Report to

SCIENTIFIC CONTROL LABORATORIES, INC.
Chicago, Illinois

for

TOTAL CHROMIUM AIR EMISSIONS TESTING

of the

3 CHROME PLATING TANKS (SVN-2) & 3 CHROME ETCH TANKS (SVN-6)
with
2 EMISSIONS CONTROL SYSTEM STACKS

AIRLANE DRIVE PLANT (SRN No. 0895)
LACKS ENTERPRISES, INC.
Kentwood, Michigan

August 9-10, 2022

ETE

EXECUTIVE SUMMARY

On August 9 and 10, 2022, Environmental Technology & Engineering Corp (ETE) personnel visited the Lacks Enterprises, Inc. facility located at 4260 Airlane Drive SE in Kentwood, Michigan (SRN No. 0895). The purpose of the visit was to perform air emissions testing for compliance demonstration with the total chromium air emissions limits for process SVN-2 which is comprised of three chrome plating tanks and process SVN-6 which is comprised of three chromium etch tanks. the emissions from each process are controlled by their respective emissions control systems (2). The limits were contained in a Michigan Dept. of Environmental, Great Lakes, & Energy Air Quality Division permit.

The results of the testing of SVN-2 indicated total chromium levels below (in compliance with) the total chromium air emissions limits as shown below:

Process Tested	Control System	Test Date	Test	Total Chromium Concentration	Total Chromium Emissions Rate
SVN-2	3 stage composite mesh pad	8/9	1	0.00378 mg/dscm	0.000441 lb/hr
			2	0.00403 mg/dscm	0.000481 lb/hr
			3	0.00243 mg/dscm	0.000276 lb/hr
			AVG	**0.00341 mg/dscm**	**0.000400 lb/hr**
Applicable Air Emissions Limits -				**0.007 mg/dscm**	**0.00043 lb/hr**
Results % of Limit -				**48.7 %**	**93.0 %**

Notes: mg/dscm means milligrams of total chromium per dry standard cubic meter of exhaust

The results of the testing of SVN-6 indicated total chromium levels below (in compliance with) the total chromium air emissions limits as shown below:

Process Tested	Control System	Test Date	Test	Total Chromium Concentration	Total Chromium Emissions Rate
SVN-6	3 stage composite mesh pad	8/10	1	0.00101 mg/dscm	0.000096 lb/hr
			2	0.00145 mg/dscm	0.000137 lb/hr
			3	0.00110 mg/dscm	0.000104 lb/hr
			AVG	**0.00119 mg/dscm**	**0.000112 lb/hr**
Applicable Air Emissions Limits -				-	**0.00037 lb/hr**
Results % of Limit -					**30.3 %**

Notes: mg/dscm means milligrams of total chromium per dry standard cubic meter of exhaust

1.0 GENERAL BACKGROUND

On August 9 and 10, 2022, Environmental Technology & Engineering Corp (ETE) personnel visited the Lacks Enterprises, Inc. facility located at 4260 Airlane Drive SE in Kentwood, Michigan (SRN No. 0895). The purpose of the visit was to perform air emissions testing for compliance demonstration with the total chromium air emissions limits for process SVN-2 which is comprised of three chrome plating tanks and process SVN-6 which is comprised of three chromium etch tanks. the emissions from each process are controlled by their respective emissions control systems (2). The limits were contained in a Michigan Dept. of Environmental, Great Lakes, & Energy Air Quality Division permit.

Lacks Enterprises, Inc. - Airlane is an electroplating facility specializing in nickel and chromium plating for the automotive industry. The operations targeted for testing in this project involved the chromium plating process (SVN-2) and the chromium etch process (SVN-6). Various sizes and shapes of plastic parts are etched in an acidic solution and then are plated with chromium. These parts are placed on bars as part of the production process; bar count is the common means to quantify production rates. There are three chromium plating and three chromium etch tanks which comprise each operation. Emissions from each set of tanks are captured through two ventilation systems. For each system, the exhaust gas is drawn through a process-specific three stage composite mesh pad control system (CMP). Each control system is exhausted through a single stack to atmosphere.

