Proposed Amended Rule 1407

Working Group #3

January 30, 2018

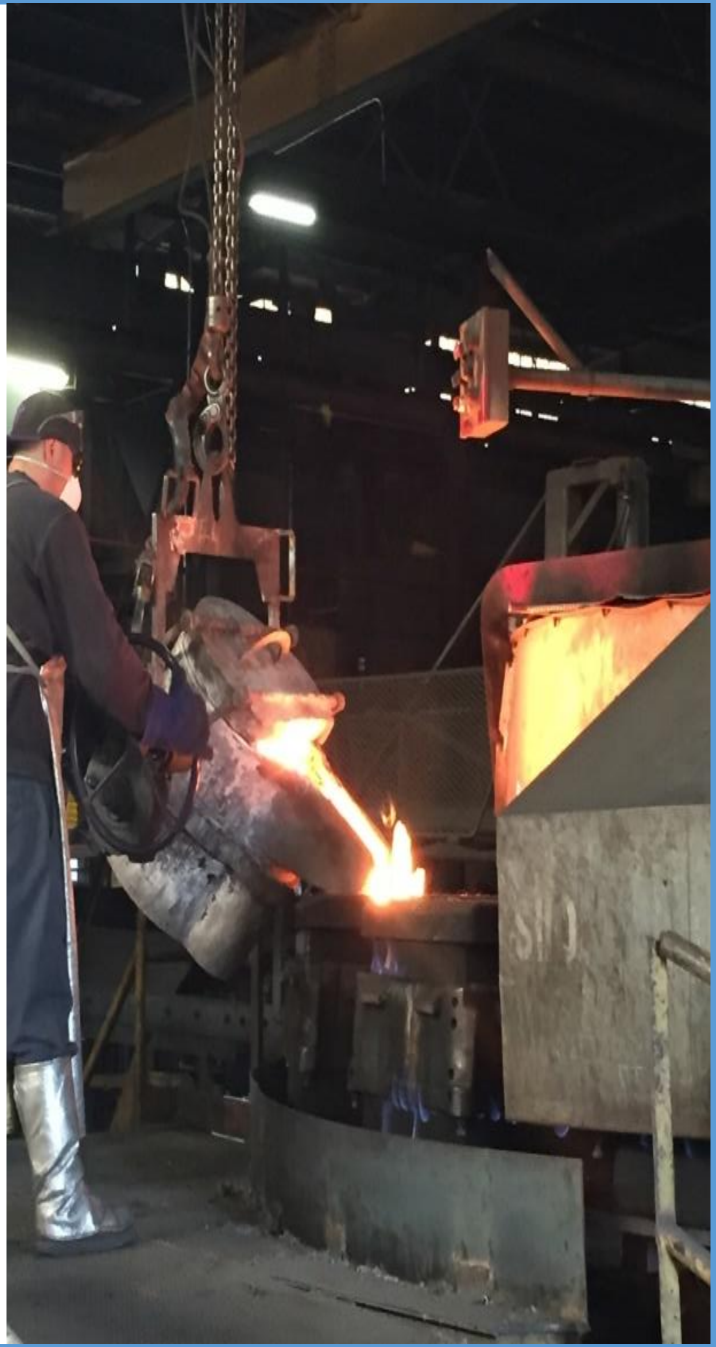
South Coast AQMD

Agenda

- Summary of Working Group #2
- Meeting with California Metals Coalition – December 15, 2017
- Applicability of Proposed Amended Rule 1407
- Hexavalent Chromium
- Initial Review of Two Source Tests
- Initial Concepts for Point Source Emission Limits

Summary of Working Group #2

- Discussed existing provisions under Rule 1407 and possible rule concepts for:
  - Purpose and Applicability
    - Include ferrous metal melting operations and hexavalent chromium
  - Control Approach
    - Point source controls, total enclosures, and housekeeping
  - Source Tests
    - Emission of specific toxics versus emission of particulates
    - Control efficiency versus mass emission
  - Emission Control Device Monitoring
    - Flow meter, smoke test, pressure gauge, bag leak detection system,
  - Ambient Air Monitoring
  - Exemptions



