Proposed Rule (PR) 1147.2
NOx Reductions from Metal Processing Equipment

Working Group Meeting #2
August 6, 2019

Call-In Number / Passcode
913-227-1201 / 225465
Agenda

- Summary of Working Group Meeting #1
- Summary of Stakeholder Meetings
- Rule 1147 Equipment Data Request
- BARCT Analysis
  - Assessment of Emission Limits for Existing Units
    - Metal Melting Furnaces
    - Metal Heat Treating Furnaces
  - Other Regulatory Requirements
- Next Steps
Summary of Working Group Meeting #1
Summary of Working Group Meeting #1

- Background
- Overview of Rule Development Process
- Overview of Rule 1147
- Proposed Rule 1147.2
- Equipment Data
BARCT analysis is conducted for each equipment category and fuel type
Summary of Stakeholder Meetings

- **13 stakeholder meetings**
  - RECLAIM and non-RECLAIM facilities
  - Consultants
  - Vendors

- **Discussed**
  - Proposed applicability
  - Equipment
    - Configurations
    - Retrofits
    - Permit-exempt
  - Facility operations
  - NOx control technologies
  - Source testing considerations
~240 surveys sent to facilities with metal processing equipment
- 26 surveys have been returned (~11%)
- Survey can be completed electronically and submitted via email http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/proposed-rules#1147.2

Staff plans to send a supplemental survey to gather data on permit-exempt equipment
- Many pieces of equipment are permit-exempt
- Equipment inventory is underrepresented
- Equipment does not have a NOx rule or permit emission limit
BARCT Analysis
Working Group Meeting #2: Current Progress

*BARCT analysis is conducted for each equipment category and fuel type
Methodology & Approach

For metal melting and metal heat treating furnaces, identified:

• Total number of units
• NOx permit limit and source test (if available)
• Heat input
• Control technology (if any)
• Replacement or retrofit and corresponding dates

Analyzing data to:

• Identify low emitting units
• Segment possible groupings of equipment (heat input, type, other parameters such as temperature)
• Summarize NOx permit limits and source test performance relative to current Rule 1147 limit
Assessment of Emission Limits for Existing Units

Metal Melting Furnaces
Metal Melting Furnaces – Assessment of Permitted NOx Levels

- Staff evaluated all permitted NOx concentration limits for metal melting furnaces
  - Electric furnaces were excluded for evaluation of combustion NOx
  - All NOx limits were corrected to 3% O2

- Based on the South Coast AQMD permit database, 204 permitted metal melting furnaces were evaluated

- Permit limit data organized to determine:
  - Permit limit distribution
  - Permit limits of units not using Rule 1147 limit or RECLAIM default NOx emission factor
  - Correlation to heat input data

- Staff has identified approximately 92 unpermitted furnaces (exempt from permitting)
  - Unpermitted furnaces have not been included in the proposed universe
RECLAIM default NOx emission factor is 102 ppm*
  ▪ Applied to identified RECLAIM units without an emission factor

Rule 1147 NOx permit limit is 60 ppm

Of the 204 metal melting furnaces, 19 have NOx permit limits below 60 ppm
  ▪ 15 at RECLAIM facilities
  ▪ 4 at non-RECLAIM facilities

NOx permit limits below 60 ppm range from 30 to 55 ppm

* Converted from 130 lb NOx/mmscf natural gas, units can have permit limits higher than the default emission factor
Of the 19 metal melting furnaces with NOx permit limits < 60 ppm, heat inputs range between 1.0 - 30.0 MMBtu/hr
- Only 1 unit < 5 MMBtu/hr
- For units greater than 5 MMBtu/hr, even distribution of heat inputs for units with NOx permit limits < 60 ppm

**Heat Input Distribution for 19 Units Permitted at < 60 ppm**

<table>
<thead>
<tr>
<th>Heat Input (MMBtu/hr)</th>
<th># of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5</td>
<td>1</td>
</tr>
<tr>
<td>&gt; 5 to &lt; 20</td>
<td>9</td>
</tr>
<tr>
<td>≥ 20</td>
<td>9</td>
</tr>
</tbody>
</table>

**Permit Limits (19 Units) vs. Heat Input**

- Rule 1147 Limit

![Graph showing heat input distribution](image)
Assessment of Source Test Results for Metal Melting Furnaces