Lacks personnel monitored the operations and emissions control device parameters throughout the test efforts. Those detailed notes are included in Appendix A of this report. The test times and associated data are summarized as follows:

Test Date	Process Tested	Test	Test Period	Process Bar Count	CMP Scrubber Pressure Drop	Tank Surface Tensions Range
8/9	SVN-2	1	08:46 - 10:48	64	3.98 in. H_2O	40 dynes/cm
		2	11:10 - 13:12	64	3.95 in. H_2O	40 - 41 dynes/cm
		3	13:30 - 14:32	64	3.96 in. H_2O	40 - 41 dynes/cm
8/10	SVN-6	1	08:15 - 10:17	67	1.23 in. H_2O	43 - 44 dynes/cm
		2	10:35 - 12:37	68	1.23 in. H_2O	43 - 45 dynes/cm
		3	12:55 - 14:57	69	1.24 in. H_2O	44 - 45 dynes/cm

Ms. Karen Baweja of Lacks Enterprises and Mr. Jeff Zak of Scientific Control Laboratories facilitated in the coordination of the process activities and field test efforts. Mr. Trevor Drost and Ms. April Lazzaro of Michigan EGLE-AQD witnessed the test efforts and production activities. The field test efforts were performed by ETE personnel; Michael Huenink was the test team leader. The analysis for total chromium content in the sample solutions was performed by Element One, Inc. (Wilmington, NC).

2.0 RESULTS

Testing to determine total chromium "Cr" levels in the stack exhaust was performed isokinetically using EPA Methods 1 through 4 and 306. A brief description of the method is included in Section 3.0 of this report. Sketches showing the sampling port and point locations at each test location are included as Figures 2-1 (SVN-2) and 2-2 (SVN-6).

The stack flow parameters measured during testing and the weights of the total Cr collected were used to determine the emissions for each test. Three separate 120 minute tests were performed on each stack. The chromium emission results for both stacks are included as Table 2-1; the detailed isokinetic data and calculations for the runs are included in Appendix B of this report. The full analytical report is included as Appendix C of this report; however, the best results summary can be observed on page 4 of that lab report.

The results of the testing of SVN-2 indicated total chromium levels below (in compliance with) the total chromium air emissions limits as shown below:

Process Tested	Control System	Test Date	Test	Total Chromium Concentration	Total Chromium Emissions Rate
SVN-2	3 stage composite mesh pad	8/9	1	0.00378 mg/dscm	0.000441 lb/hr
			2	0.00403 mg/dscm	0.000481 lb/hr
			3	0.00243 mg/dscm	0.000276 lb/hr
			AVG	**0.00341 mg/dscm**	**0.000400 lb/hr**
Applicable Air Emissions Limits -				**0.007 mg/dscm**	**0.00043 lb/hr**
Results % of Limit -				**48.7 %**	**93.0 %**

Notes: mg/dscm means milligrams of total chromium per dry standard cubic meter of exhaust

The results of the testing of SVN-6 indicated total chromium levels below (in compliance with) the total chromium air emissions limits as shown below:

Process Tested	Control System	Test Date	Test	Total Chromium Concentration	Total Chromium Emissions Rate
SVN-6	3 stage composite mesh pad	8/10	1	0.00101 mg/dscm	0.000096 lb/hr
			2	0.00145 mg/dscm	0.000137 lb/hr
			3	0.00110 mg/dscm	0.000104 lb/hr
			AVG	**0.00119 mg/dscm**	**0.000112 lb/hr**
Applicable Air Emissions Limits -				**-**	**0.00037 lb/hr**
Results % of Limit -					**30.3 %**

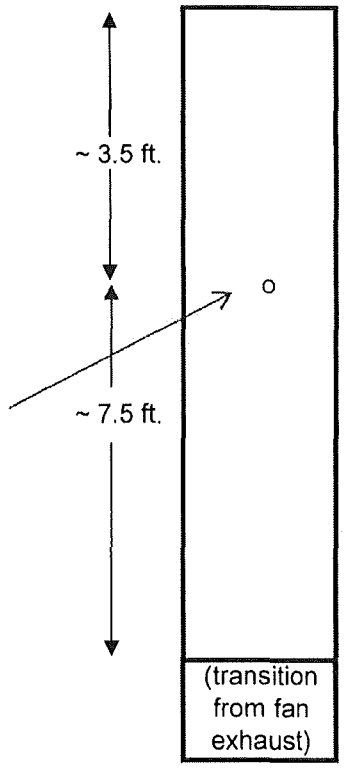
Notes: mg/dscm means milligrams of total chromium per dry standard cubic meter of exhaust

