Proposed Rule 1407.1
Control of Emissions of Toxic Air Contaminants from Chromium Alloy Melting Operations

Working Group Meeting #5

June 6, 2018

South Coast AQMD

Agenda

- Summary of Working Group Meeting #4 for PAR 1407 and PR 1407.1
- General Approach
- Initial rule concepts
  - Purpose
  - Applicability and Exemptions
  - Information Gathering
    - Operational Information
    - Metals Composition Testing
    - Emissions Testing
      - Source Test Methodology
      - Source Testing
    - Reporting

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

- Summary of Working Group Meeting #3 and comments, including comments from California Metals Coalition
- Overview of rule development schedule and process, including key milestones
- Discussed new approach for PAR 1407 and PR 1407.1
  - Upon request of industry and challenges regarding the lack of emissions data for ferrous melting operations, bifurcated PAR 1407
    - PAR 1407 will address non-chromium alloy melting operations
    - PR 1407.1 will address chromium alloy melting operations
    - Discussed initial concepts for PAR 1407 and PR 1407.1
      - General approach
      - Initial concepts
      - Tentative schedules

General Approach for PR 1407.1

- Gather information to assess toxic air contaminant emissions with focus on:
  - Facility and equipment inventory
  - Processing data
  - Recordkeeping and reporting, and
  - Emissions testing
- Assess information collected
  - If warranted, initiate additional rulemaking to address toxic air contaminant emissions

Initial Rule Concepts – Purpose

Background

- Chromium alloys contain toxic air contaminants which have the potential to be emitted during metal melting operations
- A source test of a chromium alloy furnace has shown that some chromium is converted to hexavalent chromium
- Additional emissions data is needed to quantify the type and amount of toxic air contaminant emissions that occur from chromium alloy melting operations
- Emission data will be used to assess the need for requirements to address toxic air contaminant emissions

Proposed Purpose of PR 1407.1

- To gather toxic air contaminant emissions information from chromium alloy melting operations

Initial Rule Concepts – Applicability and Exemptions

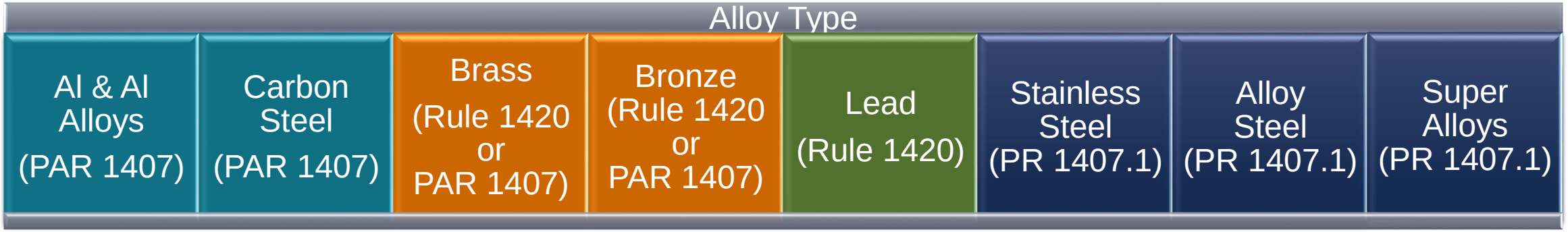
Background

- Staff categorized alloys and current SCAQMD regulations
  - Aluminum, brass, bronze, and lead alloys are already regulated by SCAQMD rules
  - Super alloys are exempt from Rule 1407 due to low arsenic and cadmium content
  - Steel is not regulated by any SCAQMD rule
- Staff examined each alloy type for chromium content
  - Aluminum alloys have < 0.4% chromium
    - Aluminum 6066 is aluminum alloy with 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

