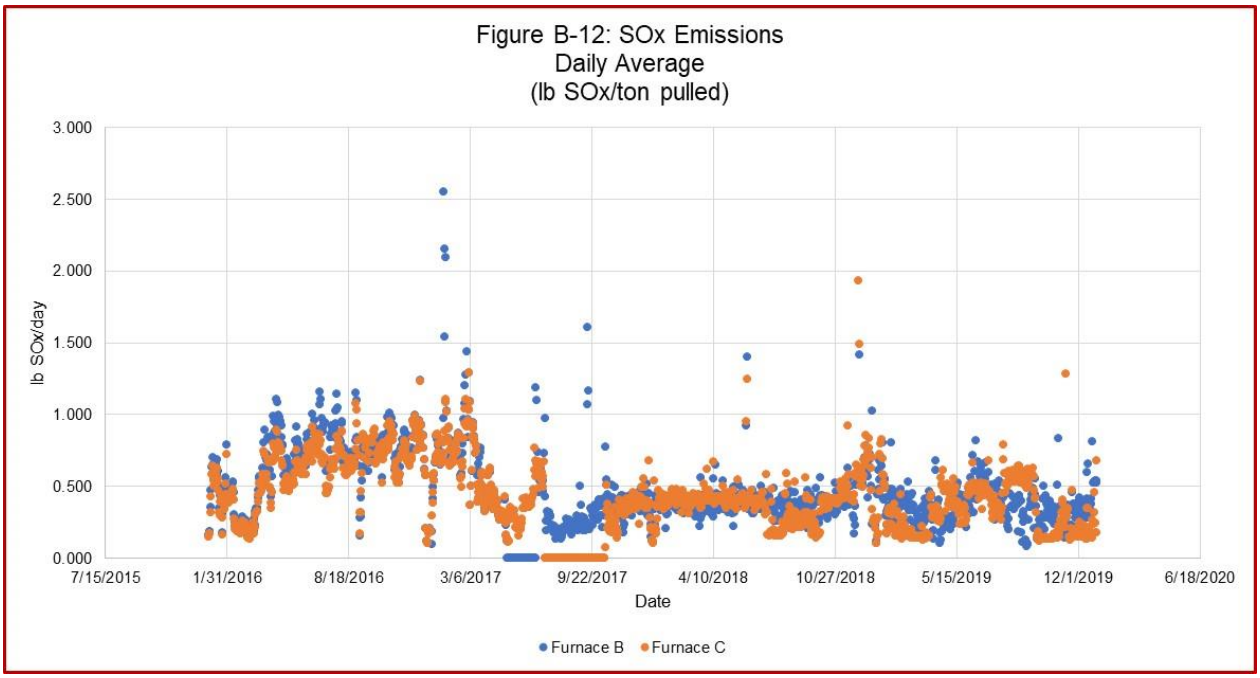
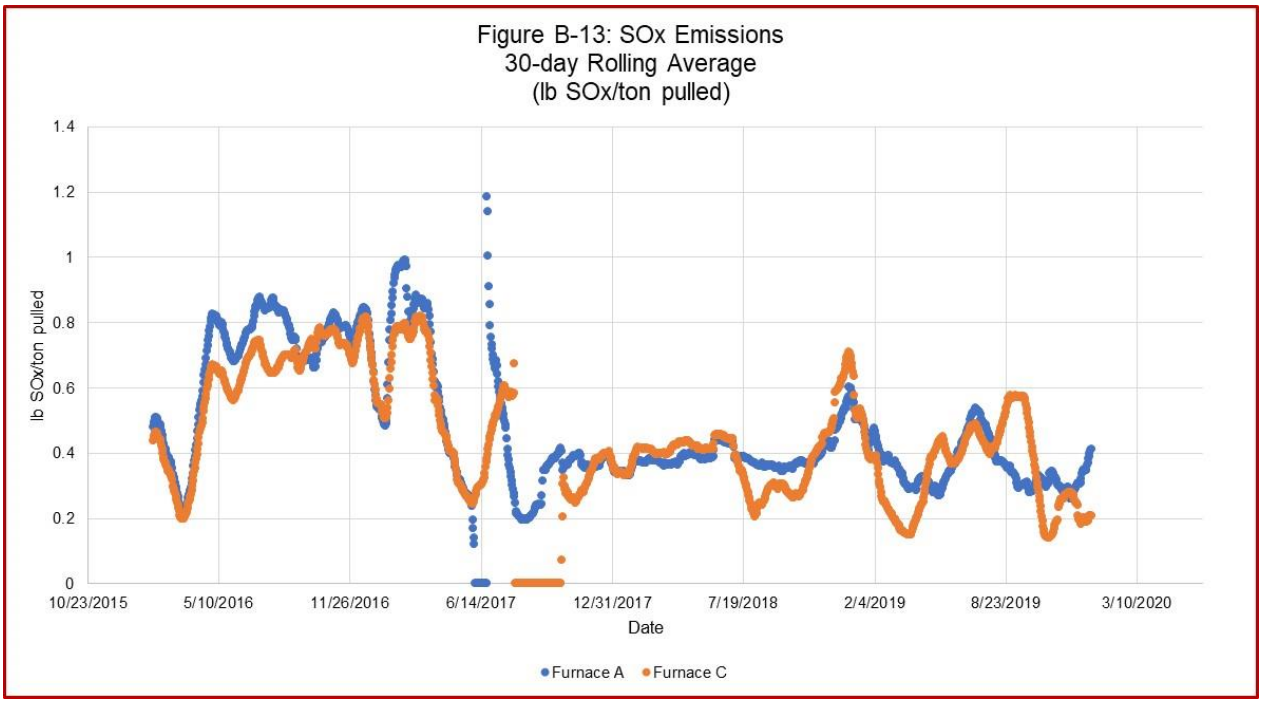


