WORKING GROUP MEETING #5
PROPOSED AMENDED RULE 1407
CONTROL OF EMISSIONS OF ARSENIC, CADMIUM AND NICKEL FROM NON-CHROMIUM ALLOY MELTING OPERATIONS

July 19, 2018

SCAQMD Headquarters

Diamond Bar, CA

Agenda

- Summary of previous working group meeting
- Rule concepts
  - Purpose and Applicability
  - Exemptions
  - Definitions
  - Point Source Controls
  - Emission Control Device Monitoring
  - Source Test Requirements
  - Source Test Methodology
- Rule development schedule

Summary of Working Group Meeting #4 (PAR 1407 and PR 1407.1)

- Overview of rule development process and schedule, including key milestones
- Revision of initial approach to have one rule to address all metal melting operations upon request of industry
- Approach revised to have two (2) separate rules
  - PAR 1407 will address non-chromium alloy melting operations
  - PR 1407.1 will address chromium alloy melting operations
- Discussed initial concepts for both PAR 1407 and PR 1407.1

Rule Concepts - Overview

- Rule concepts are provided to promote discussion
- Stakeholder input and further information can change concepts as they are developed into rule language
- General approach will focus on measures used for recent toxic rules that address toxic metal emissions, including fugitives

Overview

- Presentation will focus on initial concepts for:
  - Purpose
  - Applicability
  - Exemptions
  - Definitions
  - Point Source Controls
  - Emission Control Device Monitoring
  - Source Test Methodology
- Format of presentation will consist of a summary of current Rule 1407 provisions and then PAR 1407 provisions

Purpose and Applicability

Purpose

- Purpose will be modified to reflect separate rulemakings for:
  - PAR 1407 (Non-chromium/low-chromium alloys); and
  - PR 1407.1 (Chromium alloys)
- Rule 1407 purpose currently states:
  - The purpose of this rule is to reduce emissions of arsenic, cadmium, and nickel from non-ferrous metal melting operations
- Revise Rule 1407 purposes to replace “non-ferrous metal melting operations” with “non-chromium alloy metal melting operations”
- PAR 1407 purpose
  - The purpose of this rule is to reduce emissions of arsenic, cadmium, and nickel from non-chromium/low-chromium alloy melting operations

Proposed Applicability

- Rule 1407 purpose currently states:
  - This rule applies to all persons who own or operate non-ferrous metal melting operation(s), including but not limited to, smelters (primary and secondary), foundries, die-casters, coating processes (galvanizing and tinning) and other miscellaneous processes such as dip soldering, brazing and aluminum powder production
- Revise Rule 1407 applicability to replace “non-ferrous metal melting operations” with “non-chromium alloy metal melting operations”
- PAR 1407 applicability
  - This rule applies to all persons who own or operate non-chromium alloy metal melting operation(s), including but not limited to, smelters (primary and secondary), foundries, die-casters, coating processes (galvanizing and tinning) and other miscellaneous processes such as dip soldering, brazing and aluminum powder production

Defining Non-Chromium Alloys

- Staff examined each alloy type for chromium content
  - Aluminum alloys have < 0.4% chromium
    - Aluminum 6066 aluminum alloy has the highest chromium content
  - Brass, bronze and lead alloys are not expected to contain chromium
  - Carbon steel has no minimum specifications for chromium
  - Stainless steel, alloy steel, and super alloys have ≥ 0.4% chromium
- Proposed definition of non-chromium/low-chromium alloys
  - Aluminum, aluminum alloys, brass, bronze, and carbon steel alloys with <0.5% chromium

SCAQMD Rules Regulating Toxic Air Contaminants from Metal Melting Operations

- Staff categorized alloys and current source-specific air toxics rules for metal melting
  - Metal melting operations for aluminum, brass, bronze, and lead alloys are currently regulated under Rule 1407 and 1420
  - Super alloys are currently exempt from Rule 1407 due to low arsenic and cadmium content, but may have higher chromium contents
  - Metal melting operations for steel to be regulated under Rules 1407 or 1420
  - Proposed Rule 1407.1 will apply to alloys that contain ≥ 0.5% chrome content