Initial Rule Concepts – Applicability and Exemptions *(continued)*

Background *(continued)*

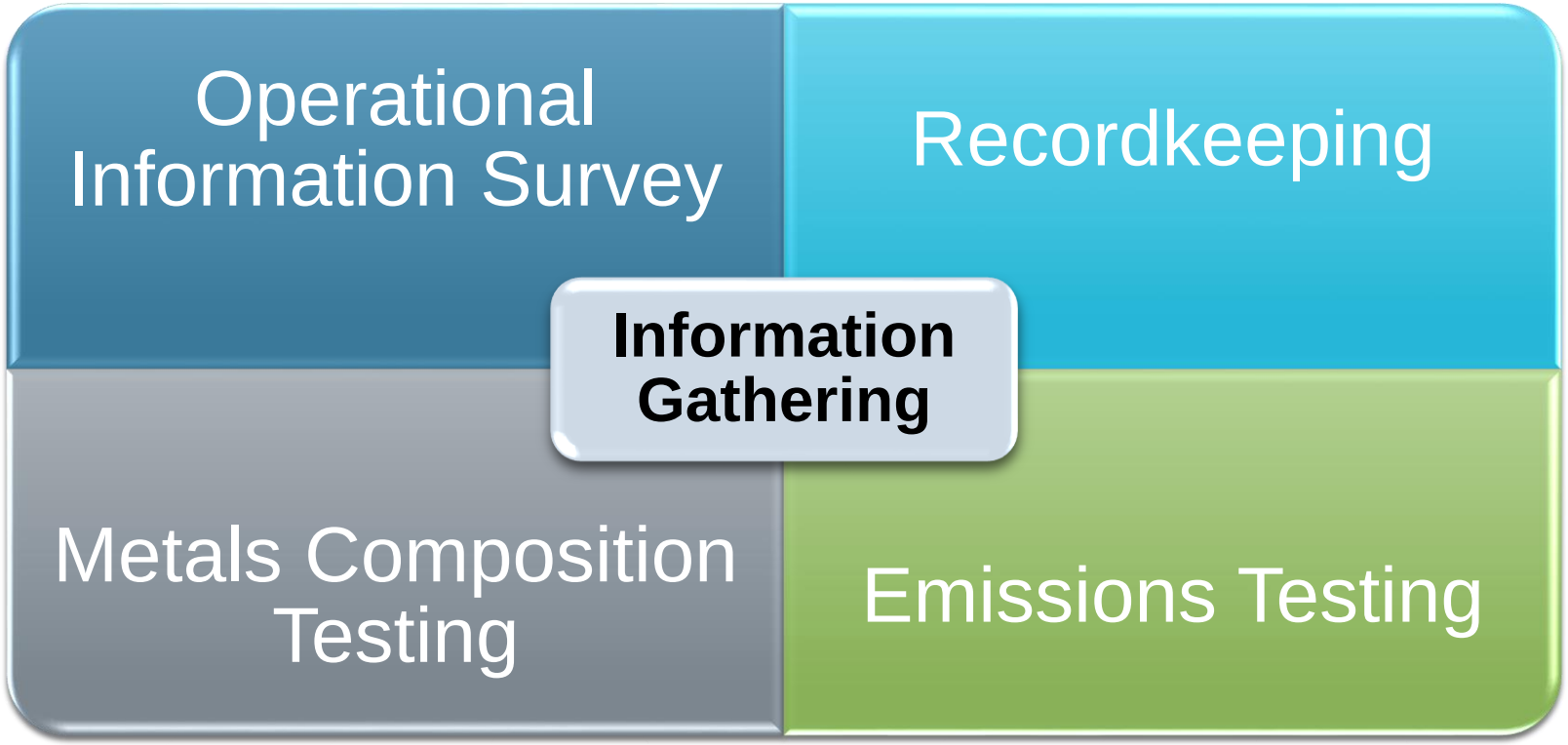
- Potential applicable alloys to assess
  - Stainless steel, alloy steel, and super alloys



Initial Rule Concepts – Applicability and Exemptions *(continued)*

- Proposed Applicability
  - All operations where chromium alloys (contain ≥ 0.5% chromium) are melted
- Exemptions
  - Equipment and structures subject to Rules 1420, 1420.1, and 1420.2
    - Lead series rules contain similar measures that may otherwise be overlapping

Initial Rule Concepts – Information Gathering



Operational Information Survey

Background

- Stainless steel and alloy steel melting furnaces are not regulated by SCAQMD
- Super alloy furnaces regulated under Rule 1407, but are exempt
- As a result:
  - A number of furnaces may not permitted
  - Location of metal melting operations and housekeeping are not regulated