- Staff reviewed source tests of metal melting furnaces to identify tested emissions

- Staff identified source tests for:
  - 25 RECLAIM metal melting furnaces
  - 29 non-RECLAIM metal melting furnaces

- Only certain units are required to source test
  - RECLAIM units that do not use the default NOx emission factor (102 ppm)
  - Non-RECLAIM units (Rule 1147), when the unit reaches:
    - 35 years old: If emit < 1 lb/day NOx; or
    - 15 years old: If emit > 1 lb/day NOx
Metal Melting Furnaces – Source Test Result Summary

- 54 NOx source tests identified
  - Results range from 8.4 to 59.6 ppm
  - NOx from RECLAIM and non-RECLAIM facilities
  - Average source test is 44 ppm

Source Tests for 19 Units Permitted at < 60 ppm

<table>
<thead>
<tr>
<th>Source Test Result (ppm)</th>
<th># of Units*</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 to 60</td>
<td>1</td>
</tr>
<tr>
<td>40 to 50</td>
<td>3</td>
</tr>
<tr>
<td>30 to 40</td>
<td>7</td>
</tr>
<tr>
<td>&lt; 30</td>
<td>6</td>
</tr>
</tbody>
</table>

* 2 units did not have source test data

All Source Test Results
All 54 metal melting furnaces with source tests are below 60 ppm NOx
- Heat inputs range between 0.2 and 34 MMBtu/hr
- 26 units less than 5 MMBtu/hr
- Even distribution of heat inputs

### Units vs. Heat Input Ranges

<table>
<thead>
<tr>
<th>Heat Input (MMBtu/hr)</th>
<th>Units with Source Test &lt; 60 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5</td>
<td>26</td>
</tr>
<tr>
<td>&gt; 5 to &lt; 20</td>
<td>18</td>
</tr>
<tr>
<td>≥ 20</td>
<td>10</td>
</tr>
</tbody>
</table>
Metal Melting Furnaces – Permit Limits vs. Source Test Results Evaluation

- Staff compared NOx permit limit data with NOx source test results to determine metal melting furnace performance relative to permitted levels.
- Confirmed “compliance margin” between permitted and source tested NOx levels.
Metal Melting Furnaces – Permit Limits vs. Source Test Results Evaluation

- Difference between NOx permit limit and NOx source test result
  - Source test result ranges from 0.6 - 51.6 ppm lower than permit limit
  - Average Difference: 16 ppm (29% lower)
Staff categorized source test data by furnace type
- Reviewed data to determine correlation between source test result and furnace type
- Based on source test results, all furnace types have one or more furnaces with NOx levels < 40 ppm
Permitted - NOx Concentration Level:
- RECLAIM: 29% units permitted < 60 ppm
- Non-RECLAIM: 3% units permitted < 60 ppm
- RECLAIM units that do not use the default emission factor (102 ppm) are permitted at a much lower limit (≤ 60 ppm)

Source Tests - NOx Concentration Level:
- NOx concentration levels range from 8.4 to 59.6 ppm
- Based on 54 source tests, average concentration is 44 ppm (~ 25% below 60 ppm – Rule 1147 emission limit)
- Crucible, Kettle, and Reverberatory types have the lowest source test results
Assessment of Emission Limits for Existing Units

Metal Heat Treating Furnaces
Staff evaluated all permitted NOx concentration limits for metal heat treating furnaces
- Electric furnaces were excluded for evaluation of combustion NOx
- All NOx limits were corrected to 3% O2

Based on the South Coast AQMD permit database, 385 permitted metal heat treating furnaces were evaluated

Permit limit data organized to determine limit distribution and permit limits of units not using Rule 1147 limit or RECLAIM default emission factor

Heat input data was also organized to determine any correlations to permit limit data

Staff has identified approximately 254 unpermitted furnaces (Exempt from permitting)
- Unpermitted furnaces were not included in the proposed universe
Analysis of Permitted Data for RECLAIM and Non-RECLAIM Metal Heat Treating Furnaces

- RECLAIM default NOx emission factor is 102 ppm*
- Rule 1147 NOx emission limit is 60 ppm
- Of the 385 metal heat treating furnaces, 217 have permitted NOx limits below 60 ppm
  - 155 furnaces at RECLAIM facilities
  - 62 furnaces at non-RECLAIM facilities
- Permitted NOx limits below 60 ppm range from 12 to 55 ppm
- 20 furnaces have a permit limit above the RECLAIM default emission factor

* Converted from 130 lb NOx/mmscf natural gas
Of the 217 metal heat treating furnaces below 60 ppm, heat inputs range between 1.6 and 44.4 MMBtu/hr.

