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EMISSION TEST REPORT

Report Title: Test Report for the Verification of Total Chromium Emissions from Decorative Chrome Plating Operations

Report Date: January 4, 2018

Test Date: November 9 – 10, 2017

Facility Information	
Name:	Adept Plastic Finishing, Inc. - Plant 5
Street Address:	48668 Alpha Drive
City, County:	Wixom, Oakland
SRN:	P0727

Facility Permit Information	
Permit to Install No.:	121-16

Testing Contractor	
Company:	Derenzo Environmental Services
Mailing Address:	39395 Schoolcraft Road Livonia, MI 48150
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Project No.:	1708010

TEST REPORT
FOR THE
VERIFICATION OF TOTAL CHROMIUM EMISSIONS
FROM
DECORATIVE CHROME PLATING OPERATIONS

ADEPT PLASTIC FINISHING, INC.- PLANT 5
WIXOM, MICHIGAN

1.0 INTRODUCTION

Adept Plastic Finishing, Inc. (Adept) operates a decorative chrome plating line containing two (2) chromium-containing processes (EUSYSTEM2 & EUCHROME5) at its facility located on Alpha Drive in Wixom, Oakland County, Michigan (Plant 5). The Michigan Department of Environmental Quality (MDEQ) has issued the facility Permit to Install (PTI) No. 121-16 for the operation of the decorative chrome plating processes.

EUSYSTEM2 (a chromic acid etching process) consists of Tank Nos. 3, 5, 6, and 7 with a porous pot tank and evaporator. EUCHROME5 (a decorative chrome electroplating process) consists of Tank Nos. 45, 49, and 50. Emissions from each individual chrome-containing process are controlled by dedicated composite mesh pad / chrome separator systems and routed to the appropriate exhaust stack. Emissions from EUSYSTEM2 are routed to SVSYSTEM2, and emissions from EUCHROME5 are routed to SVCHROME5.

Conditions of PTI No. 121-16 require Adept to perform compliance testing within 180 days of initial start-up to verify compliance with the emission rate limitations that are specified in the permit for each emission unit. In addition, provisions of 40 CFR Part 63, Subpart N, (National Emission Standards for Hazardous Air Pollutants for Chromium Emissions from Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks), specifies chromium emission limits and testing requirements that are applicable to EUCHROME5.

The testing was performed November 9 – 10, 2017 by Derenzo Environmental Services (DES) representatives Jason Logan and Clay Gaffey. Mr. Dave Patterson of the MDEQ-AQD was on-site to observe portions of the compliance testing. The project was coordinated by Mr. Ed Barriager and Mr. Ben Matteson of Adept.

The sampling and analysis was performed using procedures specified in the test protocol documents dated September 8, 2017 and approved by the MDEQ-AQD.

Appendix 1 contains a copy of the test protocol approval letter.

Questions concerning the source and test report should be addressed to:

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Report Certification

This test report was prepared by Derenzo Environmental Services based on field sampling data collected by DES. Facility process data were collected and provided by Adept employees or representatives. This test report has been reviewed by Adept representatives and approved for submittal to the MDEQ-AQD.

Test data for EUCHOME5 is also being submitted to the USEPA using the Compliance and Emissions Data Reporting Interface (CEDRI) system.

I certify that the testing was conducted in accordance approved methods unless otherwise specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

Report Prepared By:

Clay Gaffey
Environmental Consultant
Derenzo Environmental Services

Reviewed By:

Robert L. Harvey, P.E.
General Manager
Derenzo Environmental Services

2.0 SUMMARY OF RESULTS

Exhaust gases from the decorative chrome plating processes were sampled to determine the total chromium exhaust gas concentration. Three (3) two-hour test periods were performed for each system. Exhaust gas velocity measurements were performed during each test period to determine volumetric flowrate and pollutant mass emission rate. The average measured total chromium mass emission rates were less than the limits specified in PTI No. 121-16 and the Decorative Chrome Plating NESHAP (Subpart N).

Table No. 2.1 presents a summary of the operating parameters measured during the testing.

Table No. 2.2 presents a summary of the total chromium test results.