CHROMIUM PLATING PROCESS STACK (SVN-2) FIGURE 2-1
LACKS ENT - AIRLANE DRIVE PLANT

TEST POINT LOCATIONS

Point	Distance (in.) from back wall
1	1.0
2	3.2
3	5.7
4	8.5
5	12.0
6	17.1
7	30.9
8	36.0
9	39.5
10	42.3
11	44.8
12	47.0

SAMPLE PORT LOCATION



Stack Diameter: 48 inch (stack runs vertically at sampling location)

Notes: 24 isokinetic sampling points used on this round stack; 12 points along each of 2 perpendicular traverses. All other gas sampling performed at a single point in the center third of the duct.

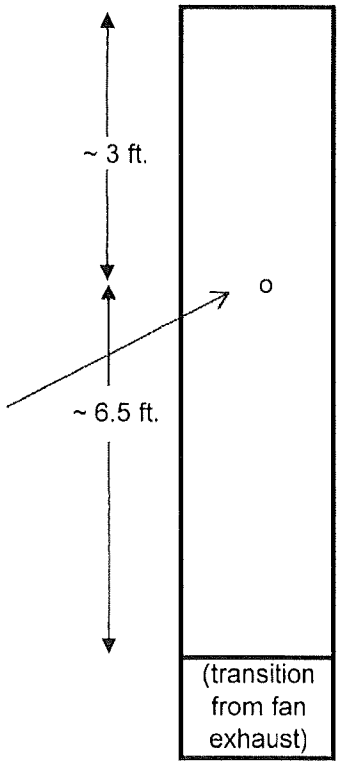
CHROMIUM ETCH PROCESS STACK (SVN-6)
LACKS ENT - AIRLANE DRIVE PLANT

FIGURE 2-2

TEST POINT LOCATIONS

Point	Distance (in.) from back wall
1	1.0
2	3.1
3	5.4
4	8.1
5	11.5
6	16.4
7	29.6
8	34.5
9	37.9
10	40.6
11	42.9
12	45.0

SAMPLE PORT LOCATION



2 sample ports, located at 90 degrees

Stack Diameter: 46 inch (stack runs vertically at sampling location)

Notes: 24 isokinetic sampling points used on this round stack; 12 points along each of 2 perpendicular traverses. All other gas sampling performed at a single point in the center third of the duct.

CR TEST RESULTS

TABLE 2-1

Chromium Control System Stacks (SVN-2 & SVN-6)
Lacks Enterprises - Airlane Dr Plant
8/9 & 8/10/2022

Sample Location	Test	Sample Total Cr Amount (mg)	Standard Sample Volume (ft3)	Standard Sample Volume (dscm)	Corrected Total Cr Concen. (mg/dscm)	Standard Exhaust Flow Rate (m3/hr)	Total Cr Emission Rate (lb/hr)
SVN-2	1	0.0105	98.08	2.777	0.00378	52954	0.000441
	2	0.01140	99.97	2.831	0.00403	54179	0.000481
	3	0.00659	95.75	2.711	0.00243	51572	0.000276
				3 Test AVG -	**0.00341**	52902	**0.000400**
		Applicable Permit Limits -			**0.007**	**mg/dscm**	**0.00043** **lb/hr**
SVN-6	1	0.00253	88.04	2.493	0.00101	42814	0.000096
	2	0.00364	88.64	2.510	0.00145	42849	0.000137
	3	0.00278	89.27	2.528	0.00110	42805	0.000104
				3 Test AVG -	**0.00119**	42823	**0.000112**
		Applicable Permit Limits -					**0.00037** **lb/hr**

Notes: Std. Sample Vol (dscm) = Std. Sample Vol (ft3) x 0.028317
Total Cr Conc. (mg/dscm) = Sample Total Cr Amount (mg) / Std. Sample Vol. (dscm)
Emission Rate = [Conc.(mg/m3) x Exhaust Flow(mg/m3)] x [1 lb / 453600 mg]

3.0 TEST METHODS

The equipment used to sample total chromium was the Western Precipitation Division of the Joy Manufacturing Company Emission Parameter Analyzer (Method 5 sample train). Samples were collected and analyzed in accordance with procedures outlined in EPA Method 306.

