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Admiral Environmental

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Project Number: 18120304
Project Type: Method 306a Stack Testing
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IDENTIFICATION OF MATERIAL:
Four (4) sample bottles, from 306A air testing, identified as SVCHROMEC:

PROCEDURE:
Cal Grinding, Inc. is a remanufacturer of automotive, locomotive, and marine engine valves. A Method 306A Stack Test was performed to demonstrate compliance with the National Emission Standards for Chromium Emissions from Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks. The tested system consists of one stack which exhausts emissions from one hard chromium plating tank (EUCHROMEC) controlled by a multistage composite mesh pad system which includes a HEPA filter stage.

The stack system tested, SVCHROMEC, has a duct diameter of 20 inches. The sampling points were located more than 2.0 duct diameters downstream from any flow disturbances, and more than 0.5 duct diameters upstream from the top of the stack. The sampling points for the stack met the criteria for an acceptable sampling point as specified in Section 11 of USEPA Method 1 (40 CFR Part 60, Appendix A). There are twelve (12) sampling points on two traverses for a total of twenty-four (24) sampling points as per Section 11 of USEPA Method 1. Specific pressure drop readings and other operating data was recorded by Mr. Eric Dangoy and Mr. Anthony Rodriguez of Scientific Control Laboratories, Inc. and Cal Grinding, Inc. personnel. This data is included at the end of this report. A stack test plan was submitted to the Michigan Department of Environmental Quality for review on October 11, 2018.

The USEPA Method 306A sampling procedure was performed December 11, 2018 by Mr. Eric Dangoy and Mr. Anthony Rodriguez of Scientific Control Laboratories, Inc. Calculations were performed in accordance with the EPA approved test procedures as specified in 40 CFR, Part 63, Method 306A. As specified in the permit, results are corrected to 70°F and 29.92 in. Hg.

RESULTS:
Leak tests were conducted before and after each run and were found to be less than 0.02 ft^3/min. The presence of cyclonic flow was checked at each sampling location and the average angle of misalignment was 7.50°. Since the average angle of misalignment for the stack was less than 20°, the amount of cyclonic flow is acceptable. Samples were analyzed by ICP-MS for the detection of total chromium.

CONCENTRATION BASED RESULTS

Sample I.D.	Test Conc. [1]	Total Cr Emissions[2]	Total Cr Emissions Corrected[3]	Current Emission Limit
Test Run #1	1.14 µg	0.0007 mg/dscm	0.0007 mg/dcm	0.006 mg/dscm
Test Run #2	1.35 µg	0.0007 mg/dscm	0.0007 mg/dcm	0.006 mg/dscm
Test Run #3	1.22 µg	0.0006 mg/dscm	0.0006 mg/dcm	0.006 mg/dscm
Blank	0.295 µg	NA	NA	N/A

[1] Analyzed by ElementOne, [2] Calculated by SCL (see attached),[3] Corrected to 29.92 in. Hg and 70°F, calculated by SCL (see attached)

AVERAGE (Total Chromium) = 0.0006 mg/dscm

Section 1:

SUPPLEMENTAL CALCULATIONS FOR CAL GRINDING, INC.

Equation from Method 306A, FR 1/25/95, Pg. 4992:

$$C_{Cr} = \frac{(M_{cr})(T_m + 460)}{(499.8)(Y_m)(V_m)(P_{bar})}$$

Where:

C_{cr} =Concentration in stack gas in mg/dscm
M_{cr} =Amount of Cr in sample from stack sampling in micrograms
T_m =Dry gas meter temperature, ° F
Y_m =Dry gas meter correction factor
V_m =Dry gas meter volume in ft^3
P_{bar} =Barometric pressure in inches of Hg

Stack Test Results Test Run #1

(461 ml in test trial #1 sample)
M_{cr} = 1.14 micrograms
T_m = 66.4° F
Y_m = 0.952 (see section 2)
V_m = (1.823 m^3)(35.315 ft^3/m^3) = 64.38 ft^3
P_{bar} = 29.99 in Hg

$$C_{Cr} = \frac{(1.14)(66.4+460)}{(499.8)(0.952)(64.38)(29.99)} = \mathbf{0.0007\ mg/dscm}$$

$$C_{Cr\ corrected} = \left(0.0007\frac{mg}{dcm}\right)\left(\frac{29.92\ in.Hg}{29.92\ in.Hg}\right)\left(\frac{(68+460)R}{(70+460)R}\right) = \mathbf{0.0007\ mg/dcm}$$