Exemptions

Exemptions for Facilities Regulated Under Other Metal Melting Rules

- Rule 1407 currently exempts metal melting operations regulated under Rule 1420
- Since the adoption of Rule 1407, additional lead melting rules have been adopted
- Lead series rules will have similar or more stringent provisions than PAR 1407 – including these facilities in PAR 1407 is redundant
- Operations and sources exempt from Rule 1420 because of low lead content (≤ 0.05%) may be subject to either PAR 1407 or PR 1407.1

PAR 1407 Exemptions for Metal Melting Operations Regulated Under Other Rules

- PAR 1407 will exempt metal melting operations regulated under the following rules:
  - Rule 1420 – Emissions Standard for Lead
  - Rule 1420.1 – Emission Standards for Lead and Other Toxic Air Contaminants from Large Lead-Acid Battery Recycling Facilities
  - Rule 1420.2 – Emission Standards for Lead from Metal Melting Facilities
  - Proposed Rule 1407.1 - Control of Emissions of Toxic Air Contaminants from Chromium Alloy Melting Operations

Current Rule 1407 Low Throughput and Purity Exemptions

- Current Rule 1407 includes exemptions from requirements (d) and fugitive emission controls (e) if:
  - Facilities melt ≤ 1 ton per year
  - Operations melt less than the quantities for all metals listed in Table I (Sum of fraction of metals melted relative to exemption limit must be ≤1)
  - Operations melt alloys with ≤ 0.004% cadmium and ≤ 0.002% arsenic by weight