The data presented in the tables below are the average for three (3) two-hour test periods. Data and measurements for each test period are presented at the end of this report in Section 6.0

Table 2.1 Summary of decorative chrome plating line operating parameters

Operating Parameter	Avg. Measured Value[1]
EUSYSTEM2 process rate (sq. feet per two hours)	1,200
EUSYSTEM2 Tank No. 5 pressure drop (inH_2O)	3.2
EUSYSTEM2 Tank No. 6 pressure drop (inH_2O)	3.2
EUCHROME5 process rate (sq. feet per two hours)	1,200
EUCHROME5 Tank No. 49 pressure drop (inH_2O)	3.1

Table 2.2 Summary of decorative chrome plating process test results

Analyte	EUSYSTEM2	EUCHROME5
Total Chromium (mg/dscm)	<2.08E-04	<1.74E-04
NESHAP standard (mg/dscm)	--	*0.006*
Total Chromium (lb/hr)	<2.42E-05	<6.02E-06
Permitted Limit	*1.50E-04*	*4.20E-05*

3.0 SOURCE DESCRIPTION

3.1 General Process Description

Adept operates a decorative chrome plating line that contains two (2) chromium-containing systems; EUSYSTEM2 and EUCHOME5. Decorative chrome plating the surface of plastic parts requires the parts to be chromic acid etched, dipped in various metal solutions, and put into the chromium plating bath. Once the parts are placed into the chromium plating system tanks, chrome is electrolytically deposited onto the coated plastic part in varying thicknesses depending on the application.

Process gas from the decorative chrome plating processes is captured and exhausted to two (2) independent chrome separator / composite mesh pad scrubber control devices, which are used to reduce chromium emissions to the atmosphere.

3.2 Emission Control System Description

Each chrome-containing system is equipped with a dedicated vertical chrome separator / composite mesh pad (CMP) scrubber. EUSYSTEM2 (Tank Nos. 3, 5, 6 and 7) have local scrubbers and are routed to exhaust stack SVSYSTEM2. The process tanks containing chromium (Tank Nos. 5, 6) are also equipped with a mist eliminator.

EUCHROME5 (Decorative Chrome Plating Tank No. 49) has a local scrubber and mist eliminator and is routed to exhaust stack SVCHROME5.

A fume suppressant is used to maintain the surface tension of the tanks so that it does not exceed 35 dynes per centimeter when measured using a tensiometer. Surface tension readings taken during the test event are included in Appendix 3.

Appendix 2 provides sampling location drawings for the scrubber exhausts.

3.3 Process Operating Conditions During the Compliance Testing

The facility is operating at approximately 50% capacity; therefore, the testing was performed on non-production days to achieve the required process conditions. EUSYSTEM2 used plastic parts to simulate 100% production, while EUCHROME5 utilized a dummy bar to simulate 100% production.

EUSYSTEM2 processed an average of 72 pieces or 1,200 square feet for each two (2) hour test period. The local scrubbers for the chromium-containing process tanks (Tank Nos. 5 and 6) both had an average pressure drop of 3.2 inH_2O.

EUCHROME5 utilized a dummy bar for the test event. Therefore, there was a process rate of 1,200 square feet for each two (2) hour test period. The local scrubber for the decorative chrome plating tank (Tank No. 49) had an average pressure drop of 3.1 inH_2O.

Appendix 3 provides plating process and control device operating data for the test periods.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A test protocol was prepared by DES and submitted to the MDEQ-AQD prior to performing the compliance test. This section provides a summary of the sampling and analytical procedures that were used during the tests and presented in the protocol.

4.1 Exhaust Gas Velocity and Flowrate (USEPA Methods 1 and 2)

Exhaust gas sampling was performed using stack sampling ports that satisfied USEPA Method 1 criteria. For EUSYSTEM2, these ports are located in the 45.75-inch diameter exhaust stack prior to the roof exhaust fan and are >120-inches (>2.62 duct diameters) downstream of the nearest flow disturbance and 24-inches (0.52 duct diameters) upstream from the nearest flow disturbance. For EUCHROME5, these ports are located in the 25.75-inch diameter exhaust stack prior to the roof exhaust fan and are >220-inches (>4.66 duct diameters) downstream of the nearest flow disturbance and 16.25-inches (0.63 duct diameters) upstream from the nearest flow disturbance.

To determine pollutant mass flow emission rates, the stack gas velocity was measured using procedures specified in USEPA Method 2 throughout each test period using the isokinetic sample probe. Gas velocity (pressure) measurements were performed at each traverse point with an S-type Pitot tube and red-oil manometer. Temperature measurements were conducted at each traverse point using a K-type thermocouple and a calibrated digital thermometer.

Appendix 4 provides copies of exhaust gas velocity field data sheets and flowrate calculations.