Objective of operational information survey

- Identify types of operations and processes performed
- Collect detailed furnace information and existing pollution controls
- Obtain facility plot plan of location of equipment and processes
- Understand current housekeeping practices

Operational Information Survey
(continued)

Operational Informational Survey will collect

- Casting techniques or processes performed
- Finishing activities or operations performed
- For each metal melting furnace (permitted and unpermitted)
  - Furnace type (reverberatory, electric arc, electric induction, cupola, kettle, etc.)
  - Size and capacity
  - Operating temperatures (average and maximum)
  - Fuel type
    - If gas fired, include BTU rating of furnace
  - Alloy(s) melted
  - Specifications of final product(s)
  - SCAQMD permit or application number, if applicable
    - If applicable, associated control device, including the permit or application number

Operational Information Survey
(continued)

Operational Information Survey *(continued)*

- Facility Plot Plan
  - Dimensions of each building, including opening and dimensions of openings
  - Location and dimensions (height and diameter) of stacks, include weather caps or butterfly valves
  - Location of each metal melting furnace, emission collection system, and emission control device
  - Location of operations for pouring, casting, cooling, degating, cutting, blasting, sanding, and finishing (grinding, polishing, buffing)
  - Location of storage of dust-forming material

Operational Information Survey
(continued)

Operational Information Survey *(continued)*

- Housekeeping
  - Schedule of sweeping, washing, mopping, or vacuuming and method used for the following areas:
    - Where metal wastes are stored, disposed of, recovered, or recycled
    - Surfaces around metal melting operations and subject to vehicular or foot traffic
    - Work stations around buffing, grinding, and polishing operations
    - Parking areas
  - Storage practices for metal-containing trash or debris

Metals Composition Testing

Background

- Each batch of alloy has varying content for each toxic air contaminant
- The composition of alloys may affect the emissions of these toxic air contaminants
- Collecting metals composition data will provide information on the type and amount of toxic air contaminants in alloys

Metals Composition Testing

- Test results, certificates of analyses, or other documentation to identify the content of arsenic, cadmium, chromium, hexavalent chromium, and nickel for the following materials:
  - Raw materials and final materials, per batch
  - Slag and dross, per melt
  - Baghouse catch
  - Waste
  - Other by-products

Recordkeeping

Background

- Data regarding furnace run hours and metals melted is needed to help assess emissions of toxic air contaminants

Proposed Recordkeeping Requirements

- Quarterly records for each metal melting furnace
  - Run hours
  - Melt records – quantity of raw materials processed
    - Including additives, alloys, ingots, scrap, and reruns
    - Data collected from metals composition testing

Emissions Testing

Background

- SCAQMD currently has one hexavalent chromium source test for a ferrous metal melting furnace – hexavalent chromium was detected
- SCAQMD staff offered to conduct source tests at certain facilities as part of rule development, however, facilities were either reluctant or non-responsive
- Further testing is needed to assess toxic air contaminant emissions during chromium alloy melting operations

Objective of Emissions Testing

- Obtain emissions data to assess toxic air contaminant emissions
  - Source tests for multi-metals and hexavalent chromium of chromium alloy melting furnaces will provide toxic air contaminant emissions information