Meeting with California Metals Coalition

Meeting with California Metals Coalition

- December 15, 2017
- Attended By
  - SCAQMD
  - California Metals Coalition
  - 6 metal melting facilities

Meeting with California Metals Coalition *(cont.)*

- Differences between alloys, processes, furnaces, volumes
  - Varying material content depending on product and client needs
  - Volumes processed differ significantly from facility to facility
  - Melting temperature dependent on alloy
  - Vacuum melting versus air melting
- Expressed concern about a “one-size fits all” approach
- When and how is hexavalent chromium produced?
  - Not intentionally creating hexavalent chromium
- Requirement versus contaminant
  - Chromium and nickel are added to melts
  - Arsenic and cadmium are contaminants

Meeting with California Metals Coalition *(cont.)*

- Total Enclosures
  - May pose a health and safety issue
  - SCAQMD staff discussed this issue with Cal-OSHA
  - Staff's approach for total enclosures is not in conflict with any Cal-OSHA requirements
  - Any requirements for total enclosures will include a provision that will allow modifications for OSHA requirements
- Source testing and ambient air monitoring
  - Source testing is expensive
  - Questions about what SCAQMD plans to do about ambient air monitoring
  - Staff responded that a separate ambient air monitoring rule is being developed – Proposed Rule 1480
    - Expected to include various types of sources and toxic air contaminants

Meeting with California Metals Coalition *(cont.)*

- Questions regarding why not amend Rule 1407 for non-ferrous metal melting and adopt Rule 1407.1 for ferrous metal melting?
  - Discuss in more detail in next slide
- What does SCAQMD plan to do about welding, cutting, and grinding?
  - Proposed Amended Rule 1407 may include provisions for grinding and possibly cutting
  - More discussion of welding at Rule 1407 facilities is needed
- How will SCAQMD determine thresholds?
  - Staff will be discussing possible point-source emission rates
  - Concepts for ambient or other types of thresholds or approaches for monitoring would be addressed in Proposed Rule 1480

Proposed Amended Rule 1407
Applicability

Rule 1407 and Rule 1407.1

- Stakeholders have commented to have two rules – Rule 1407 for non-ferrous metal melting and Rule 1407.1 for ferrous metal melting
- Staff believes that having one rule for both non-ferrous and ferrous metal melting will be easier for facility operators
  - Easier for operators to have all requirements in one rule versus splitting requirements in two rules
  - Proposed rule can be tailored to accommodate different limits for different alloys and volumes processed
  - Both non-ferrous and ferrous metal melting facilities, whether one or two rules, would have the similar requirements (housekeeping, enclosures, recordkeeping, emissions testing, etc.)
    - These requirements can also be tailored to accommodate different alloys and volumes processed

PAR 1407 Toxic Air Contaminants

Alloy	Rule 1407 Status	US EPA Carcinogenic Classification
Arsenic	Current 1407	Carcinogenic to Humans
Cadmium	Current 1407	Likely to be Carcinogenic to Humans
Chromium (hexavalent)	PAR 1407	Carcinogenic to Humans
Nickel	Current 1407	Carcinogenic to Humans

Hexavalent Chromium

Toxicity of Hexavalent Chromium[1]

Exposure Pathway	• Inhalation of aerosols or particles • Ingestion (eating and drinking) • Skin contact
Carcinogen	• Known human carcinogen • Inhalation pathway (lung and nose cancers)
Chronic Non-Cancer Health Effects	• Irritation of the nose, throat and lungs • Allergic symptoms (wheezing, shortness of breath) • Nasal sores and perforation of the membrane separating the nostrils
Chronic Inhalation REL	• 0.2 ($\mu g/m^3$)