The sampling train consisted of a glass probe tip, a glass lined probe, and PVC connective tubing. A series of four impingers followed in an ice bath. The first was a modified Greenburg-Smith impinger with 100 ml of 0.1 N sodium hydroxide (NaOH); the second was a Greenburg-Smith impinger with 100 ml of 0.1 N NaOH; the third was a modified Greenburg-Smith impinger dry; the fourth was also a modified Greenburg-Smith impinger containing a tared quantity of Silica Gel. The gas then passed through a vacuum pump, calibrated dry gas meter, and a calibrated orifice. A schematic drawing of the sampling train is included.

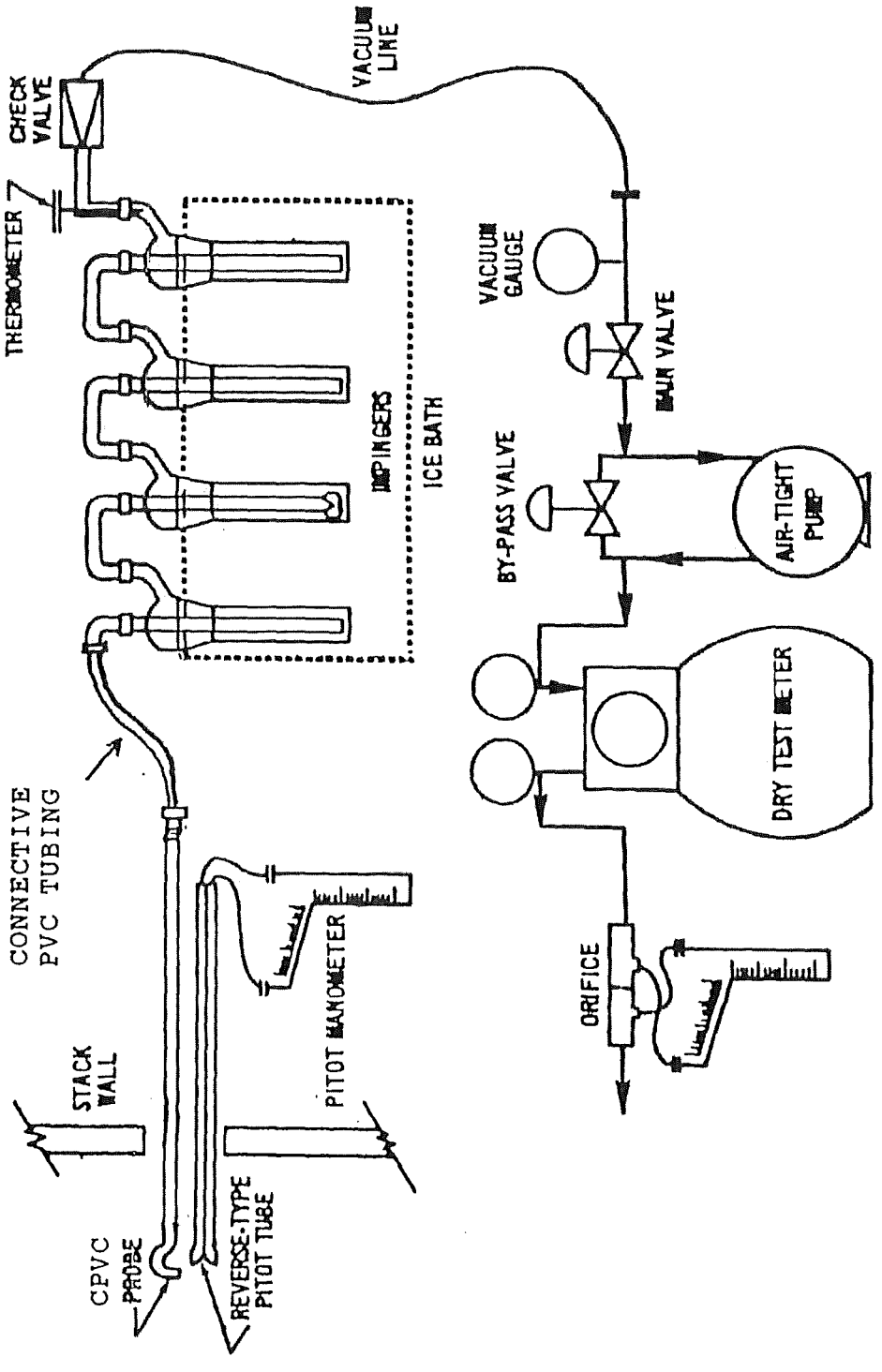
The temperatures of the stack gas stream, as well as strategic locations within the sampling devices, were monitored by RTDs and read directly from a gauge on the control unit. The initial gas stream velocity was obtained from a preliminary traverse using a Pitot tube. The initial moisture was estimated from previous tests of similar processes. This data, along with the stack temperature, was used to set a nomograph so that rapid calculations of isokinetic sampling conditions could be made.