Stack Test Results Test Run #2

(454 ml in test trial #2 sample)
M_{cr} = 1.35 micrograms
T_m = 76.8° F
Y_m = 0.952 (see section 2)
V_m = (1.934 m^3)(35.315 ft^3/m^3) = 68.30 ft^3
P_{bar} = 30.01 in Hg

$$C_{Cr} = \frac{(1.35)(76.8+460)}{(499.8)(0.952)(68.30)(30.01)} = \mathbf{0.0007\ mg/dscm}$$

$$C_{Cr\ corrected} = \left(0.0007\frac{mg}{dcm}\right)\left(\frac{29.92\ in.Hg}{29.92\ in.Hg}\right)\left(\frac{(68+460)R}{(70+460)R}\right) = \mathbf{0.0007\ mg/dcm}$$

Stack Test Results Test Run #3

(477 ml in test trial #3 sample)
M_{cr} = 1.22 micrograms
T_m = 80.6°F
Y_m = 0.952 (see section 2)
V_m = (2.195 m^3)(35.315 ft^3/m^3) = 77.52 ft^3
P_{bar} = 30.01 in Hg

$$C_{Cr} = \frac{(1.22)(80.6+460)}{(499.8)(0.952)(77.52)(30.01)} = \mathbf{0.0006\ mg/dscm}$$

$$C_{Cr\ corrected} = \left(0.0006\frac{mg}{dcm}\right)\left(\frac{29.92\ in.Hg}{29.92\ in.Hg}\right)\left(\frac{(68+460)R}{(70+460)R}\right) = \mathbf{0.0006\ mg/dcm}$$

Section 2:

Calculation for Pre and Post Test Gas Meter Calibration:

Pre-Test Calibration (11/05/2018):
The meter was run for 6 minutes with a critical orifice that allows 0.75 cfm. The meter recorded a volume of 4.770 ft^3. The average temperature was 71.2° F and the barometric pressure was 29.96 in. of mercury.

Post-Test Calibration (12/26/2018):
The meter was run for 6 minutes with a critical orifice that allows 0.75 cfm. The meter recorded a volume of 4.626 ft^3. The average temperature was 65.6° F and the barometric pressure was 30.46 in. of mercury.

$$Y_m = \frac{V_{m(std),mfg} \times T_m}{17.64 \times V_m \times P_{bar}}$$

K_1 = 17.64
V_m = volume of gas recorded from posttest in ft^3
P_{bar} = barometric pressure in inches of mercury
T_m = temperature in degrees R
$V_{m(std),mfg}$ = Volume of gas sample measured by manufacturer's calibrated orifice and dry gas meter, corrected to standard conditions (dscf)

$$V_{m(std),mfg} = V_{cr(std)} = K' \frac{P_{bar}\theta}{\sqrt{T_{amb}}}$$

where (see attached calibration sheet for values):
K' = factor from orifice calibration sheet provided with critical orifice by manufacturer
P_{bar} = barometric pressure in inches of mercury
Θ = time in minutes
T_{amb} = ambient temperature in degrees R

$$V_{(std),mfg} = \frac{0.5876(29.65)(6)}{\sqrt{539}}$$

$$V_{(std),mfg} = 4.50\ ft^3$$

Therefore,

$$Y_{m(pretest)} = \frac{(4.50)\times(71.2+460)}{17.64\times4.770\times29.96}$$

$$Y_{m(pretest)} = 0.948$$

$$Y_{m(posttest)} = \frac{(4.50)\times(65.6+460)}{17.64\times4.626\times30.46}$$

$$Y_{m(posttest)} = 0.952$$

Post Y_m value as compared to pretest Y_m value

$$\frac{Y_{m(pretest)}}{Y_{m(posttest)}} = \frac{0.948}{0.952} = 0.996$$

Since the Y value is between 0.95 and 1.05, the gas meter is acceptable.

CONCLUSION:

The tests were conducted to demonstrate compliance with the National Emission Standards for Chromium Emissions from Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks. The results indicate that system SVCHROMEC at Cal Grinding, Inc. meets the chromium emission limit of 0.006 mg/dscm. The 3-stage composite mesh pad systems with a HEPA filter, as it is currently implemented, is sufficient as a pollution control device, in order to meet the chromium electroplating NESHAP. To maintain compliance, Cal Grinding, Inc. must keep the total pressure drop reading across the composite mesh pad system within ± 2.0" of the pressure drop that was recorded on the day of the test. The total pressure drop readings as recorded on the day of the test is as follows:

- SVCHROMEC, including HEPA filter: 4.0 inches W.C. ±2.0 in. W.C.

I certify that the preceding results are true and accurate.

Respectfully submitted,

SCIENTIFIC CONTROL LABORATORIES, INC.

By _____
Eric Dangoy, Engineering Services

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