Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

TEST RESULTS FOR FUME SUPPRESSANT CERTIFICATION

MCGEAN ROHCO'S DIS MIST NP IN DECORATIVE CHROME PLATING TANKS

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March 16, 1990

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EXECUTIVE SUMMARY

SCAQMD Rule 1169, adopted June 3, 1988 and amended September 8, 1989, requires all decorative chrome plating operations in the District to demonstrate emission reductions of 95% or stack emission rates below 0.15 mg/amp-hour as of November 1, 1989. Further reductions are required in 1990 and 1992 for facilities with substantial emissions. The Metal Finishing Association of Southern California (MFASC) has offered to provide data on the efficiency of fume suppressants for preventing emissions of chromic acid mists.

SCAQMD has indicated that data from such tests would be accepted if the tests are conducted in accordance with SCAQMD requirements. The extent of the emission reduction in terms of a percentage of uncontrolled tank emissions must be clearly demonstrated for each anti-mist additive by multiple tests on full scale plating tanks. Once the additive is certified by the SCAQMD, the emission reductions will be acknowledged if the additive is used in accordance with the manufacturer's directions.

This report provides source test data and results on the efficiency of McGean Rohco, Inc.'s, anti-mist additive, Dis Mist NP, in controlling chromic acid emissions from decorative chrome plating tanks. After 6 days of testing a decorative chrome plating tank under uncontrolled and controlled conditions, it was found that the average efficiency of Dis Mist NP in controlling chromic acid emissions was 99.73% for total chrome and 99.84% for hexavalent chrome.

INTRODUCTION

Pacific Environmental Services (PES), a participant in CARB's Independent Contractor Program, was contracted by McGean Rohco, Inc., to perform source testing to determine the efficiency of McGean Rohco's Dis Mist NP, in reducing chromic acid emissions from decorative chrome plating tanks. Two tests per day were conducted for a three day period on uncontrolled emissions from a decorative chrome plating tank, and two tests per day were conducted for a three day period on the emissions from the same plating tank with Dis Mist NP added to the plating solution. Test dates were February 20 - February 22, 1990 for the uncontrolled tests and February 27 - March 1, 1990 for the tests with Dis Mist NP.

In order to evaluate the effectiveness of the anti-mist additive Dis Mist NP, it was necessary to have a host decorative chrome plating tank outfitted with an emission collection system. Facilities were made available by Mr. Harry W. Levy, President of Gene's Plating Works, 3498 E. 14th Street, Los Angeles, CA. Earnest McClellan, Plant Manager, provided assistance with tank operation during source testing. The sampling location for the tests was in the 12.75" I.D. tank exhaust duct for Tank #42, before the emissions passed through any air pollution control equipment. The sample location and tank diagram are shown in Figure 1.

Source tests were conducted by M.J. Simon and S.G. Parks of PES, under the direction of M.D. High, Vice President of PES. Sam Oguntulu of SCAQMD was present during most days of testing to observe test conditions. Gary Wannlund and Ed Ong of McGean Rohco, Inc. were present during the testing to make additions of Dis Mist NP to the decorative chrome plating solution and to measure the surface tension of the plating bath.