Current Rule 1407 Table I

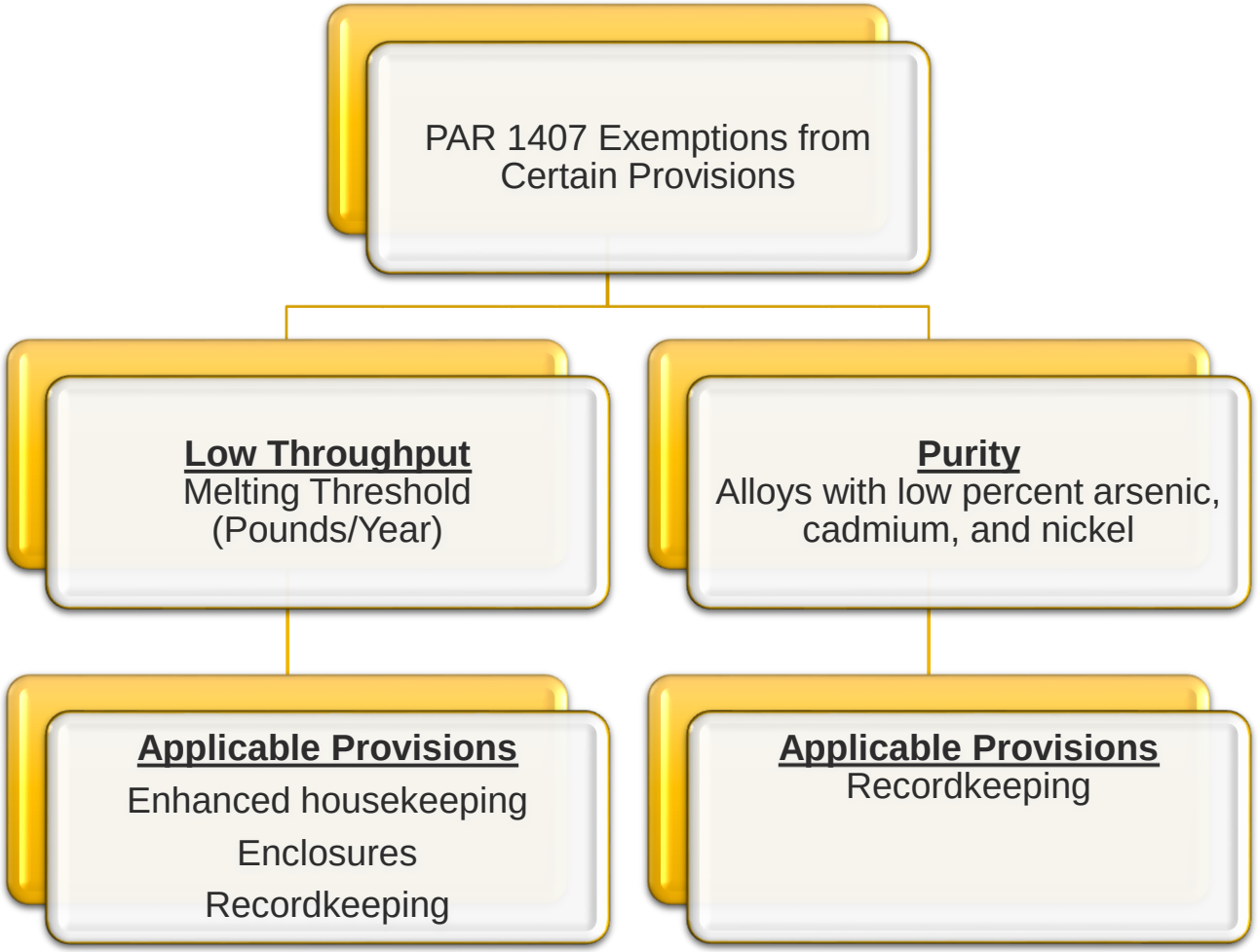
Exemption Limits For Metal Melted

Metal	Exemption Limit (tons per year)
Pure Lead	400
Hard Lead	200
Aluminum Scrap	125
Aluminum Ingot containing more than 0.004 percent cadmium or 0.002 percent arsenic by weight	125
Solder	100
Zinc Scrap	30
Copper or copper-based alloys (except scrap) containing more than 0.004 percent cadmium or 0.002 percent arsenic by weight	30
Type Metal	25

Low Throughput and Purity Exemption Considerations: PAR 1407

- Thresholds for risk levels have changed as risk assessment procedures have been updated
- Fugitive emissions have been shown to be a significant source of emissions from metal melting operations
- Language used in exemptions is overly broad
  - For example, exemption provided for operations melting aluminum ingots or clean aluminum scrap and for aluminum reverberatory scrap furnaces
    - Current language does not address potential toxic air contaminants
    - Aluminum alloy 2020 (0.25% Cadmium) and 2218 (2% Nickel) would be exempt if using clean scrap
- Staff will discuss proposed revisions to low throughput and purity exemptions at next Working Group Meeting

Concepts for Low Throughput and Purity Exemptions



Current Rule 1407: Other Exemptions

- Exemption from subdivision (d) - Requirements
  - Aluminum ladles, etc. used to convey aluminum from a melting furnace to casting equipment
  - Operations melting aluminum ingots or clean aluminum scrap
  - Aluminum reverberatory scrap furnaces
  - Control equipment used exclusively to control fugitive emissions

PAR 1407 Concepts for Other Exemptions

- Retain exemption for ladles and other conveying equipment
  - Controlled through housekeeping and other fugitive control measures
- Remove other aluminum furnace exemptions
  - Overly broad exemption that does not address toxics
  - Exemptions still available based on low-throughput and purity
- Remove exemption for control equipment used for fugitive emissions
  - Control of fugitive emissions are key area of focus

Other Aluminum Processing Exemptions

Aluminum Furnaces Exclusively Processing Al Scrap or Combination of Al Scrap and Ingot						
Scenario	Vent to Control Device	Parametric Monitoring	Visual Inspection	Limited House-Keeping	Source Testing	Record-keeping
Current Rule 1407	No	No	No	Yes	No	Yes
PAR 1407	Possibly based on throughput	Yes (if vented to control device)	Yes	Yes	Yes (if vented to control device)	Yes