Figure B-12 illustrates the SOx emissions per day based on the ratio of emissions to glass pulled from the container glass melting furnaces from CY 2016 to CY 2019.



Figures B-13 illustrates the NOx emissions on a rolling 30-day average based on the ratio of emissions to glass pulled for the container glass melting furnaces from CY 2016 to CY 2019.



SOx Data Analysis

The primary goal for the installation of the CCF and oxy fuel burners at the container glass facility was tied to reducing NOx emissions. Although there is some observable SOx reduction at the

container glass facility due to the CCF, the emissions impacts will be evaluated at a later date when the RECLAIM SOx program is also transitioned to a command-and-control regulatory structure.

APPENDIX C – RESPONSE TO COMMENT LETTERS

Comment Letter No. 1 – Latham and Watkins (on behalf of Owens-Illinois)

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Madrid	Washington, D.C.
Milan	

014112-0373

April 16, 2020

VIA EMAIL

Rodolfo Chacon
Air Quality Specialist
South Coast Air Quality Management District

Re: Proposed Amendments to SCAQMD PAR 1117

Dear Mr. Chacon:

We are submitting these comments on South Coast Air Quality Management District ("SCAQMD") Proposed Amended Rule 1117 - Emission of Oxides of Nitrogen from Glass Melting Furnaces ("PAR 1117") on behalf of our client Owens-Brockway Glass Container, Inc. ("Owens"). In addition, attached is a markup of the current version of PAR 1117 (March 2020). The Owens facility is located at 2901-23 Fruitland Ave in Vernon, CA 90058 (Facility ID No. 7427) ("Facility"). The Facility is a RECLAIM Cycle 1 for both NOx and SOx (Coastal Zone). The Facility is one of only two facilities subject to PAR 1117 and the only container glass melting facility subject to the rule.

Background

The Facility produces about 700 tons per day of glass containers for the food and beverage industry. The Facility uses significant volumes of recycled glass, also known as cullet, in the production process. During normal operations, the feed to the Facility's two furnaces, identified as Furnaces B and C, consists of between 55% and 73% cullet. Furnaces B and C consist of two newly re-bricked advanced oxyfuel-fired glass furnaces that vent to an advanced air pollution control system. Installed in 2016 and 2017, the Tri-Mer emission control system reduces NOx, SOx and PM from the Facility. 1-1

US-DOCS\114746523.6

The emission control upgrades implemented at the Facility are above and beyond what is required to comply with emission limits in the Facility Title V Operating Permit, and any requirements applicable to similar facilities elsewhere in the country. Taken together, the furnace design and air pollution control system represent one of the lowest-emitting glass container manufacturing capabilities in the United States. Owens implemented the upgrades because of the incentive provided by the NOx RECLAIM allowing for the sale of unused RTCs as a means of recouping some of its investment. Of course, the incentive to undertake emission control projects of this type will be eliminated with the sunset of the NOx RECLAIM program. 1-1 cont.

Specific Comments

1. **The proposed NOx limit must be set at a level that takes into consideration performance of the furnaces and control equipment over time.**

As a result of the recent re-bricking of the furnaces, and optimization of the emission control system, control of emissions from the Facility is currently at peak performance. While Owens implements a rigorous maintenance program, over time it is inevitable that additional oxygen from the ambient air will ingress into the furnaces. NOx emissions are produced as a result of the thermal reaction between nitrogen and oxygen in the high temperature environment of the glass melting furnaces. Therefore, over the period of time until the furnaces would be rebricked again, NOx emissions will increase. 1-2