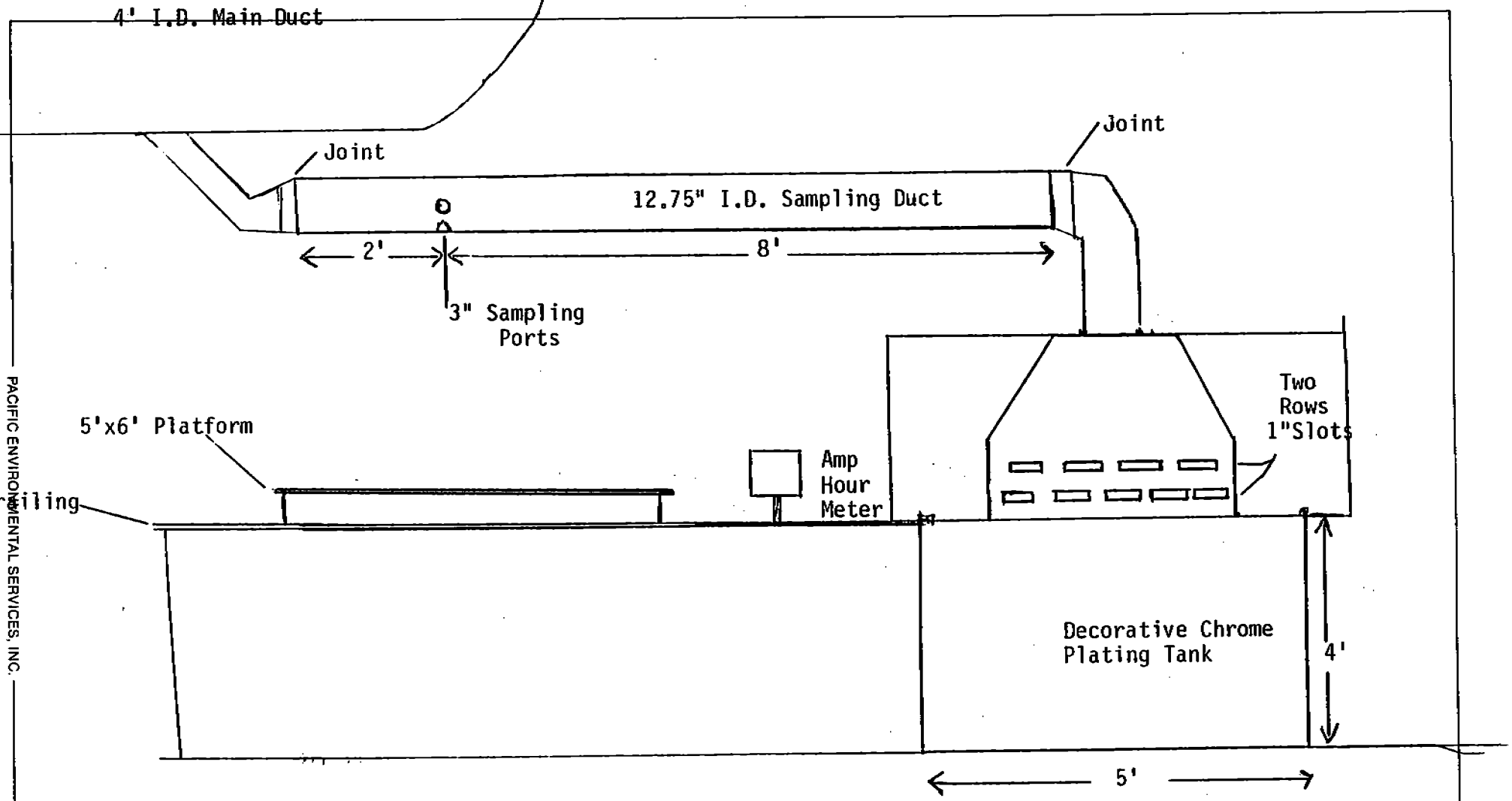


FIGURE 1: Sampling Location Diagram

PACIFIC ENVIRONMENTAL SERVICES, INC.

EQUIPMENT AND PROCESS DESCRIPTION

Gene's Plating Works, 3498 E. 14th Street, Los Angeles, CA. 90023 is engaged in the business of decorative chrome plating. Tests of chromic acid emissions were performed on decorative chrome plating Tank #42. The dimensions of Tank #42 were 5'L x 3'W x 4'D.

Before the tests were initiated, a smoke tube was used to check the collection efficiency of the Tank #42 emission collection system. No fugitive emissions were observed.

Two tests each were conducted using applied amperages of approximately 800, 1300, and 2300 for both uncontrolled and controlled conditions (a total of twelve tests). Voltage was 6.0 - 7.0 volts D.C.. It was supplied by a smaller rectifier for the low and medium load conditions and by a larger rectifier for the high load condition. Amp-hours were recorded from the amp-hour meter for the low and medium loads for use in subsequent calculations. During the high load test the larger rectifier could not be hooked up properly to the amp-hour meter so the amp-hours were calculated by the number of wheels used, the amperage used during plating, and the average time of plating.

In order to obtain repeatable current consumption, identical loads were plated during the controlled and uncontrolled tests. For the low load tests, one wheel was plated at a time for a duration of 60-70 seconds. A total of 45 wheels were plated for each low test. During the medium load test an additional dummy wheel was placed in the tank and plated along with the 45 wheels. For the high load test two additional dummy wheels were placed in the tank and plated along with the 45 wheels.

During testing, tank temperature was maintained at 100 degrees Fahrenheit. Freeboard height was maintained at 8.5" for all tests. The chromic acid concentration was measured at 23.0 oz/gal.