Definitions

Definitions

- Where appropriate current Rule 1407 will add, remove, or modify definitions to address new rule provisions similar to those used in recently-adopted toxic rules
- Some definitions will be added to address provisions that were included in the rule, while others will be discussed later when they come up
- Definitions added:
  - **Bag Leak Detection System**: a system that monitors electrical charge transfer based in triboelectric or electrostatic induction to continuously monitor bag leakage and similar failures by detecting changes in particle mass loading in the exhaust (Parametric Monitoring from Rule 1420)
    - Currently, Rule 1407 references **Broken Bag Detector** [clause (d)(5)(B)(iii)] which is not defined
  - **Foundry:** any facility, operation, or process where metal or a metal alloy is melted and cast (Applicability from Rule 1420)

Definitions *(continued)*

Definitions added (continued)

- **Building Enclosure**: a permanent building, enclosed with a floor, walls, and a roof to prevent exposure to the elements, (e.g., precipitation, wind, run-off), with limited openings to allow access for people, vehicles, equipment, or parts that is free of breaks or deterioration that could cause or result in fugitive emissions.
- **Enclosure Opening**: Any opening such as passages, doorways, bay doors, and windows in a building enclosure.
- **Non-Chromium Alloy** is a substance composed of two or more metals or a metal and another element which contains 0.5 percent chromium or less by weight.

Definitions (continued)

- Definitions removed:
  - **Clean Aluminum Scrap:** Exemption referencing term removed
  - **District**: Defined in Rule 102 – Definitions
  - **Good Operating Practices**: Will be specified as parametric monitoring requirements
  - **Hard Lead**: Lead containing operations subject to Rule 1420, 1420.1, or 1420.2
  - **Non-Ferrous Metal:** Rule title has been amended to address emissions of arsenic, cadmium and nickel from non-chromium alloys melting operations as opposed to non-ferrous melting operations
  - **Particulate Matter:** Defined in Rule 102 - Definitions
  - **Person:** Defined in Rule 102 - Definitions
  - **Pure Lead:** Lead containing operations subject to Rule 1420, 1420.1, or 1420.2
  - **Solder:** Lead containing operations subject to Rule 1420, 1420.1, or 1420.2
  - **Type Metal:** Lead containing operations subject to Rule 1420, 1420.1, or 1420.2

Point Source Requirements

Point Source Requirements - Background

- Control efficiency ensures that the control equipment adequately removes pollutants
- Collection efficiency ensures that the pollution control device has the appropriate air flow to effectively collect emissions

Current Rule 1407 Point Source Requirements

- All emission points must be vented to an emission collection system
- Gas stream from emission collection system shall be ducted to control device with particulate emissions control efficiency of 99%
- Requires limiting the temperature of the control device inlet gas stream to a maximum of 360 degrees F, unless operator can demonstrate 99% or more control efficiency for arsenic and cadmium at higher temperatures

PAR 1407 Point Source Initial Concepts

- Point source requirements will be similar to recently-approved toxic rules and require, either:
  - Minimum control efficiency of 99%; or
  - Mass outlet emission rate limit for all facility sources based on results from source test subsequent to initial test conducted to demonstrate an outlet emission rate ≤ total mass outlet emission rate equivalent to achieve 99% control efficiency
- Capture system meets design criteria and ventilation velocities of Industrial Ventilation Manual
- Maintain current rule provision that limits the temperature of the control device inlet gas stream to a max. of 360 degrees F

Point Source Requirements – PAR 1407 Concepts for Arsenic Control

- Arsenic emissions may not be effectively controlled by dry filter media
  - Results of recent baghouse testing identified arsenic emissions in gaseous form
  - Baghouse only suitable for particulate emission control, but not for gaseous emissions
  - Wet scrubber in series with 2-stage mesh pad system identified as possible arsenic control option

Point Source Comparison: Current Rule 1407 and PAR 1407

Point Source Requirement	Current Rule 1407	PAR 1407
Control Efficiency (CE) for Particulate Emissions	99% Control Efficiency	99% Control Efficiency
Control Efficiency for Metals	None	99% Control Efficiency
Control Device	Dry Filter Baghouse	Dry Filter Baghouse; arsenic emissions to be controlled by wet scrubber or equivalent
Capture Efficiency	No Requirement	Applicable Industrial Ventilation