The proposed NOx limit of 0.25 lb/ton is low for glass melting furnaces. For other glass melting furnaces outside of California, emission limits ranging from 1.1 to 1.3 lbs per ton of glass pulled have been required in consent orders with USDOJ. Owen's has already significant capital costs to install the add-on emission control system and will incur additional operating costs associated with the system. A 0.25 lb/ton NOx limit, which is far below that applicable to other similar facilities, places Owens at a further competitive disadvantage. Owens is also concerned that this limit does not account for expected increases of emissions over time or provide for a sufficient compliance margin. 1-3

During initial discussion with staff, Owens proposed a NOx limit of 1.0 lb/ton, which it believes is representative of limits recently imposed on other similar facilities, and also represents a 33% reduction of the current Facility permitted NOx limit, and a 75% reduction from the current NOx limit in Rule 1117. Upon further review, Owens believes that it can maintain emissions from the furnaces at the Facility below 0.75 lb/ton NOx limit. As such, PAR Rule 1117(d)(1) should be revised to "0.75 pound of NOx per ton of glass pulled, averaged over a rolling 30-day period." 1-4

2. **The definition for Cullet should be clarified to include recycled and scrap glass.**

In PAR 1117(c)(3), the definition of "Cullet" should be clarified. At the Facility, cullet and raw materials, consisting primarily of silica sand, limestone and soda ash, are weighed, 1-5

combined, and mixed to precise ratios into a batch. The composition of the batch varies depending on the type of glass being made. The batch is then directed to a furnace, where it is melted and formed into glass bottles or other containers. Rejects and off-spec containers are recycled as cullet and reused. Cullet should be clarified to include recycled and scrap glass. 1-5 cont.

3. The definition for Furnace should be broadened to include any fossil fueled furnace.

In PAR 1117(c)(6), the definition of "Furnace" should be clarified. For the purposes of the rule, furnace means any fossil fuel-fired glass melting furnace or sodium silicate furnace. The definition of Furnace should not be related to containers. The term furnace should be read broadly to include any fossil fuel-fired glass melting furnace or sodium silicate furnace. 1-6

4. The definition of Startup should reflect actual operating conditions.

In PAR 1117(c)(14), the definition of "Startup" should be clarified. Once the minimum temperatures have been reached and the emissions control system is operational, startup time limits should not apply. When the emissions control system is not bypassed, emissions are being controlled. The definition of Startup should be revised to mean the period of time "after initial construction or a furnace rebuild during which a furnace is heated to operating temperatures by the primary furnace combustion system, pollution control equipment is brought on line, and systems and instrumentation are brought to stabilization." 1-7

5. Limits for idling, startup and shutdown should reflect actual operating conditions.

Key to limiting emissions during start-up, shutdown and idling is not limiting the duration of the event, but limiting the period of time that the emission control system is not fully operational. Emissions from the furnaces are controlled when the emissions control system is operational. The requirements under Rule 1117(d)(3) should reflect operating conditions and clarify that the time limits apply only when the exhaust is not passing through "operating pollution control equipment, including the injection of any associated chemical reagent into the exhaust stream to control NOx." 1-8

Furthermore, Rule 1117(d)(4) should be revised to clarify that, during start-up, shutdown and idling, the furnaces shall operate with "exhaust emission control systems, including the injection of any associated chemical reagent into the exhaust stream to control NOx, whenever technologically feasible." 1-9

6. Compliance determinations should also should reflect actual operating conditions.

PAR Rule 1117(e)(1) may require Owens to determine compliance on a rolling 30-day average using a Continuous Emissions Monitoring System ("CEMS") regardless of actual operating conditions at the Facility. Operating days should only be removed from the 30-day roll 1-10

when the emissions control system is bypassed. As such, Rule 1117(e)(1) should be modified to account for "for all days in which the Furnace operated for the previous 30 days." 1-10 cont.

7. PAR 1117 needs to define "in full use" for air pollution control equipment.

Owens has a separate ceramic catalyst filter ("CCF") system for each of the two glass melting furnaces at the Vernon Plant. The CCF systems are similar to baghouses, but instead of fabric bags the CCF systems use ceramic catalyst filters, also known as "candles" due to their shape. Each of the two CCF systems is composed of separate housing units that can be taken off-line independently, while furnace exhaust continues to pass through the remaining operating housing units. The Furnace B system has four housing units with 240 filters in each housing unit, for a total of 960 filters; the Furnace C system has four housing units with 200 filters in each housing unit, for a total of 800 filters. 1-11

While Owens typically operates with all housing units online, the systems are designed to enable Owens to meet permitted emission limits for a particular furnace with only two of the four housing units in that system online. PAR 1117 should allow Owens to operate only two of the four housing units at one time.

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Thank you for your attention to these comments. If you would like to discuss our concerns, please contact me at (714) 755-8105 or by email at michael.carroll@lw.com.