[1] Health Effects of Hexavalent Chromium Fact Sheet, CalEPA's Office of Environmental Health Hazard Assessment, November 9, 2016

Hexavalent Chromium Formation

- $Cr(s) \xrightarrow{\text{HEAT}} Cr^{6+} + 6e^{-}$
- Heat oxidizes chromium to hexavalent chromium
- Temperature of conversion
  - Trivalent chromium in chromium(III) oxide (Cr2O3) could be converted to hexavalent chromium at a temperature range of 200-300°C (392-572°F)[1]
  - Initial rates of conversion increase with increased temperature

[1] "Extent of oxidation of Cr(III) to Cr(VI) under various conditions pertaining to natural environment", Journal of Hazardous Materials, February 6, 2006

Criteria for a Recommended Standard Occupational Exposure to Hexavalent Chromium

Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health
September 2013

- Cr(VI) is formed as a by-product when metals containing metallic chromium are used, such as welding and the thermal cutting of metals; steel mills; and iron and steel foundries
  - These operations and processes use extremely high temperatures which result in the oxidation of the metallic forms of chromium to Cr(VI)
- 1994 – Meridian Research, Inc.
  - Estimated 808,177 production workers in U.S. industries with potential exposure to Cr(VI)
  - > 98% of the potentially exposed workforce was found in six industries: electroplating, welding, painting, paint and coatings production, iron and steel production, and iron and steel foundries

Criteria for a Recommended Standard Occupational Exposure to Hexavalent Chromium *(cont.)*

- 2006 – OSHA
  - Estimated that more than 558,000 U.S. workers were exposed to Cr(VI)
  - The largest number of workers potentially exposed to Cr(VI) were in the following application groups: carbon steel welding (> 141,000), stainless steel welding (> 127,000), painting (> 82,000), electroplating (> 66,000), steel mills (> 39,000), iron and steel foundries (> 30,000), and textile dyeing (> 25,000)
- 2006 – Shaw Environmental Report
  - Industry sectors with the greatest number of workers exposed above the REL and the greatest number of workers exposed to Cr(VI) include: welding, painting, electroplating, steel mills, and iron and steel foundries

Proposed Amended Rule 1407
Source Test Examples

Initial Review of Two Source Tests

- Reviewing source test data – number of source tests is limited
- Evaluated two source tests:
  - Example #1: Furnace, uncontrolled, melting aluminum
    - Multi-metals, including hexavalent chromium
  - Example #2: Furnace, controlled, melting steel
    - Chromium and hexavalent chromium

Example	Control	Metal Melted	Average Processed (lbs)	Pollutants
Example #1	Uncontrolled	Aluminum	56,033	Multi-metal, including Hexavalent Chromium
Example #2	Controlled	Steel	3,195	Chromium and Hexavalent Chromium

Source Test Data – Example #1

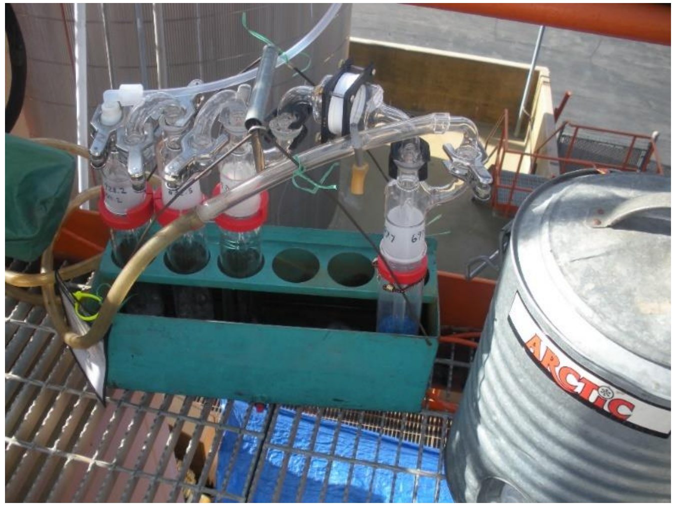
- Equipment Tested – Furnace, no control equipment
- Metal Melted – Aluminum