Source Testing

Source Test Provisions – Current Rule 1407

- Current Rule 1407 requires one-time source test be conducted to demonstrate 99% control efficiency
- Executive Officer may require additional testing periodically or when there is process change(s)

Source Testing Requirements – PAR 1407

- Initial and periodic source testing needed to confirm point source mass emission limits or to demonstrate capture and control efficiency limits
- Initial source test to demonstrate 99% control efficiency and subsequent tests that may only require measurement of stack outlet mass emissions
- Recommend periodic source testing for point sources - every five years
  - Proposed enhancements to parametric monitoring provides information regarding operation of the pollution control equipment between source tests
  - Periodic source tests are needed to quantify the emissions and/or control efficiency of the air pollution control equipment

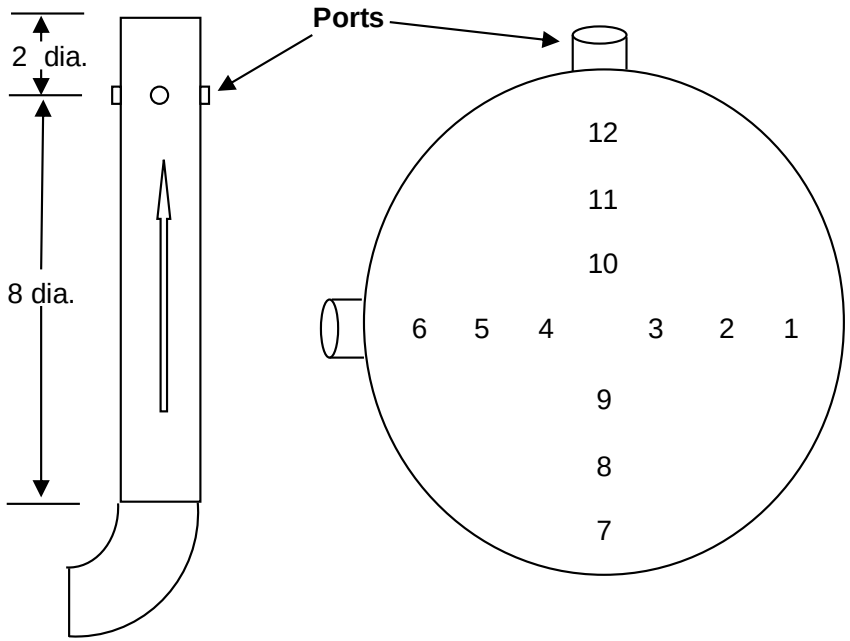
Source Test Methodology

- Purpose of Testing
- Sampling Location
- Process Information
- Determination of Exhaust Flow Rate
- Arsenic, Cadmium, and Nickel Emissions (CARB Method 436)
- Results

Purpose of Testing

- Information only, point source identification, control efficiency check, emission rate or factor determination
- Screening Tests
  - Single sampling runs with modified method
  - lower cost, simpler, easier to identify potential sources and relative emissions
  - Results are qualitative; cannot be used for compliance or emission factor determination
- Full Source Tests
  - three (3) run set of tests with protocol method
  - Higher cost, more complicated logistics
  - Comprehensive and statistically significant results; can be used for compliance and emission factor determination
- Results – concentration, mass emissions, emission factors

Sampling Location



Stack Diagram

Stack Cross-Section

Stack Diameter = 12 in.

Traverse Point Numbers	Distance from Inner Stack Wall (in.)
1, 7	0.53
2, 8	1.75
3, 9	3.55
4, 10	8.45
5, 11	10.25
6, 12	11.47

Sample Probe Placement

Modified Sample Probe Placement

Process Information

- Burner gas flow rate
- Material processed
- Production rate
- Process temperatures
- Exhaust flow (if applicable)
- Exhaust capture efficiency (if applicable)
- Pressure drops across control devices (if applicable)