For the controlled emission tests, the fume suppressant manufacturer provided the fume suppressant. The manufacturer's representative, Ed Ong, installed suppressant in quantities sufficient to maintain a reduced surface tension in the plating solution below 74.8 dynes/square centimeter. A record of chemical additions and surface tension measurements is included in the Appendix as part of the test data. Surface tension results at the beginning and end of each test are shown below:

Test	Load	Surface Tension dynes/square centimeter
DMR10	Low Load	63.0-70.8
DMR11	Low Load	63.1-70.8
DMR13	Medium Load	70.2-74.8
DMR14	Medium Load	70.2-73.2
DMR16	High Load	71.7-74.8
DMR17	High Load	71.7-74.8

Dis Mist NP is a liquid fume suppressant used to reduce drag-out losses and chromic acid mist generated during the course of decorative chromium plating. Dis Mist NP reduces the solution surface tension, thus reducing the spray and mist which would either be thrown into the atmosphere, or drawn up into the exhaust hoods. The reduced surface tension also allows better drainage of racks and parts.

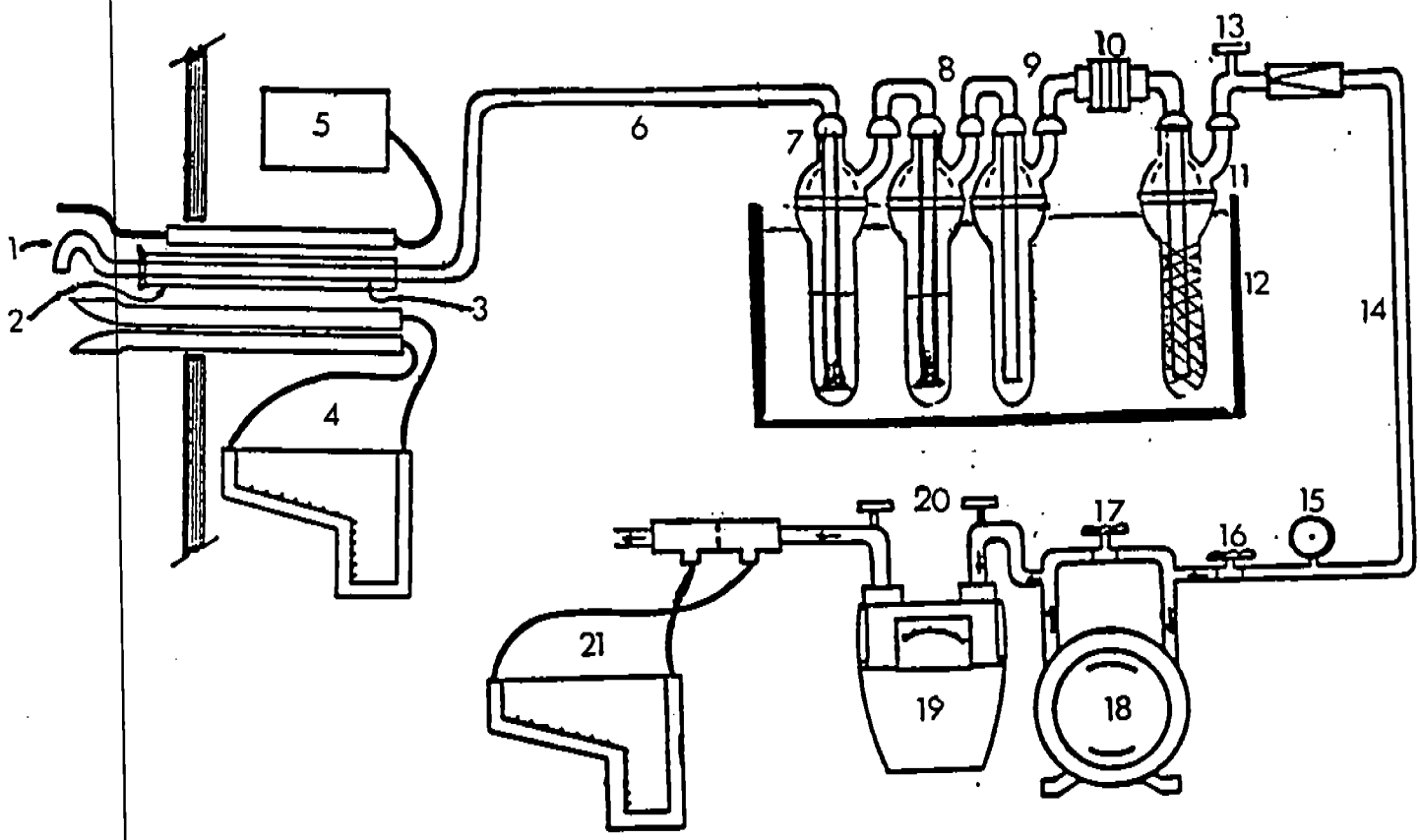
TESTING METHODOLOGY

PES used the proposed test method of CARB Method 425, dated July 7th, 1989, for sampling the chrome emissions. Sampling locations, velocities, volumetric flow rate, and moisture content determinations were done in accordance with CARB Methods 1, 2, and 4. As specified by CARB Method 1, 12 sampling points were used.