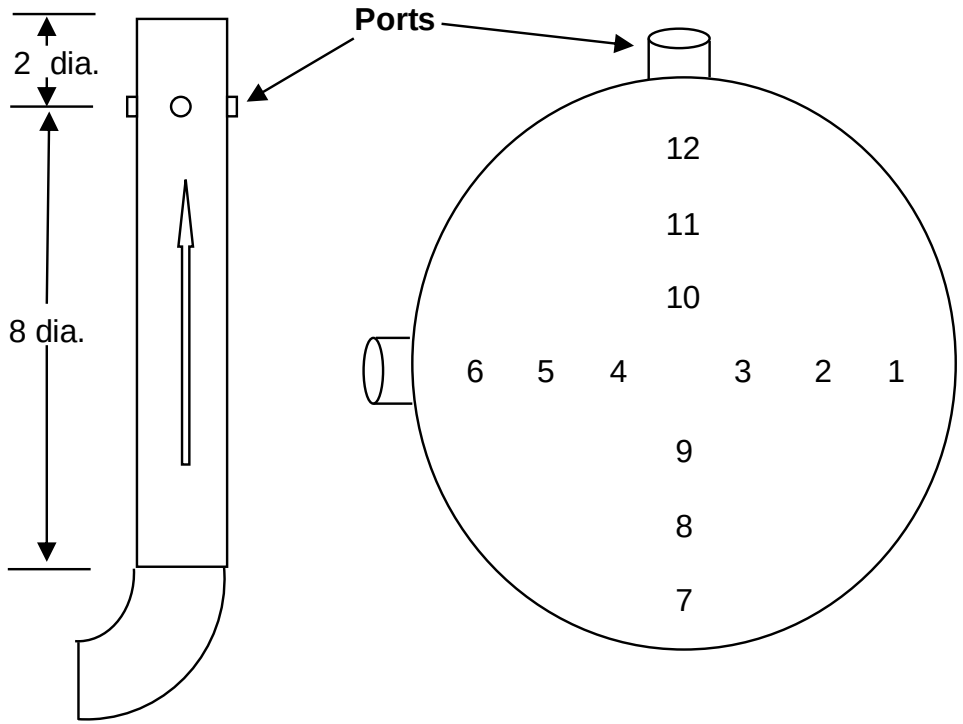
Source Test Methodology

- Purpose of Testing
- Sampling Location
- Process Information
- Determination of Exhaust Flow Rate
- Hexavalent Chromium, Total Chromium Emissions (CARB Method 425)
- Multi-Metals Emissions (CARB Method 436)
- Results

Screening and Protocol Emissions Tests

- Information only, point source identification, control efficiency check, emission rate or factor determination
- Screening Emissions 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
- Protocol Emissions 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 (if applicable)
- Power consumption
- Material processed
- Production rate
- Process temperatures
- Exhaust flow (if applicable)
- Exhaust capture efficiency (if applicable)
- Pressure drops across control devices (if applicable)