4.2 Exhaust Gas Molecular Weight

The exhaust gas is captured building air that has been drawn through the CMP system. A dry molecular weight of 29.0 was used as specified in Section 8.6 of USEPA Method 2.

4.3 Exhaust Gas Moisture Content (USEPA Method 4)

Moisture content of the scrubber exhaust gas was determined in accordance with the USEPA Method 4 chilled impinger method as part of the isokinetic sampling procedures for chromium (i.e., not as a separate measurement train). The amount of moisture removed from the sample

stream by the chilled impingers was determined gravimetrically by weighing the impinger contents before and after the test period to determine net weight gain.

Appendix 4 provides moisture train sampling data and calculations.

4.4 Total Chromium Emission Rate (USEPA Method 306)

USEPA Method 306, *Determination of Chromium Emissions from Decorative and Hard Chrome Electroplating and Chromium Anodizing Operations*, was used to determine total chromium concentration in the scrubber exhaust gas. Process gas was withdrawn from the scrubber exhaust stack at an isokinetic sampling rate using a glass sampling nozzle, glass-lined probe and an impinger train containing 0.1N sodium hydroxide (NaOH) solution. Pursuant to USEPA Method 306, the sample probe was not heated and the filter was omitted. Therefore, the glass probe liner was connected directly to the first impinger using a glass adapter.

Stack gas temperature and velocity pressure at each traverse point were monitored and recorded throughout each two-hour test period to determine volumetric flowrate.

At the conclusion of each two-hour test period the weight of each impinger was measured. The total silica gel moisture gain was determined gravimetrically and the stack gas total moisture was determined based on the total weight gain of the impingers and silica gel. The sample nozzle, probe liner, first three impingers and connective glassware were rinsed using 0.1N NaOH solution. The rinse and impinger solutions were combined and shipped to Element One, Inc. (Wilmington, North Carolina) for analysis. Prior to shipment, the pH of the recovered solutions was checked using litmus paper to verify that the pH exceeded 8.5.

The total chrome content in the recovered solutions was determined by Element One, Inc. using inductively coupled plasma mass spectrometry (ICP-MS).

Appendix 5 contains a copy of the Element One laboratory report.

The total chromium concentration was determined using the laboratory reported chromium mass and the following equation:

$$C_{Cr} = M_{Cr} / V_m / (1{,}000\ \mu g/mg)$$

C_{Cr}	= Concentration of total Cr (mg/dscm)
M_{Cr}	= Mass Cr in recovered solutions (μg)
V_m	= Sample gas volume for test period (dscm)

The total chromium mass emission rate was determined using calculated total chromium concentration and the volumetric flowrate, using the following equation

$E_{Cr} = M_{Cr} / V_m * Q_d * (60 \text{ min/hr}) / (454E\text{-}06 (\mu g / lb)$

E_{Cr} = Emission rate of total chrome (lb/hr)
Q_d = Exhaust gas volumetric flowrate (dscfm)

5.0 QA/QC ACTIVITIES

5.1 Exhaust Gas Flow Measurement

Prior to arriving onsite, the instruments used during the source test to measure exhaust gas properties and velocity (barometer, pyrometer, and Pitot tube) were calibrated to specifications in the sampling methods.

The absence of cyclonic flow for each sampling location was verified using an S-type Pitot tube and oil manometer. The Pitot tube was positioned at each of the velocity traverse points with the planes of the face openings of the Pitot tube perpendicular to the stack cross-sectional plane. The Pitot tube was then rotated to determine the null angle (rotational angle as measured from the perpendicular, or reference, position at which the differential pressure is equal to zero).

5.2 Meter Box and Isokinetic Rate

The dry gas metering console, which was used for the isokinetic sampling, was calibrated prior to and after the testing program. This calibration uses the critical orifice calibration technique presented in USEPA Method 5. The metering console calibration exhibited no data outside the acceptable ranges presented in USEPA Method 5.

The digital pyrometer in the metering console was calibrated using a NIST traceable Omega® Model CL 23A temperature calibrator.

The sampling nozzle diameter was determined using the three-point calibration technique.

The sampling rate for all test periods was within 10% of the calculated isokinetic sampling rate required by USEPA Methods 306 and 5.

5.3 Total Chromium Recovery and Analysis

All recovered total chromium samples were stored and shipped in pre-rinsed polyethylene sample bottles with Teflon® lined caps. The liquid level on each bottle was marked with a permanent marker prior to shipment and the caps were secured closed with tape. Samples of the reagent used in the test event (500 milliliters of 0.1N sodium hydroxide) was sent to the laboratory for analysis to verify that the reagent used to recover the samples has low total chromium content.