Run Number	Amount Processed (lbs)	Source Test Results (lbs)				
		Arsenic	Cadmium	Chromium	Hexavalent Chromium	Nickel
1	57,280	0.000348	0.000260	0.000920	0.000030	0.000252
2	55,320	0.000220	0.000148	0.000248	0.000030	0.000372
3	55,500	0.000320	0.001360	0.000296	0.000052	0.000204

Source Test Data – Example #2

- Equipment Tested – Furnace vented to baghouse
- Metal Melted – Steel

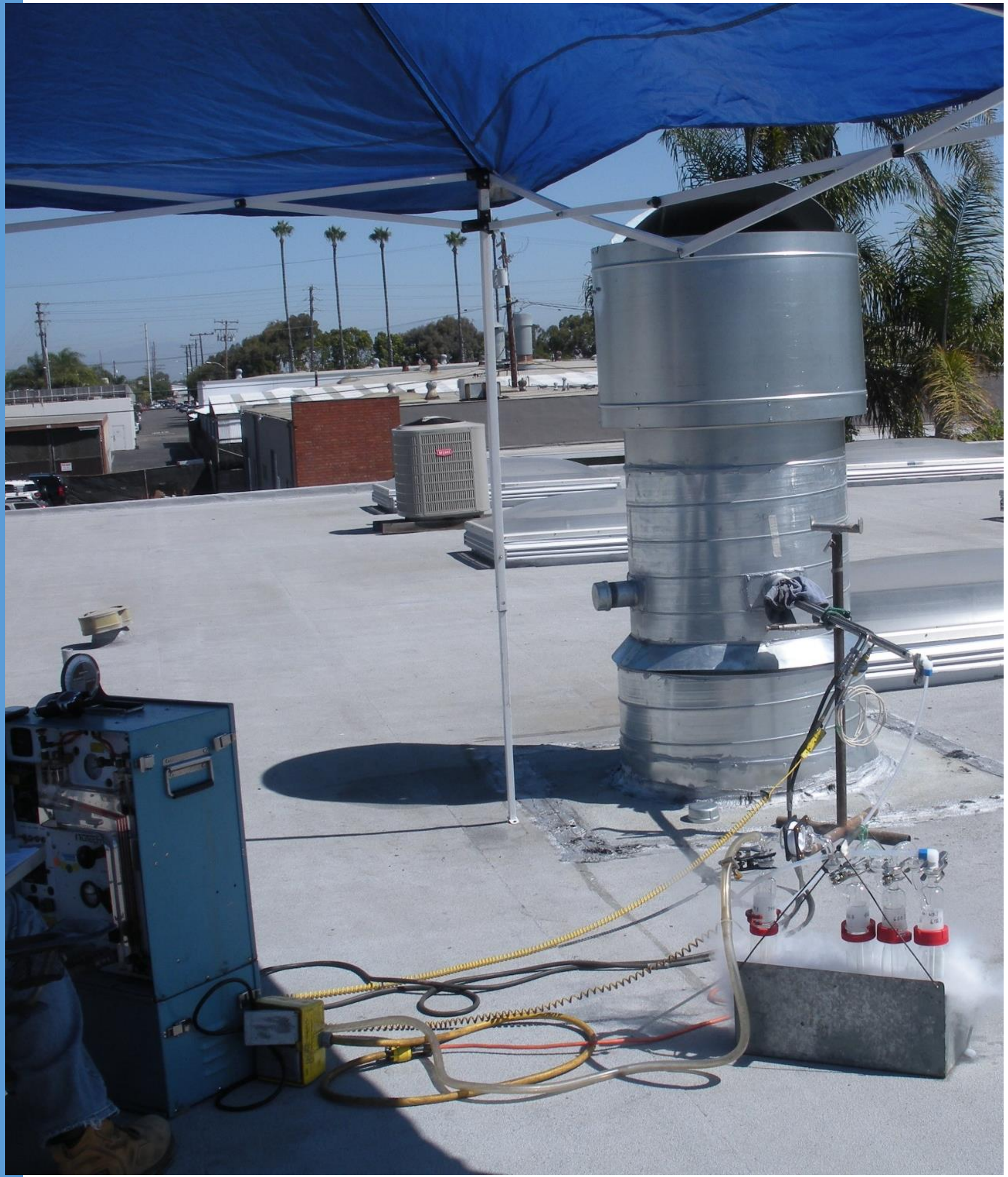
Run Number	Amount Processed (lbs)	Source Test Results (lbs)	
		Chromium	Hexavalent Chromium
1	2,810	0.00013	0.00004
2	4,064	0.00025	0.00019
3	2,711	0.00068	0.00050