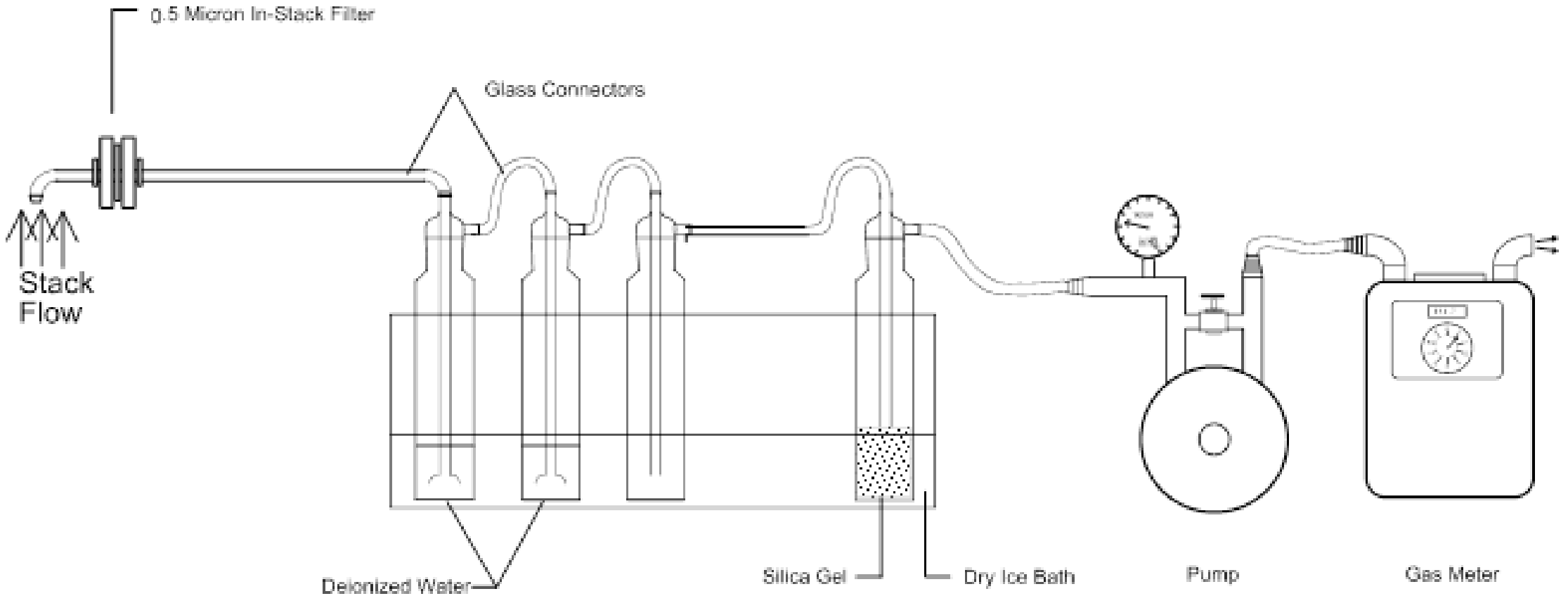
Exhaust Flow Rate

- Direct Measurement
  - Pitot tube for differential pressure
  - Thermocouple for exhaust temperature
  - Multi-point traverse across two cross-sectional diameters of duct
  - 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)

Particulate Matter Emissions

- SCAQMD Method 5.1, 5.2, or 5.3
- Samples extracted through probe, sample line, impinger train, filter, and sample gas meter with a vacuum pump
- First 2 impingers contain deionized water
- Probe, sample line, filter, and impinger solutions recovered following sampling
- Particulate matter determined by gravimetric methods