Sincerely,

Michael J. Carroll
of LATHAM & WATKINS LLP

Attachment

cc: Wayne Nastri, SCAQMD
Phil Fine, SCAQMD
Susan Nakamura SCAQMD
Barbara Baird, SCAQMD
Mary Reichert, SCAQMD

Response to Comment 1-1

The South Coast AQMD staff appreciates your comments and recognizes that the emissions control equipment that has been installed at this facility has significantly reduced the NOx emissions at the site. Staff agrees with the commenter that when combined, the furnace design and air pollution control system represent one of the lowest-emitting glass container manufacturing capabilities in the United States. This combination of design and added control equipment is unique and uncommon at other plants operating in the United States.

Through the PAR 1117 rulemaking process, it is the intent of staff to codify these achievements in emissions reductions. Staff does not anticipate that the facility will incur any additional equipment or operational costs resulting from PAR 1117 than what has already been invested by the facility. Staff also notes that the decision by the facility to implement these upgrades was made in part because of the incentive provided by the NOx RECLAIM program allowing for the sale of unused RTCs, and has benefited in the RECLAIM program by installing pollution controls before requirements under PAR 1117 were established.

Response to Comment 1-2

Staff recognizes that a container glass melting furnace's refractory brick ages over time and may allow air to ingress. Staff reviewed NOx emissions data for the two furnaces operating at the facility from 2004 through 2015 and noted that prior to the installation of the ceramic catalyst filter system, there was an increase in the aggregate NOx emissions over this period. The NOx emission limit established for container glass melting furnaces accounts for aging of refractory brick.

Response to Comment 1-3

As part of the BARCT technology assessment, staff identified other glass melting furnaces operating with NOx emission limits ranging from 1.1 to 1.3 lbs of NOx per ton of glass pulled in consent decrees with the United States Department of Justice and in other regulatory jurisdictions. Staff considered these limits as unique to the circumstances and conditions found at these locations. Similarly, for PAR 1117, staff evaluated data specific to the operation of the two container glass melting furnaces at the affected facility.

What has already been demonstrated and achieved by the use of the currently installed emissions control equipment is what PAR 1117 will codify. Staff does not anticipate that the facility will incur any additional equipment or operational costs resulting from PAR 1117 than what has already been invested by the facility.

Staff initially proposed a NOx emission limit of 0.25 lb per ton of glass pulled. Based on stakeholder input, staff has revised the NOx limit to 0.75 lb per ton of glass pulled to accommodate increases in NOx emissions due to the aging of the furnaces and associated emissions control equipment, and also to provide a compliance margin.

Response to Comment 1-4

Staff has revised the NOx emission limit to 0.75 lb per ton of glass pulled, averaged over a rolling 30-day period for container glass melting furnaces.

Response to Comment 1-5

The definition of cullet has been revised to include the term "recycled."

Response to Comment 1-6

Within the jurisdiction of the South Coast AQMD, there are only two RECLAIM facilities currently affected by PAR 1117. To provide distinction between the two types of operations, staff has included the container glass definition to distinguish this process versus the other for sodium silicate. The definitions are specific to the directly affected sources of the proposed amended rule.

Response to Comment 1-7

Staff has revised the language in PAR 1117 (d)(3) that pertains to startups, shutdowns, and idling to exclude periods of time when the exhaust emissions control equipment is in use. The goal of limiting these operational situations is to minimize uncontrolled emissions. If the exhaust emission control equipment is in operation, then staff agrees the intention has been met.

Further, staff has distinguished between types of emission control equipment in this provision. Although oxy-fueled burners are recognized as a type of emissions control equipment, the use of the add-on exhaust emissions controls is what is targeted by the revised provision.

Response to Comment 1-8

See response to Comment 1-7.

Response to Comment 1-9

The phrase "whenever technologically feasible" was determined to be too broad to be able to enforce. Instead, staff has incorporated existing permit conditions that specify the temperature at which ammonia or a similar reagent should be injected and when the catalyst system in operation.

Response to Comment 1-10

Staff has updated the language in PAR 1117 (e)(1) to explicitly exclude emissions from idling, startup, and shutdowns from being counted as part of the 30-day rolling average. However, idling, startup, and shutdown activities are still limited by the time restrictions in PAR 1117 (d)(3). If a furnace operates beyond the time allowed for either idling, startups, or shutdowns, then the emissions emitted beyond the allotted time shall be counted as part of the 30-day rolling average.

The purpose of including the requirement that "if a furnace operates for fewer than 30 days, then compliance for NOx will be determined based on the average for the actual days of operation" is to address batch-type operations. If a furnace such as one used in the sodium silicate process is operated for less than 30 days and is shutdown based on operational considerations, then its emissions shall be averaged for the amount of time that it actually operated.

Response to Comment 1-11

PAR 1117 does not define the requirement "in full use" for any air pollution control equipment, but defers any specific requirements to conditions listed on the facility's permit to operate. At a minimum, the permit to operate currently requires the use of two of the four ceramic catalyst filter housing units per furnace line.