The glassware used in the total chromium train was washed and rinsed prior to use in accordance with the procedures of USEPA Method 306. The glass sample nozzle and probe liner were washed, rinsed and soaked in acid prior to use in accordance with USEPA Method 306. Analysis of the reagent blank indicated that its chromium content was less than the method detection limit (i.e., ND, or no chromium detected).

5.4 Laboratory QA/QC Procedures

The laboratory total chromium analyses were conducted by a qualified third-party laboratory according to the appropriate QA/QC procedures specified in the associated USEPA test methods and are included in the final report provided by Element One (Wilmington, NC).

Appendix 6 presents test equipment quality assurance data (instrument calibration records, meter box calibration records, cyclonic flow determinations sheets, Pitot tube, nozzle and probe assembly calibration records).

6.0 TEST RESULTS AND DISCUSSION

6.1 Test Results and Allowable Emission Limits

Operating data and air pollutant emission measurement results for each two-hour test period are presented in Tables 6.1 and 6.2.

The measured total chromium concentrations and emission rates for EUSYSTEM2 and EUCHROME5 are less than the allowable limits specified in PTI No. 121-16 and the NESHAP (Subpart N) for the operation of the individual processes:

- 0.00015 lb/hr for EUSYSTEM2
- 0.006 mg/dscm for EUCHROME5
- 0.000042 lb/hr for EUCHROME5

6.2 Variations from Normal Sampling Procedures or Operating Conditions

Testing was originally scheduled for November 7-8, 2017. A run was attempted on November 7, 2017, but testing was delayed due to the facility operating at approximately 50% capacity. Production at the facility currently operates at 50% capacity; therefore, testing was performed on non-production days to simulate maximum capacity. Testing was rescheduled for November 9-10, 2017 in order to satisfy the MDEQ requirement of testing at or near maximum capacity. The decorative chrome plating processes were operated at the maximum routine output and no variations from the normal operating conditions of the processes occurred during the test periods.

Table 6.1 Measured exhaust gas conditions and total chromium emission rates for EUSYSTEM2

Date Test No.	11/9/17 1	11/9/17 2	11/9/17 3	Three Test Average
EUSYSTEM2 process rate (sq.ft. / 2hrs)	1,200	1,200	1,200	1,200
Tank No. 5 scrubber dP (inH_2O)	3.2	3.2	3.2	3.2
Tank No. 6 scrubber dP (inH_2O)	3.2	3.2	3.1	3.2
Exhaust gas flowrate (dscfm)	30,992	31,642	30,370	31,001
Sample volume (dscm)	2.91	3.03	2.85	2.93
Total chromium catch weight[1] (µg)	<0.730	0.640	0.459	<0.610
EUSYSTEM2 Total Chromium Emissions				
Total chromium conc. (mg/dscm)	<2.5E-04	2.1E-04	1.6E-04	<2.1E-04
Total chromium emission rate (lb/hr)	<2.9E-05	2.5E-05	1.8E-05	<2.4E-05
Permitted limit (lb/hr)				*1.5E-04*

1. Less than (<) indicates that the laboratory reported non-detect (ND) at the detection limit specified in the table.

Table 6.2 Measured exhaust gas conditions and total chromium emission rates for EUCHROME5

Date Test No.	11/10/17 1	11/10/17 2	11/10/17 3	Three Test Average
EUCHROME5 process rate (sq.ft. / 2hrs)	1,200	1,200	1,200	1,200
Tank No. 49 scrubber dP (inH_2O)	3.1	3.1	3.1	3.1
Exhaust gas flowrate (dscfm)	9,138	9,220	9,430	9,263
Sample volume (dscm)	2.72	2.78	2.86	2.79
Total chromium catch weight[1] (μg)	<0.548	<0.517	<0.385	<0.483
EUCHROME5 Total Chromium Emissions				
Total chromium conc. (mg/dscm)	<2.0E-04	<1.9E-04	<1.4E-04	<1.7E-04
NESHAP standard (mg/dscm)				*0.006*
Total chromium emission rate (lb/hr)	<6.9E-06	<6.4E-06	<4.8E-06	<6.0E-06
Permitted limit (lb/hr)				*4.2E-05*

1. The laboratory reported non-detect (ND) for all samples at the detection limits specified in the table.