The sample was extracted through a glass nozzle, a nonheated 20" glass-lined stainless steel probe, a 10 foot teflon hose from the probe to the first impinger, two Greenburg-Smith impingers each with 100 ml of 0.1N sodium hydroxide solution, an empty impinger, a glass filter holder, an impinger filled with silica gel, a 25 foot umbilical line, a vacuum pump, a dry gas meter, and a calibrated orifice connected to an inclined manometer (Figure 2). Teflon coated glass fiber filters with 0.3, 0.1, and 0.035 micron pore layers were used in the filter holders.

The length of each test was 120 minutes. Sample sizes ranged from 97 to 120 cubic feet depending on the nozzle size used and the measured stack gas velocities. Field data were recorded on field data sheets during each test (Appendix). Leak checks were performed before and after each test.

The volume of the impinger solution and the weight of the silica gel was recorded before and after the tests in order to obtain the moisture content of the stack gas stream. The contents of the impingers were placed in 500 ml. polyethylene containers and the sampling train from the impingers to the nozzle was rinsed 3 times with a 0.1 N sodium hydroxide solution and added to the same containers. Filters were placed in other polyethylene bottles and analyzed separately. The samples were kept at 60 degrees Fahrenheit or less during and after the tests prior to the analyses in order to prevent deterioration of hexavalent chrome to total chrome.



1. Glass or stainless steel sampling nozzle
2. Stainless steel probe sheath
3. Stainless steel, glass, or Teflon-lined probe
4. Type S pitot tube and manometer for ΔP readings
5. Stack temperature sensor
6. 15 ft. teflon probe line with ball and socket connectors
7. Greenburg-Smith impinger with 100 ml. of .1 N NaOH solution
8. Greenburg-Smith impinger with 100 ml. of .1 N NaOH solution
9. Modified Greenburg-Smith impinger - drv
10. Filter holder with teflon-lined glass fiber filter
11. Modified Greenburg-Smith impinger filled with 200 grams of silica gel
12. Impinger case filled with ice
13. Impinger exit gas temperature sensor
14. Umbilical line to meter box
15. Vacuum gauge
16. Coarse adjustment valve
17. By-pass valve to adjust ΔH
18. Leak free vacuum pump
19. Dry gas meter
20. Dry gas meter inlet and outlet temperature sensors
21. Orifice meter with manometer for ΔH readings

FIGURE 2
Diagram Of Sampling Train

Laboratory analyses were conducted by Thermo Analytical Laboratory in Monrovia, California. Analyses for total chrome used atomic absorption spectrophotometry and analyses for hexavalent chrome used diphenylcarbazide colorometric techniques. The detection level of the analytical procedure for hexavalent chrome, Cr 6, and total chrome, Cr T, were 0.003 and 0.001 mg/l respectively. Total chrome is easier to measure and detection levels can be reduced to lower levels than those possible for hexavalent chrome. Total chrome analyses serve as a back-up and quality control check for hexavalent chrome concentrations.

QUALITY ASSURANCE/QUALITY CONTROL

All sampling devices were constructed and calibrated as specified in EPA reference Methods 2 and 5 of 40 CFR 60, APTD-0576, and APTD-0581. The meter box was not moved from the site during the test series. It was calibrated before and after the tests to make sure that the gas meter correction factor remained within tolerance during the tests.

To ensure that the sampling trains were clean for each day of testing, all glassware and probe lines were cleaned with 0.1 normal nitric acid solution, 0.1 normal sodium hydroxide solution, distilled water, and acetone. The sampling trains were then capped until the next tests.

To demonstrate that the sampling trains remained free from contamination, a field train blank was run for each day of testing. An extra sampling train was taken to the site each day and placed near the actual sampling train. The sample from the field train blank was retrieved along with samples from the trains used for the tests. Results showed that the amount of hexavalent chrome in the trains was below detectable amounts and that the average amount of total chrome was below 0.010 mg/liter for the liquid sample and below 2.9 micrograms for filter samples (Table 1). Train blank results were used to correct the values for the test results.

