

**SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
(SOUTH COAST AQMD)**

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

Clarifications to Source Test Report Evaluations for Facility A and Facility C

July 30, 2020

Source Test Evaluation Process

In general, for the purposes of compliance and permitting, prior to conducting a source test at a facility, a protocol is submitted to the South Coast AQMD for review and approval. If any deficiencies were identified in the protocol, these are typically specified and must be addressed during testing to ensure requirements are met.

The next step in the process is for the contractor to complete the source test at the facility. During the test, all required parameters specified by the test methods being used are monitored and documented on field data sheets which are later used to complete necessary calculations for emissions reporting. Samples are analyzed and the laboratory results are used in calculations. A test report is generated based on the testing which includes facility process information, any specific events that occurred during testing, calibrations, raw data, and calculated results. This report is then submitted to the South Coast AQMD for review.

Once received by the South Coast AQMD, the report is reviewed for accuracy and completeness. The report is reviewed to ensure that the appropriate methods were adhered to during the test, and all parameters fell within acceptable ranges. Emissions calculations are verified and may be adjusted as needed based on numerous factors which would be detailed in the reviewer's evaluation. A decision is also made on the acceptability of the report. If the document is complete, with calculations performed correctly (or requiring only minor adjustments), the report is deemed "acceptable" or "conditionally acceptable." If the test was performed incorrectly or there is missing information, the report may be deemed unacceptable, requiring a retest. The source test reports for Facility A and Facility C were evaluated for rule development purposes and not compliance purposes. Both source tests reports were deemed "conditionally acceptable."

When reviewing the Source Test Report Evaluations for Facility A and Facility C, please note the following clarifications:

- 1. For the elemental composition of alloys melted during source testing, results in the facility analysis reports should be used rather than the laboratory analysis results included in the Source Test Report Evaluations.**

[Reference: "Laboratory Analysis" for Facility A, page 6 and Facility C, page 6]

Analysis of the various materials sampled from the chromium alloy melting operation were conducted by a contract laboratory using U.S. EPA Method 6010B – *Inductively Coupled Plasma-Atomic Emission Spectrometry* for multiple metals and U.S. EPA Method 7199 – *Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography* for hexavalent chromium (U.S. EPA 6000/7000 series), which are part of the U.S. EPA SW-846 compendium of methods for the evaluation of solid wastes. Prior to analysis by these methods, the samples must be solubilized or digested using appropriate SW-846 sample preparation methods specified in Chapter 3 of the U.S. EPA SW-846 compendium. Metal samples were prepared according to U.S. EPA Method 3050B – *Acid Digestion of Sediments, Sludges, and Soils*, which uses nitric acid and hydrogen peroxide to digest samples for analysis. The method specifically identifies that it is not a total digestion technique for most samples. Samples were prepared for hexavalent chromium analysis using U.S. EPA Method 3060A – *Alkaline Digestion for Hexavalent Chromium*. This method uses an alkaline digestion to solubilize both water-insoluble and water soluble hexavalent chromium compounds in solid waste samples. The intended usage of these methods was primarily to identify specific metals in the various samples (i.e. raw material, baghouse catch, slag, and casting sand), rather than determine the elemental composition of samples.

Testing of the baghouse catch, raw material used to charge the furnace, and slag by the methods discussed was completed first at Facility A. A comparison of the analysis results by these methods of the raw material to those provided by the facility indicate that the sample was most likely not fully digested and therefore results are biased low. It is likely that the slag sample, which contains solid material, is also biased low. Analysis results of the baghouse catch are not anticipated to be biased in the same fashion as the solid samples due to the baghouse catch being a fine dust, which is more completely digested in the sample preparation procedures for these methods. Based on the results of the raw material analysis, the methods described were only used for the baghouse catch and slag analysis at Facility C. The slag results are expected to have a low bias at Facility C as well due to the presence of solid material in the slag.