The principle of the method was to collect the sample representative of the exhaust by adjusting the sample collection velocity to match the exhaust gas stream velocity at the point of collection. The velocity at the point of collection was measured with an "S" type Pitot tube and the collection velocity was matched to the stack gas velocity by adjusting the flow as indicated by the calibrated orifice.

To determine the molecular weight of the stack gas, samples were drawn into an Orsat analyzer and analyzed for percentage CO2, O2, CO, and N2.

At the completion of the test, the impinger contents were measured and weighed for determination of the actual moisture content of the exhaust gas stream. The impinger contents were then placed in a clean glass jar with Teflon-lined cap. The probe tip, probe, and connective tubing were then rinsed with 0.1 N NaOH (100 ml total) into the sampling train. That rinse was also placed in the sample jar. The impingers were then rinsed twice more with 0.1 N NaOH (100 ml) and the rinses were also added to the sample jar. The samples were refrigerated prior to analysis.

The sample solutions were analyzed for total Cr content by ICP-MS using the analytical methods contained in EPA Method 306. Field blanks of the sample solutions were also analyzed and all results were blank corrected. For those samples analyzed in duplicate, the average of the two results was used in the final emissions calculations.



EPA METHOD 306

TOTAL CHROMIUM EMISSIONS SAMPLING TRAIN

4.0 CALIBRATION DATA

The probe tips, Pitot tubes, dry gas meters, and sample box orifices were calibrated prior to the testing in accordance with the procedures outlined in the Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment as published by the US EPA. The values obtained were:

Stack/ Test Location	Date	Control Box ID	Orifice Coeff. ($\Delta H@$)	Dry Gas Meter Coeff. (γ)	Probe Tip Diameter
SVN-2 (plating)	8/9	3	0.949	0.993	0.250 in.
SVN-6 (etch)	8/10	3	0.949	0.993	0.250 in.

The flow measurements were made with an S-type Pitot tube which had a verified Pitot tube coefficient (C_p) of 0.84. Prior to the sampling efforts on the stack, the "null" angles were measured for a determination of the absence or presence of cyclonic flow. For SVN-2, those measurements indicated null angles in the range of 0 to 5 percent, with the average of 2.7 degrees falling well within the 20 percent criteria for acceptable sampling locations. For SVN-6, those measurements indicated null angles in the range of 0 to 5 percent, with the average of 1.7 degrees falling well within the 20 percent criteria for acceptable sampling locations.

The dry gas meter installed in the control box was a temperature compensating meter. The correction factor (gamma) for the meter could best be described by the equations:

Box 3 $\gamma = 0.993 + [(T_M - 70) \times 0.00012]$

The most recent calibrations on the sampling equipment were performed on July 8, 2022.

The isokinetic ratios for the SVN-2 test runs were in the range of 96.3 to 96.9 percent; the isokinetic ratios for the SVN-6 test runs were in the range of 98.6 to 100.0 percent. All of the isokinetic sampling ratios were within the acceptable range of 90 to 110 percent.

The quality control data from the sample analysis is included in the detailed analytical report.