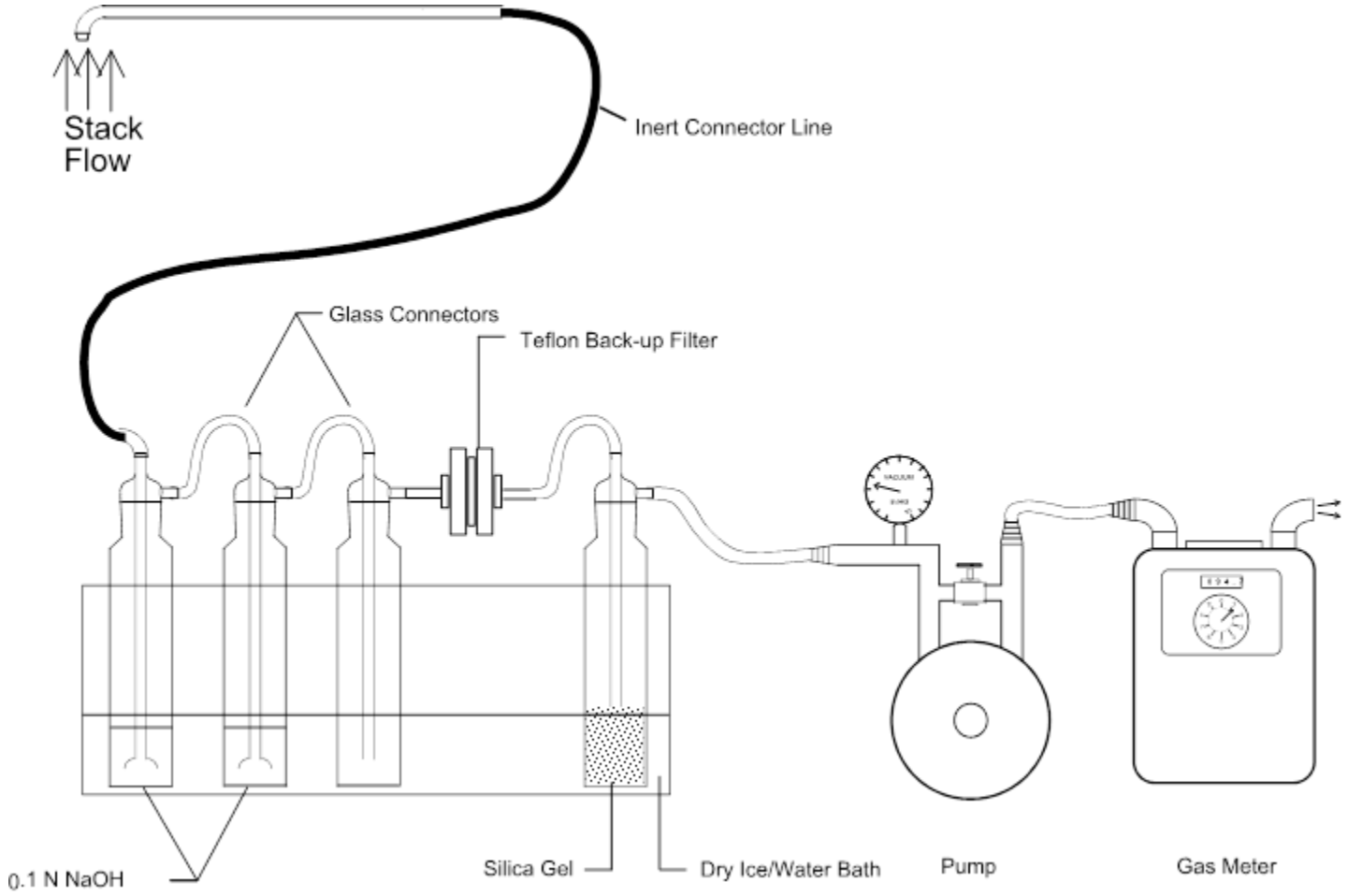
SCAQMD Method 5.3 – Particulate Matter



Hexavalent Chromium, Total Chromium Emissions

- California Air Resources Board Method 425 (CARB M425)
- Samples extracted through probe, sample line, impinger train, filter, and sample gas meter with a vacuum pump
- First 2 impingers contain 0.1N sodium bicarbonate or 0.1N sodium hydroxide solution
- Probe, sample line, filter, and impinger solutions recovered following sampling
- Hexavalent chromium determined by ion chromatography with a post-column reactor (IC/PCR) or colorimetric procedure (IC-C) and photometric detection
- Total chromium determined by inductively-coupled plasma mass spectrometry (ICP-MS) or graphite furnace atomic absorption (GF-AA)