Various solid samples were also analyzed by South Coast AQMD using a portable handheld X-ray fluorescence (XRF). This particular instrument has not been optimized for the testing of metal alloys. As a local air regulatory agency, the intended usage of this instrument upon order was not specified to the manufacturer as solid alloys of metal. Therefore, the results reported by this instrument should only be used qualitatively; as an indication of the presence of individual elements in a given sample. The results should not be used to quantify the percent weight of elements in the sample, as they are most likely inaccurate. As an example, for Facility C, the portable XRF analysis for chromium (Cr) was 48.7% for the raw material and 81.1% for the test coupon. These weight percentages are not accurate. Page 251 of the source test report for Facility C shows the spectrographic analysis for Cr content for the alloys as between 25-28%, which is the accurate result according to the facility.

For the development of Proposed Rule 1407.1, South Coast AQMD will refer to the facility analysis reports found on pages 345-347 of 380 of the source test report for Facility A and on

pages 251-254 of 288 of the source test report for Facility C for the elemental composition of alloys melted during source testing.

- 2. The observation of emission capture loss during the capture and collection efficiency testing was a visual estimation and was only made on a single day at each facility.**

[Reference: “Representativeness of Data and Process” for Facility A, page 3 (4th bullet point), and Facility C, page 3 (5th bullet point)]

Facilities A and C utilized capture systems that rely on the furnace lid being in a predominately closed position. During capture efficiency testing at both facilities, it was observed by South Coast AQMD staff that capture of emissions was periodically lost during testing. When the lid to the furnace was temporarily removed for various operational needs (e.g. charging the furnace, de-slagging, pouring operations, etc.), there was a visual indication that some fugitive emissions were likely escaping the control system. This process is not automated and relies heavily on manual procedures conducted by an operator. South Coast AQMD observed that emission was lost approximately 30% of the time for Facility A and approximately 15% of the time for Facility C during the course of the first day of testing. These percentages were a visual observation and were not established by a test. This observation was only made on a single day at each facility to get an estimate of periods when capture is lost. One facility has since modified operations to improve emission capture. Emission capture can be improved through additional engineering controls such as use of overhead hoods, controlling cross drafts, process changes to minimize fugitives, and reducing periods when the lid is removed.

- 3. Determination of control efficiency using South Coast AQMD Method 5.1 results for particulate matter (PM) mass emissions is not a reliable indicator of control device performance.**

[Reference: “Representativeness of Data and Process” for Facility A, page 2 (2nd and 8th bullet point), and Facility C, page 2 (2nd bullet point) and page 3 (3rd bullet point)]
[Reference: “Test Results Summary” for Facility A and C, page 5]

Results for control device efficiency determined from PM emissions at both Facilities A and C were notably low and are not the best indicator of control device performance on an efficiency basis. South Coast AQMD Method 5.1 – *Determination of Particulate Matter Emissions from Stationary Sources Using a Wet Impingement Train* was used for PM testing. This method uses gravimetric analysis (weighing) as the means of PM quantification following organic extraction and drying of the impinger recovery. Due to the nature of the gravimetric analysis, typically a catch of 5 – 10 mg would be the minimum range where results are considered reliable. In order to demonstrate a desired control efficiency of 99% and achieve a reliable outlet sample catch of 5 mg, an inlet sample catch would need to be 500 mg. The reported results show that the combined inlet recovery was 16.3 mg for Facility A and 45.2 mg for Facilities C, while outlet sample catches of PM were below 5 mg at

Facility A and below 10 mg at Facility C. Therefore, the data acquired at both facilities result in significant error bars in the calculation of control efficiency using South Coast AQMD Method 5.1.

In addition, the South Coast AQMD Method 5.1 analysis includes an organic extraction which quantifies condensable organics passing through the HEPA and reported as PM. Facility A showed an appreciable amount of organics in the outlet location, which also likely biases the control efficiency low using this method.

Based upon Method 5.1 PM results, South Coast AQMD recommends use of the triplicate run data from CARB Method 425 – *Determination of Total Chromium and Hexavalent Chromium Emissions from Stationary Sources* and CARB Method 436 – *Determination of Multiple Metals Emissions from Stationary Sources* for determination of control efficiencies for these sources. These methods are much more accurate at low concentrations, as the analytical detection limits for Ion Chromatography and Inductively Coupled Plasma Mass Spectrometry are far lower than those using gravimetric analysis specified by South Coast AQMD Method 5.1.