Extra care was used during sample retrieval. Clean rubber stoppers were used to cap the trains. Each sampling train was rinsed three times with 0.1 normal sodium hydroxide solution after the each test and these rinses were added to the respective sample. Disposable rubber gloves were worn during sample retrieval to help eliminate contamination. All sample volumes and weights were recorded immediately on sample recovery sheets during charging and sample recovery.

FIELD TRAIN BLANK RESULTS

TEST DATE	LIQUID Cr6		LIQUID CrT		FILTER Cr6		FILTER CrT	
2-20-90	<0.003	mg/l	0.011	mg/l	<0.5	ug	6.2	ug
2-21-90	<0.003	mg/l	0.013	mg/l	<0.5	ug	3.2	ug
2-22-90	<0.003	mg/l	0.012	mg/l	<0.5	ug	4.2	ug
2-27-90	<0.003	mg/l	0.005	mg/l	<0.5	ug	1.0	ug
2-28-90	<0.003	mg/l	0.014	mg/l	<0.5	ug	0.7	ug
3-01-90	<0.003	mg/l	0.005	mg/l	<0.5	ug	2.0	ug
Average	<0.003	mg/l*	0.010	mg/l	<0.5	ug	2.9	ug

* The value of 0.0015 mg/l was used for purposes of correcting test values.

RESULTS OF SOURCE TESTS

Calculations were made from the field data sheets to determine sample volume, moisture content, molecular weight, velocities, and flow rates of the exhaust gas stream. Results are shown on the emission test calculation sheets (Appendix).

LOW LOAD

Tests DMR-1 & DMR-2, conducted on the uncontrolled tank with an average amperage of 328 showed an emissions rate of 5.68 mg/amp-hour for total chrome and 4.28 mg/amp-hour for hexavalent chrome (Table 2A and 2B).

Tests DMR-10 & DMR-11, conducted with Dis Mist NP and with an average amperage of 371, showed an emissions rate of 0.021 mg/amp-hour for total chrome and 0.010 mg/amp-hour for hexavalent chrome (Table 5A and 5B).

From these results the reduction benefit of Dis Mist NP for decorative plating conditions with nominal amperages of 800 was calculated. Results showed a reduction of 99.63% for total chrome and 99.77% respectively for hexavalent chrome (Table 8).

MEDIUM LOAD

Tests AMT-4 & AMT-5, conducted on the uncontrolled tank with an average amperage of 453 showed an emissions rate of 4.75 mg/amp-hour for total chrome and 4.00 mg/amp-hour for hexavalent chrome (Table 3A and 3B).

Tests DMR-13 & DMR-14, conducted with Dis Mist NP and with an average amperage of 451, showed an emissions rate of 0.00 mg/amp-hour for total chrome (after correcting for the blank) and 0.003 mg/amp-hour for hexavalent chrome (Table 6A and 6B).

From these results the reduction benefit of Dis Mist NP, for decorative plating conditions with nominal amperages of 1300 A was calculated. Results showed a reduction of 100.0% total chrome and 99.93% respectively for hexavalent chrome (Table 8).

HIGH LOAD

Tests DMR-7 & DMR-8, conducted on the uncontrolled tank with an average amperage of 919 showed an emissions rate of 2.55 mg/amp-hour for total chrome and 2.44 mg/amp-hour for hexavalent chrome (Table 4A and 4B).

Tests DMR-16 & DMR-17, conducted with Dis Mist NP and with an average amperage of 994, showed an emissions rate of 0.011 mg/amp-hour for total chrome and 0.004 mg/amp-hour for hexavalent chrome (Table 7A and 7B).

From these results the reduction benefit of Dis Mist NP for decorative plating conditions with nominal amperages of 2300 A was calculated. Results showed a reduction of 99.57% for total chrome and 99.84% for hexavalent chrome (Table 8).

SUMMARY

When Dis Mist NP was used in the decorative chrome plating solution in quantities to keep the surface tension between 63.0 and 74.8 dynes/square centimeter, hexavalent chrome emissions were reduced by an average of 99.84% for plating loads between 800 and 2300 amperes.