Hexavalent Chromium Conversion Rates

Source Test	Chromium (lbs)	Hexavalent Chromium (lbs)	Percent of Hexavalent Chromium*
Example 1 (Aluminum, Uncontrolled) - Run 1	0.000920	0.000030	3%
Example 1 (Aluminum, Uncontrolled) - Run 2	0.000248	0.000030	12%
Example 1 (Aluminum, Uncontrolled) - Run 3	0.000296	0.000052	18%
Example 2 (Steel, Controlled) - Run 1	0.00013	0.00004	31%
Example 2 (Steel, Controlled) - Run 2	0.00025	0.00019	76%
Example 2 (Steel, Controlled) - Run 3	0.00068	0.00050	74%

* Percent of Hexavalent Chromium to Total Chromium (Hexavalent Chromium / Chromium)



Initial Observations of Two Source Tests

- Percentage of hexavalent chromium conversion was substantially lower in furnace melting aluminum as compared to furnace melting steel
- Staff is continuing to evaluate other source tests – data is very limited
- SCAQMD is planning on conducting source testing to obtain additional information

Proposed Amended Rule 1407
Initial Concepts for Emission Limits

Concepts for Establishing Point-Source Emission Rate Limits

- Depending on how the emission limit is established will dictate the type of source test(s) needed:
  - PM emission limit – PM source test
  - Toxic metal particulate emission limit – Multi-metals source test PLUS a hexavalent chromium source test
- Assessing an approach that will minimize the number of source tests a facility would be required to conduct

Concept for Establishing Point Source Emission Rate Limits *(cont.)*

- Establish the level of point source controls that can achieve that specified risk level for:
  - Types of metals
  - Amount of metals processed
- PM source testing would verify that the control efficiency of the point source control
- Approach limits the source testing to PM for most facilities

Establishing Thresholds

- Create bins based on alloys processed and annual production
  - Bins will determine levels of housekeeping, enclosures, point source requirements, and source test frequency
  - Low chromium alloys and high chromium alloys will be in different bins
  - High annual production facilities and low annual production facilities will be in different bins
- Bins will be established based on cancer screening risk values (Table 1.1 of Permit Application Package “M” used for SCAQMD Risk Assessment Procedures)
- Facilities that produce both high and low chromium alloys would be categorized in the higher bins

Determining a Facility's Bin

- Step 1
  - Facilities segregated by chromium content in alloys
    - Schedule A – Facilities exclusively melting low chromium alloys (alloys with chromium content ≤ 1%)
    - Schedule B – All other facilities

- Step 2
  - Determine annual production to establish bin (numbers are examples)

Bin	Cancer Screening Risk	Schedule A (≤ 1% chromium) (tons/year)	Schedule B (≥ 1% chromium) (tons/year)
Exempt	$< 1 \times 10^{-6}$	300	0.4
1	10×10^{-6}	3,000	4
2	25×10^{-6}	7,400	10
3	100×10^{-6}	29,600	40
4	$> 100 \times 10^{-6}$	> 29,600	> 40