CARB M425 – Hexavalent Chromium

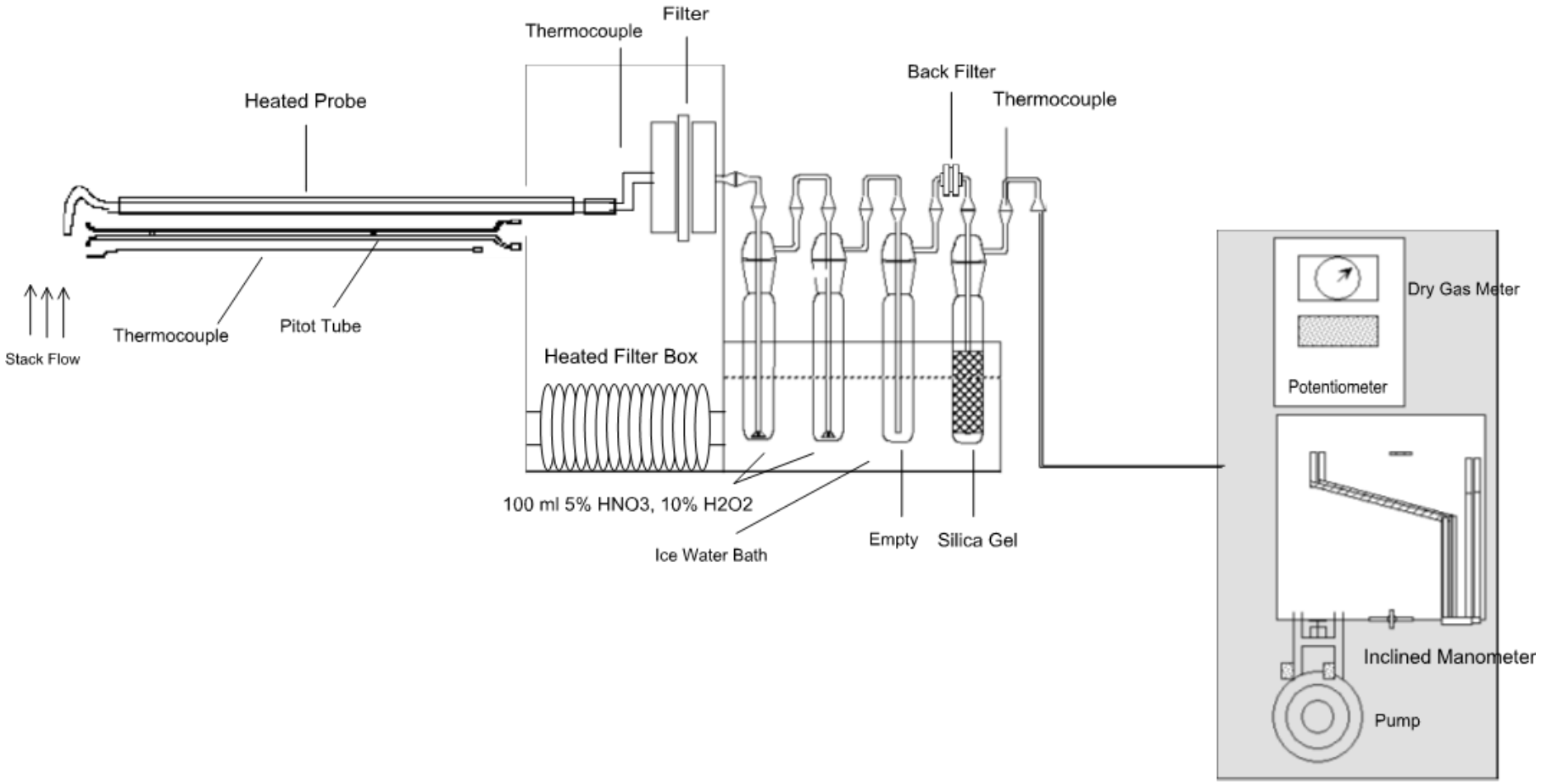


CARB M425 – Sampling Setup

Multi-Metals Emissions

- California Air Resources Board Method 436 (CARB M436)
- 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
- Multi-metals determined by inductively-coupled plasma mass spectrometry (ICP-MS), direct aspiration atomic absorption spectroscopy (DAAAS), or cold vapor atomic absorption spectroscopy (CVAAS)

CARB M436 – Multi-Metals



Results

- Concentration (ng/m^3, ppm)
  - Determined by screening or protocol 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

Initial Concepts – Source Testing

Background

- Source tests for furnaces without stacks will have to be a modified protocol due to inability to test inlet and therefore will be only qualitative
- Source tests for furnaces with stacks, following protocol, will give quantitative results

Proposed Source Testing Requirements

- Owner or operator of chromium alloy melting operations will be required to:
  - Submit a source test protocol for approval prior to testing
  - Conduct source testing for point sources for PM10, multi-metals, and hexavalent chromium
  - Measure mass emissions from the furnace (inlet) and, if applicable, mass emissions from the control device (outlet)
  - Measure the temperature of gas entering the control device

Initial Concepts – Source Testing
(continued)

- Require furnaces with existing control equipment to conduct protocol tests at inlet and outlet for concentration, mass emissions, and control efficiency
  - All furnaces with existing control equipment to be source tested
  - Alloy(s) tested should be alloy most processed in furnace tested
  - If multiple furnaces vented to single control device, then all furnaces should be operating during test (unless otherwise restricted by permit condition)
  - May be used for initial source test requirement, if further testing required
- Require furnaces without existing control equipment to conduct screening tests
  - Not all furnaces without existing control equipment will be required to be source tested
    - Only one of each type of furnace to be source tested
    - Alloy(s) tested should be alloy most processed in furnace tested

Initial Rule Concepts – Reporting

- Within 90 days of rule adoption, provide the Operational Information Survey:
  - Operations conducted at the facility
  - Inventory of furnaces and control devices
  - Facility plot plan
  - Current housekeeping practices
- By 1/31/2020 provide the following information:
  - Processing data for individual furnaces
  - Results of metal composition testing
  - Results of emissions testing

Next Steps

Action	Target Dates
Working Group Meeting #6	July 11, 2018
Stationary Source Committee	July 20, 2018
Public Workshop	July or August 2018
Set Hearing	September 7, 2018
Public Hearing	October 5, 2018

Contact Information

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General Questions

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