TABLE 2A: TOTAL CHROME EMISSIONS FROM AN UNCONTROLLED DECORATIVE CHROME TANK PLATING AT LOW LOAD

TEST DATE: 2/20/90
POLLYBALLS: None
ADDITIVE: None
AMPERAGE: Nominally 800 A - During Intermittent Plating

DMR-1-L Sample liquid from the impingers in the sample train for test DMR-1.
DMR-1-F Sample caught on the filter in the sample train for test DMR-1.
DMR-2-L Sample liquid from the impingers in the sample train for test DMR-2.
DMR-2-F Sample caught on the filter in the sample train for test DMR-2.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr T (mg/l)	Impinger Catch Cr T (mg)	Filter Catch Cr T (mg)	Total Catch Cr T (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr T (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr T (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr T (mg/amp-hour)
DMR-1-L	510	2.7300	1.392								
DMR-1-F				0.003							
TEST TOTAL					1.3952	108.074	0.0129	2697	2089	328	6.369
DMR-2-L	500	2.1800	1.090								
DMR-2-F				0.001							
TEST TOTAL					1.0910	103.206	0.0106	2577	1634	328	4.983
AVERAGE							0.0117	2637	1862	328	5.676

TABLE 2B: HEXAVALENT CHROME EMISSIONS FROM AN UNCONTROLLED DECORATIVE CHROME PLATING TANK AT LOW LOAD

TEST DATE: 2/20/90
POLLYBALLS: None
ADDITIVE: None
AMPERAGE: Nominally 800 A - During Intermittent Plating

DMR-1-L Sample liquid from the impingers in the sample train for test DMR-1.
DMR-1-F Sample caught on the filter in the sample train for test DMR-1.
DMR-2-L Sample liquid from the impingers in the sample train for test DMR-2.
DMR-2-F Sample caught on the filter in the sample train for test DMR-2.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr 6 (mg/l)	Impinger Catch Cr 6 (mg)	Filter Catch Cr 6 (mg)	Total Catch Cr 6 (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr 6 (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr 6 (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr 6 (mg/amp-hour)
DMR-1-L	510	1.8885	0.963								
DMR-1-F				0.000							
TEST TOTAL					0.9631	108.074	0.0089	2697	1442	328	4.397
DMR-2-L	500	1.8185	0.909								
DMR-2-F				0.000							
TEST TOTAL					0.9093	103.206	0.0088	2577	1362	328	4.153
AVERAGE							0.0089	2637	1402	328	4.275

TABLE 3A: TOTAL CHROME EMISSIONS FROM AN UNCONTROLLED DECORATIVE CHROME PLATING TANK AT MEDIUM LOAD

TEST DATE: 2/21/90
POLLYBALLS: None
ADDITIVE: None
AMPERAGE: Nominally 1300 A - During Intermittent Plating

DMR-4-L Sample liquid from the impingers in the sample train for test DMR-4.
DMR-4-F Sample caught on the filter in the sample train for test DMR-4.
DMR-5-L Sample liquid from the impingers in the sample train for test DMR-5.
DMR-5-F Sample caught on the filter in the sample train for test DMR-5.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr T (mg/l)	Impinger Catch Cr T (mg)	Filter Catch Cr T (mg)	Total Catch Cr T (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr T (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr T (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr T (mg/amp-hour)
DMR-4-L	535	3.1500	1.6853								
DMR-4-F				0.007							
TEST TOTAL					1.6926	118.388	0.0143	2623	2250	454	4.956
DMR-5-L	615	2.3200	1.4268								
DMR-5-F				0.002							
TEST TOTAL					1.4292	110.123	0.0130	2635	2052	452	4.540
AVERAGE							0.0136	2629	2151	453	4.748

TABLE 3B: HEXAVALENT CHROME EMISSIONS FROM AN UNCONTROLLED DECORATIVE CHROME PLATING TANK AT MEDIUM LOAD

TEST DATE: 2/21/90
POLLYBALLS: None
ADDITIVE: None
AMPERAGE: Nominally 1300 A - During Intermittent Plating

DMR-4-L Sample liquid from the impingers in the sample train for test DMR-4.
DMR-4-F Sample caught on the filter in the sample train for test DMR-4.
DMR-5-L Sample liquid from the impingers in the sample train for test DMR-5.
DMR-5-F Sample caught on the filter in the sample train for test DMR-5.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr 6 (mg/l)	Impinger Catch Cr 6 (mg)	Filter Catch Cr 6 (mg)	Total Catch Cr 6 (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr 6 (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr 6 (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr 6 (mg/amp-hour)
DMR-4-L	535	2.4785	1.3260								
DMR-4-F				0.000							
TEST TOTAL					1.3260	118.388	0.0112	2623	1763	454	3.883
DMR-5-L	615	2.1085	1.2967								
DMR-5-F				0.000							
TEST TOTAL					1.2967	110.123	0.0118	2635	1862	452	4.119
AVERAGE							0.0115	2629	1812	453	4.001