Possible Requirements for Bins

Bin 1	Bin 2	Bin 3	Bin 4
	Building Enclosure	Total Enclosure	Total Enclosure
Housekeeping	Housekeeping	Enhanced Housekeeping	Enhanced Housekeeping
	Control Efficiency of a Baghouse	Control Efficiency of a HEPA Baghouse	Control Efficiency of a ULPA Baghouse
Recordkeeping	Recordkeeping	Recordkeeping	Recordkeeping
	Periodic Source Testing (PM)	Annual Source Testing (PM)	Annual Source Testing (Metals)

Determination of Bins

- Step 1 – Determined emission rate for each toxic air contaminant for low chromium alloy and high chromium alloy
- Step 2 – Correlate emission rate with cancer screening risk and toxic air contaminant that is the risk driver
- Step 3 – Calculate tons of risk driver processed to reach cancer screening risk thresholds

Possible Level for Health Risk Threshold

- Considering a cancer screening risk value of 10×10^{-6}, meteorology, and closest receptor distance
  - Table 1.1 of Permit Application Package "M" used for SCAQMD Risk Assessment Procedures
- Annual limits for worst case meteorology and closest receptor at 100 m

Toxic Air Contaminant	Arsenic	Cadmium	Hexavalent Chromium	Nickel
Annual Limit (lbs)	0.0301	0.234	0.00431	3.9

- Average distances for residents are 100 meters
- Considering 10 in a million – remaining health risk will be attributed to fugitive emissions
- These are initial concepts – seeking input

Example #1 – Uncontrolled Aluminum Furnace (Schedule A)

Step 1: Determination of Average Emission Rate

Run Number	Amount Processed (lbs)	Amount Processed (tons)	Source Test Results (lbs)				
			Arsenic	Cadmium	Chromium	Hexavalent Chromium	Nickel
1	57,280	28.64	0.000348	0.000260	0.000920	0.000030	0.000252
2	55,320	27.66	0.000220	0.000148	0.000248	0.000030	0.000372
3	55,500	27.75	0.000320	0.001360	0.000296	0.000052	0.000204
Average	**56,033**	**28.01**	**0.000296**	**0.000589**	**0.000488**	**0.000037**	**0.000276**
Average Emission Rate (lb/ton processed)			**0.000011**	**0.000021**	**0.000017**	**0.000001**	**0.000001**

Example #1

Step 2: Cancer Screening Risk Level and Determination of Risk Driver

Toxic Air Contaminant	Arsenic	Cadmium	Chromium	Hexavalent Chromium	Nickel
Screening Emission Levels* (lbs/year)	0.0301	0.23	NA	0.00431	3.86
Emission Rate (lb/ton processed)	0.000011	0.000021	0.000017	0.000001	0.000001
Tons of Alloy before Screening Emission Level Exceeded**	2,736	11,142	NA	4,310	3,860,000

- Risk driver is toxic air contaminant that will exceed Screening Emission Level with least amount of metal processed

* Cancer risk at ten in a million (10×10^{-6}), worst case meteorology, resident at 100 m

** Tons of Alloy = Screening Emission Level/Emission Rate

Example #1

Step 3: Calculate Tons Processed to Exceed Threshold

Bin	Cancer Screen Risk	Tons Processed (tons/year)
Exempt	$< 1 \times 10^{-6}$	300
1	10×10^{-6}	3,000
2	25×10^{-6}	7,400
3	100×10^{-6}	29,600
4	$> 100 \times 10^{-6}$	> 29,600

Point-Source Emission Rate Approach

- Seeking input on approach
- Expected that facilities with higher annual production and those with higher levels of chromium would be placed in higher bins (Bins 3 or 4)
  - More source tests needed to confirm
  - More examples will be provided

Schedule

• Site Visits	Ongoing
• Source Tests	TBD
• Additional Working Groups	TBD
• Public Workshop	June 2018
• Set Hearing	July 6, 2018
• Stationary Source Committee	July 20, 2018
• Public Hearing	September 7, 2018

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