95% of metal heat treating furnaces with NOx permit limits below 60 ppm are less than 20 MMBtu/hr.

<table>
<thead>
<tr>
<th>Heat Input (MMBtu/hr)</th>
<th>Units with Permitted NOx Limit &lt; 60 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5</td>
<td>67</td>
</tr>
<tr>
<td>&gt; 5 to &lt; 20</td>
<td>142</td>
</tr>
<tr>
<td>≥ 20</td>
<td>8</td>
</tr>
</tbody>
</table>

* Excludes one outlier of 500+ MMBtu/hr
Metal Heat Treating Furnaces – Source Test Results

- Staff reviewed source tests of metal heat treating furnaces to identify tested emissions
- Staff identified source tests for:
  - 129 RECLAIM metal heat treating furnaces
  - 67 non-RECLAIM metal heat treating furnaces
- Only certain units are required to source test
  - RECLAIM units that do not use the default NOx emission factor (102 ppm)
  - Non-RECLAIM units (Rule 1147), when the unit reaches:
    - 35 years old: If emit < 1 lb/day NOx; or
    - 15 years old: If emit > 1 lb/day NOx
Metal Heat Treating Furnaces – Source Test Results

- 197 source tests with NOx emission results ranging from 4.6 to 115.0 ppm
- Combination of metal melting furnaces at RECLAIM and non-RECLAIM facilities
- 96% of the 197 units with source tests have results < 60 ppm

**Source Test Results for Units Permitted at < 60 ppm**

<table>
<thead>
<tr>
<th>Source Test Result Range (ppm)</th>
<th># of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 to &lt; 60</td>
<td>5</td>
</tr>
<tr>
<td>40 to &lt; 50</td>
<td>48</td>
</tr>
<tr>
<td>30 to &lt; 40</td>
<td>36</td>
</tr>
<tr>
<td>20 to &lt; 30</td>
<td>28</td>
</tr>
<tr>
<td>&lt; 20</td>
<td>28</td>
</tr>
</tbody>
</table>

* 217 total units permitted at < 60 ppm:
  - 72 units permitted at < 60 ppm did not have a source test result
Of the 63 metal heat treating furnaces with source tests below 30 ppm, heat inputs range between 2.1 and 24 MMBtu/hr

- 30 units are ≤ 5 MMBtu/hr
- Even distribution of heat inputs for metal heat treating furnaces with NOx source tests below 30 ppm are < 20 MMBtu/hr

### Units vs. Heat Input Ranges

<table>
<thead>
<tr>
<th>Heat Input (MMBtu/hr)</th>
<th>Units with Source Test &lt; 60 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5</td>
<td>30</td>
</tr>
<tr>
<td>&gt; 5 to &lt; 20</td>
<td>32</td>
</tr>
<tr>
<td>≥ 20</td>
<td>1</td>
</tr>
</tbody>
</table>
Metal Heat Treating Furnaces – Permit Limits vs. Source Test Results Evaluation

- Staff compared NOx permit limit data with NOx source test results to determine metal heat treating furnace performance relative to permitted levels
- Confirmed “compliance margin” between permitted and source tested NOx levels
Metal Heat Treating Furnaces – Permit Limits vs. Source Test Results Evaluation

**Permit Limit vs. Source Test Result**

- **Difference between NOx permit limit and NOx source test result**
  - Source test result ranges from 0.3* - 113 ppm lower than permit limit
  - Average Difference: 18 ppm (32% lower)

*Outlier: One source test 6.1 ppm above unit’s permit limit*
Staff categorized source test data by furnace type

- Reviewed data to determine correlation between source test result and furnace type

All furnace types have a source test result < 25 ppm
Permitted - NOx Concentration Level:
- **RECLAIM**: 58% units permitted < 60 ppm
- **Non-RECLAIM**: 52% units permitted < 60 ppm
- RECLAIM units that do not use the default emission factor (102 ppm) are permitted at a much lower limit (≤ 60 ppm)

Source Tests - NOx Concentration Level:
- NOx concentration levels range from 4.6 to 115 ppm
- Based on 197 source tests, 47% are below 40 ppm
- All furnace types have a source test result < 25 ppm
Observations