TABLE 4A: TOTAL CHROME EMISSIONS FROM AN UNCONTROLLED DECORATIVE CHROME PLATING TANK AT HIGH LOAD

TEST DATE: 2/22/90
POLLYBALLS: None
ADDITIVE: None
AMPERAGE: Nominally 2300 A - During Intermittent Plating

DMR-7-L Sample liquid from the impingers in the sample train for test DMR-7.
DMR-7-F Sample caught on the filter in the sample train for test DMR-7.
DMR-8-L Sample liquid from the impingers in the sample train for test DMR-8.
DMR-8-F Sample caught on the filter in the sample train for test DMR-8.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr T (mg/l)	Impinger Catch Cr T (mg)	Filter Catch Cr T (mg)	Total Catch Cr T (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr T (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr T (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr T (mg/amp-hour)
DMR-7-L	510	2.8100	1.433								
DMR-7-F				0.000							
TEST TOTAL					1.4332	97.968	0.0146	2601	2283	908	2.514
DMR-8-L	425	3.5300	1.500								
DMR-8-F				0.002							
TEST TOTAL					1.5020	98.344	0.0153	2632	2412	930	2.593
AVERAGE							0.0150	2617	2347	919	2.554

TABLE 4B: HEXAVALENT CHROME EMISSIONS FROM AN UNCONTROLLED DECORATIVE CHROME PLATING TANK AT HIGH LOAD

TEST DATE: 2/22/90
POLLYBALLS: None
ADDITIVE: None
AMPERAGE: Nominally 2300 A - During Intermittent Plating

DMR-7-L Sample liquid from the impingers in the sample train for test DMR-7.
DMR-7-F Sample caught on the filter in the sample train for test DMR-7.
DMR-8-L Sample liquid from the impingers in the sample train for test DMR-8.
DMR-8-F Sample caught on the filter in the sample train for test DMR-8.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr 6 (mg/l)	Impinger Catch Cr 6 (mg)	Filter Catch Cr 6 (mg)	Total Catch Cr 6 (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr 6 (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr 6 (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr 6 (mg/amp-hour)
DMR-7-L	510	2.5185	1.284								
DMR-7-F				0.000							
TEST TOTAL					1.2844	97.968	0.0131	2601	2046	908	2.253
DMR-8-L	425	3.5685	1.517								
DMR-8-F				0.000							
TEST TOTAL					1.5166	98.344	0.0154	2632	2435	930	2.619
AVERAGE							0.0143	2617	2241	919	2.436

TABLE 5A: TOTAL CHROME EMISSIONS FROM A CONTROLLED DECORATIVE CHROME PLATING TANK AT LOW LOAD

TEST DATE: 2/27/90
POLLYBALLS: None
ADDITIVE: Dis Mist NP
AMPERAGE: Nominally 800 A - During Intermittent Plating

DMR-10-L Sample liquid from the impingers in the sample train for test DMR-10.
DMR-10-F Sample caught on the filter in the sample train for test DMR-10.
DMR-11-L Sample liquid from the impingers in the sample train for test DMR-11.
DMR-11-F Sample caught on the filter in the sample train for test DMR-11.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr T (mg/l)	Impinger Catch Cr T (mg)	Filter Catch Cr T (mg)	Total Catch Cr T (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr T (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr T (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr T (mg/amp-hour)
DMR-10-L	510	0.0030	0.0015								
DMR-10-F				0.000							
TEST TOTAL					0.0015	98.232	0.0000	2632	2.5	366	0.007
DMR-11-L	490	0.0170	0.0083								
DMR-11-F				0.000							
TEST TOTAL					0.0083	99.339	0.0001	2587	13.0	375	0.035
AVERAGE							0.0000	2610	7.7	371	0.021

TABLE 58: HEXAVALENT CHROME EMISSIONS FROM AN UNCONTROLLED DECORATIVE CHROME PLATING TANK AT LOW LOAD

TEST DATE: 2/27/90
POLLYBALLS: None
ADDITIVE: Dis Mist NP
AMPERAGE: Nominally 800 A - During Intermittent Plating