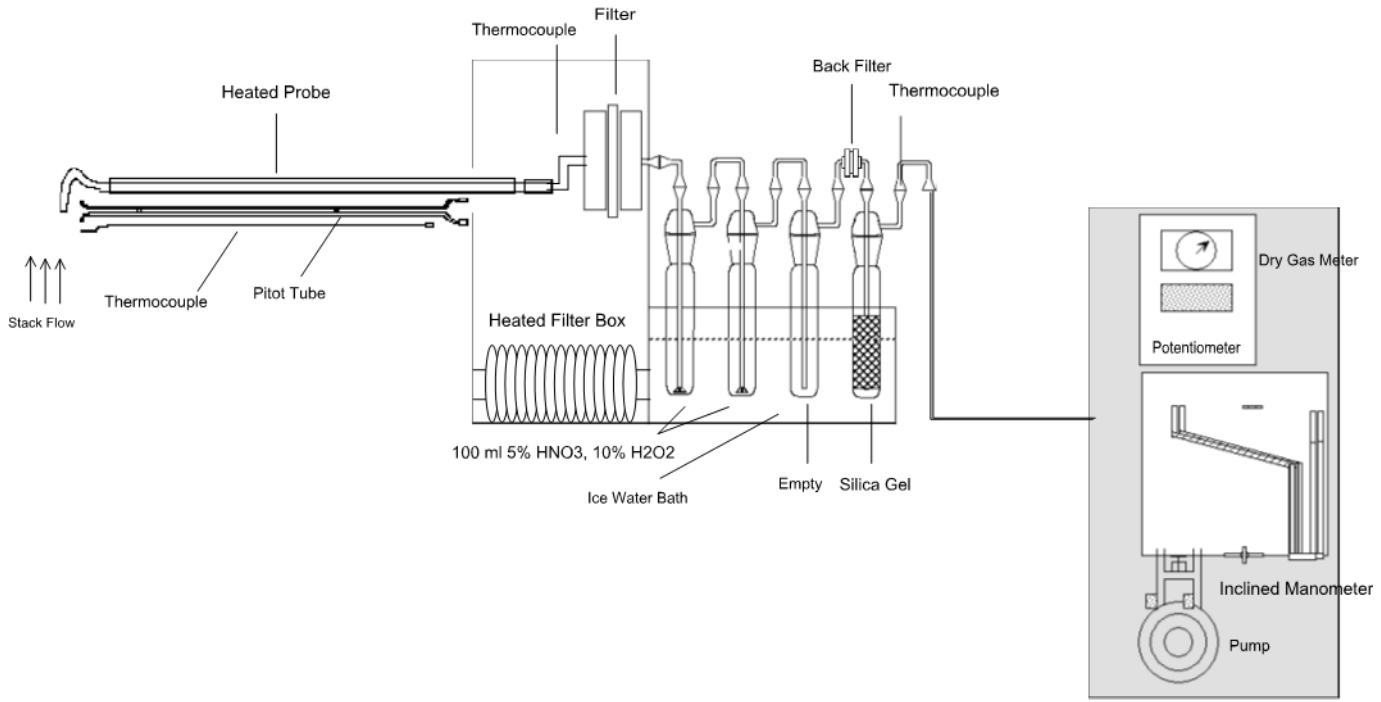
Exhaust Flow Rate

- Direct Measurement
  - Pitot tube for differential pressure
  - Thermocouple for exhaust temperature
  - Multi-point traverse across two cross-sectional diameters
  - Use stack cross-sectional area, exhaust gas density and moisture content to calculate flow rate
- Calculated from Fuel Flow and Exhaust Gas Composition
  - Dedicated fuel gas meter
  - Exhaust gas measurement of CO_2 and O_2
  - Exhaust flow rate calculated using carbon number of fuel (corrected for ambient CO_2)

Arsenic, Cadmium, and Nickel Emissions

- California Air Resources Board Method 436
- Samples extracted through probe, sample line, heated filter, impinger train, and sample gas meter with a vacuum pump
- First 2 impingers contain 5 wt.% nitric acid and 10 wt.% hydrogen peroxide solution
- Probe, sample line, filter, and impinger solutions recovered following sampling
- As, Cd, and Ni determined by inductively-coupled plasma mass spectrometry (ICP-MS) or direct aspiration atomic absorption spectroscopy (DAAAS)