- Source test results appear promising for potential emission reductions
  - Average source test result for metal melting furnaces is ~44 ppm
  - Average source test result for heat treating furnace is ~42 ppm
  - Further review necessary to examine applicability across equipment type
- Recent retrofits to be considered in rule development approach
Other Regulatory Requirements
Objective

- Objective is to assess existing units on a local, state, and national level to:
  - Evaluate permit limits of other air districts and facility equipment across the country
  - Specify current BACT for furnaces within the South Coast AQMD
- Use data to assess potential BARCT NOx concentration limit with respect to other established limits
### Staff Assessment of Emission Limits for Existing Units – South Coast AQMD (BACT)

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Equipment Type</th>
<th>Heat Input (MMBtu/hr)</th>
<th>NOx Emission Limit (ppm @ 3% O2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Extrusion Corp. (Alhambra, CA)</td>
<td>Reverberatory Furnace (Melting Furnace)</td>
<td>12.8</td>
<td>37</td>
</tr>
<tr>
<td>Carlton Forge Works (Paramount, CA)</td>
<td>Forging Furnace (Heat Treating Furnace)</td>
<td>5.0</td>
<td>30</td>
</tr>
<tr>
<td>Air District</td>
<td>Rule #</td>
<td>Rule Date</td>
<td>Emission Limit</td>
</tr>
<tr>
<td>-------------------------------------------------------------------</td>
<td>-----------------</td>
<td>--------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Ventura County Air Pollution Control District</td>
<td>Rule 74.34</td>
<td>12/13/2016</td>
<td>60 ppm</td>
</tr>
<tr>
<td>Sacramento Metro Air Quality Management District</td>
<td>BACT Clearinghouse Determination #: 211</td>
<td>BACT Determination Date: 12/12/2018</td>
<td>60 ppm</td>
</tr>
<tr>
<td>Amador Air District</td>
<td>SIP Rule 19</td>
<td>9/14/1971</td>
<td>140 lbs/hr</td>
</tr>
<tr>
<td>San Joaquin Valley Air Pollution Control District</td>
<td>Rule 4301</td>
<td>12/17/1992</td>
<td>140 lbs/hr</td>
</tr>
</tbody>
</table>
## Staff Assessment of Emission Limits for Existing Units – Other Air Districts (BACT)

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Equipment</th>
<th>Heat Input (MMBtu/hr)</th>
<th>NOx Emission Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vista Metals (Fontana, CA)</td>
<td>Billet Furnace</td>
<td>8.0</td>
<td>40</td>
</tr>
<tr>
<td>Commonwealth Aluminum Concast (Long Beach, CA)</td>
<td>Reverberatory Furnace</td>
<td>31.5</td>
<td>60</td>
</tr>
<tr>
<td>International Extrusion Corporation (Alhambra, CA)</td>
<td>Metal Heating Furnace</td>
<td>8.8</td>
<td>40</td>
</tr>
<tr>
<td>Superior Industries International (Van Nuys, CA)</td>
<td>Reverberatory Furnace</td>
<td>12.6</td>
<td>43</td>
</tr>
<tr>
<td>Custom Alloy Sales (Lynwood, CA)</td>
<td>Reverberatory Furnace</td>
<td>6.0</td>
<td>39</td>
</tr>
<tr>
<td>International Extrusion Corporation (Alhambra, CA)</td>
<td>Reverberatory Furnace</td>
<td>12.8</td>
<td>37</td>
</tr>
</tbody>
</table>
# Staff Assessment of Emission Limits for Existing Units – U.S. EPA (BACT)