CARB M436 – Arsenic, Cadmium, and Nickel



Results

- Concentration (ng/m^3, ppm)
  - Determined by screening or full source testing
- Mass Emissions (g/hr, lb/hr, lb/year)
  - Qualitatively determined by screening testing with fuel flow and exhaust gas composition
  - Quantitatively determined by protocol testing
- Emission Factors (g/ton, lb/MMBtu)
  - Qualitatively determined by screening testing with fuel flow and exhaust gas composition
  - Quantitatively determined by protocol testing

Parametric Monitoring

Emission Control Device Monitoring - Overview

- Monitoring of key parameters of pollution controls can identify operational issues of air pollution control equipment
- Benefits of parametric monitoring:
  - Provides a more continuous status of operating conditions
  - Can provide indication that emissions are not well controlled
  - Can alert the operator of operational issues or needed maintenance on the pollution control equipment
- PAR 1407 will retain many elements of the maintenance program of current Rule 1407, but make them specific requirements instead of part of approved program
  - Additional elements similar to those required in Rule 1420

Emission Control Device Monitoring – Current Rule 1407

- Rule 1407 currently requires facilities to have a maintenance program with the following practices:
  - Maximum allowable variations from designed values of collection equipment shall be specified
  - Control equipment and ducting shall be inspected and frequency recorded
  - Flow meters indicating air velocity shall be installed in collection ducting
  - Alarmed pressure gauges with specified high and low settings for pressure drop shall be installed across filtering media
  - Alarmed broken bag detectors shall be installed in baghouses
  - Temperature of the inlet to the control device shall be monitored with a temperature gauge

Emission Control Device Monitoring – PAR 1407

PAR 1407 will maintain emission control device monitoring provisions already included in Rule 1407 and will add provisions that address:

- Demonstrating that the emission control device is maintained within the recommended range of minimum capture velocity
- Recording the pressure across emission control device filter with a continuous data acquisition system; and
- Require Bag Leak Detection System (BLDS) – currently referred to as an “alarmed broken bag detector” shall be operated pursuant to SCAQMD Rule 1155

Minimum Capture Velocity Monitoring – PAR 1407

Emission collection system will be required to be operated at a minimum capture velocity specified in the most current edition of Industrial Ventilation Design Manual determined by:

- Use of hot-wire anemometer used to demonstrate emission control device is maintaining the required capture efficiency for emission control device
- Demonstrating during source test that all emission points are captured by the associated pollution control equipment by a quantitative measurement technique approved by the District
  - Capture system shall meet design criteria and ventilation velocities of Industrial Ventilation Manual
- Smoke testing during source testing and at least once every 6 months thereafter, unless it can be demonstrated to present an unreasonable risk

Comparison: Current Rule 1407 and PAR 1407 – Parametric Monitoring Requirements

Requirement	Current Rule 1407	PAR 1407
Monitoring temperature at inlet to the control device to ensure maximum temperature not exceeding 360 degrees F	Yes	Yes
Control equipment inspections and recordkeeping	Yes	Yes
Measuring key parameters such as hood and duct velocities and flow	Yes, maximum variation noted in maintenance plan	Yes
Operate a broken bag detector (or Bag Leak Detection System) with an alarm system in baghouse	Yes, per maintenance plan	Yes, pursuant to Rule 1155
Alarmed pressure gauges with specified settings across filter media	Yes, per maintenance plan	Yes, using gauge with data acquisition system
Demonstrate during source testing and periodically that collection system meets design criteria and ventilation velocities recommended by Industrial Ventilation Manual or other quantitative measurement technique	No	Yes, calibrated hot-wire anemometer
Smoke testing during source testing and at least once every 6 months	No	Yes

Next Steps

Action	Target Dates
Working Group Meetings	August 2018
Public Workshop	August 2018
Stationary Source Committee	September 21, 2018
Set Hearing	October 5, 2018
Public Hearing	November 2, 2018

Contact Information

Rule Contact:

Ken Ellis
(909) 396-2457
kellis@aqmd.gov

Mike Morris
(909) 396-3282
mmorris@aqmd.gov