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Equipment Type</th>
<th>Heat Input (MMBtu/hr)</th>
<th>Calculated NOx Emission Limit (ppm @ 3% O2)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constellium – Element 13 (Colbert County, AL)</td>
<td>Melting/Sidewell Furnace 8</td>
<td>36.0</td>
<td>33</td>
</tr>
<tr>
<td>Nucor Steel – Berkeley (Berkeley County, SC)</td>
<td>Galvanneal Furnace 2</td>
<td>22.0</td>
<td>39</td>
</tr>
<tr>
<td>Big River Steel (Osceola, AR)</td>
<td>Annealing Furnace</td>
<td>85.0</td>
<td>83</td>
</tr>
<tr>
<td>Nucor Steel Kankakee (Kankakee County, IL)</td>
<td>Reheat Furnace</td>
<td>126.0</td>
<td>58</td>
</tr>
<tr>
<td>Gerdau Sayreville (Middlesex County, NJ)</td>
<td>Billet Reheat Furnace</td>
<td>173.0</td>
<td>83</td>
</tr>
<tr>
<td>Constellium – Alloys Plant (Colbert County, AL)</td>
<td>Annealing Furnace</td>
<td>8.0</td>
<td>66</td>
</tr>
<tr>
<td>Constellium – Alloys Plant (Colbert County, AL)</td>
<td>Two Heat Treat Furnaces</td>
<td>25.0</td>
<td>50</td>
</tr>
</tbody>
</table>

**Reference:** U.S. EPA. RACT/BACT/LAER Clearinghouse (RBLC).
South Coast AQMD: BACT Review
- Metal Melting Furnaces: 37 ppm
- Metal Heat Treating Furnaces: 30 ppm

Other California Air Districts
- BARCT: 60 ppm for both metal melting and metal heat treating furnaces
- BACT: 37 ppm (metal melting) and 40 ppm (metal heat treating)
  - Lowest 6 emitters all located within the South Coast AQMD

U.S. EPA: BACT Review
- Metal Melting Furnace: 33 ppm
- Metal Heat Treating Furnace: 39 ppm
Next Steps

- Continue site visits
- Continue meetings with burner manufacturers
- Examine process NOx from metal melting and heat treating
- Gather preliminary cost data for retrofit technology implementations

<table>
<thead>
<tr>
<th>Rule Development Activity</th>
<th>Tentative Schedule</th>
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<tbody>
<tr>
<td>Next Working Group Meeting</td>
<td>September 2019</td>
</tr>
<tr>
<td>Public Workshop</td>
<td>September 2019</td>
</tr>
<tr>
<td>Set Hearing</td>
<td>October 4, 2019</td>
</tr>
<tr>
<td>Public Hearing</td>
<td>November 1, 2019</td>
</tr>
</tbody>
</table>
# Contacts

<table>
<thead>
<tr>
<th>PR 1147.2</th>
<th>PAR 1147</th>
<th>RECLAIM Questions</th>
<th>General Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>James McCreary</strong></td>
<td><strong>Shawn Wang</strong></td>
<td><strong>Kevin Orellana</strong></td>
<td><strong>Susan Nakamura</strong></td>
</tr>
<tr>
<td>Assistant Air Quality Specialist</td>
<td>Air Quality Specialist</td>
<td>Program Supervisor</td>
<td>Assistant</td>
</tr>
<tr>
<td><a href="mailto:jmccreary@aqmd.gov">jmccreary@aqmd.gov</a> 909-396-2451</td>
<td><a href="mailto:swang@aqmd.gov">swang@aqmd.gov</a> 909-396-3319</td>
<td><a href="mailto:korellana@aqmd.gov">korellana@aqmd.gov</a> 909-396-3492</td>
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</tr>
<tr>
<td><strong>Uyen-Uyen Vo</strong></td>
<td><strong>Gary Quinn, P.E.</strong></td>
<td><strong>Gary Quinn, P.E.</strong></td>
<td></td>
</tr>
<tr>
<td>Program Supervisor</td>
<td>Program Supervisor</td>
<td>Program Supervisor</td>
<td></td>
</tr>
<tr>
<td><a href="mailto:uvo@aqmd.gov">uvo@aqmd.gov</a> 909-396-2238</td>
<td><a href="mailto:gquinn@aqmd.gov">gquinn@aqmd.gov</a> 909-396-3121</td>
<td><a href="mailto:gquinn@aqmd.gov">gquinn@aqmd.gov</a> 909-396-3121</td>
<td></td>
</tr>
<tr>
<td><strong>Mike Morris</strong></td>
<td><strong>Michael Krause</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning and Rules Manager</td>
<td>Planning and Rules Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="mailto:mmorris@aqmd.gov">mmorris@aqmd.gov</a> 909-396-3282</td>
<td><a href="mailto:mkrause@aqmd.gov">mkrause@aqmd.gov</a> 909-396-2706</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RECLAIM Questions**

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**Gary Quinn, P.E.**
Program Supervisor
gquinn@aqmd.gov 909-396-3121