DMR-10-L Sample liquid from the impingers in the sample train for test DMR-10.
DMR-10-F Sample caught on the filter in the sample train for test DMR-10.
DMR-11-L Sample liquid from the impingers in the sample train for test DMR-11.
DMR-11-F Sample caught on the filter in the sample train for test DMR-11.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr 6 (mg/l)	Impinger Catch Cr 6 (mg)	Filter Catch Cr 6 (mg)	Total Catch Cr 6 (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr 6 (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr 6 (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr 6 (mg/amp-hour)
DMR-10-L	510	0.0015	0.0008								
DMR-10-F				0.000							
TEST TOTAL					0.0008	98.232	0.00001	2632	1.2	366	0.003
DMR-11-L	490	0.0085	0.0042								
DMR-11-F				0.000							
TEST TOTAL					0.0042	99.339	0.00004	2587	6.5	375	0.017
AVERAGE							0.00002	2610	3.9	371	0.010

TABLE 6A: TOTAL CHROME EMISSIONS FROM A CONTROLLED DECORATIVE CHROME PLATING TANK AT MEDIUM LOAD

TEST DATE: 2/28/90
POLLYBALLS: None
ADDITIVE: Dis Mist NP
AMPERAGE: Nominally 1300 A - During Intermittent Plating

DMR-13-L Sample liquid from the impingers in the sample train for test DMR-13.
DMR-13-F Sample caught on the filter in the sample train for test DMR-13.
DMR-14-L Sample liquid from the impingers in the sample train for test DMR-14.
DMR-14-F Sample caught on the filter in the sample train for test DMR-14.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr T (mg/l)	Impinger Catch Cr T (mg)	Filter Catch Cr T (mg)	Total Catch Cr T (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr T (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr T (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr T (mg/amp-hour)
DMR-13-L	545	0.0000	0.0000								
DMR-13-F				0.000							
TEST TOTAL					0.0000	97.673	0.00000	2630	0.0	461	0.000
DMR-14-L	630	0.0000	0.0000								
DMR-14-F				0.000							
TEST TOTAL					0.0000	113.095	0.00000	2582	0.0	440	0.000
AVERAGE							0.00000	2606	0.0	451	0.000

TABLE 6B: HEXAVALENT CHROME EMISSIONS FROM A CONTROLLED DECORATIVE CHROME PLATING TANK AT MEDIUM LOAD

TEST DATE: 2/28/90
POLLYBALLS: None
ADDITIVE: Dis Mist NP
AMPERAGE: Nominally 1300 A - During Intermittent Plating

DMR-13-L Sample liquid from the impingers in the sample train for test DMR-13.
DMR-13-F Sample caught on the filter in the sample train for test DMR-13.
DMR-14-L Sample liquid from the impingers in the sample train for test DMR-14.
DMR-14-F Sample caught on the filter in the sample train for test DMR-14.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr 6 (mg/l)	Impinger Catch Cr 6 (mg)	Filter Catch Cr 6 (mg)	Total Catch Cr 6 (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr 6 (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr 6 (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr 6 (mg/amp-hour)
DMR-13-L	545	0.0015	0.0008								
DMR-13-F				0.000							
TEST TOTAL					0.0008	97.673	0.00001	2630	1.3	461	0.003
DMR-14-L	630	0.0015	0.0009								
DMR-14-F				0.000							
TEST TOTAL					0.0009	113.095	0.00001	2582	1.3	440	0.003
AVERAGE							0.00001	2606	1.3	451	0.003

TABLE 7A: TOTAL CHROME EMISSIONS FROM A CONTROLLED DECORATIVE CHROME PLATING TANK AT HIGH LOAD

TEST DATE: 3/1/90
POLLYBALLS: None
ADDITIVE: Dis Mist NP
AMPERAGE: Nominally 2300 A - During Intermittent Plating

DMR-16-L Sample liquid from the impingers in the sample train for test DMR-16.
DMR-16-F Sample caught on the filter in the sample train for test DMR-16.
DMR-17-L Sample liquid from the impingers in the sample train for test DMR-17.
DMR-17-F Sample caught on the filter in the sample train for test DMR-17.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr T (mg/l)	Impinger Catch Cr T (mg)	Filter Catch Cr T (mg)	Total Catch Cr T (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr T (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr T (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr T (mg/amp-hour)
DMR-16-L	515	0.0140	0.0072								
DMR-16-F				0.000							
TEST TOTAL					0.0073	97.007	0.00008	2597	11.7	957	0.012
DMR-17-L	550	0.0120	0.0066								
DMR-17-F				0.000							
TEST TOTAL					0.0066	98.146	0.00007	2589	10.4	1030	0.010
AVERAGE							0.00007	2593	11.1	994	0.011

TABLE 7B: HEXAVALENT CHROME EMISSIONS FROM A CONTROLLED DECORATIVE CHROME PLATING TANK AT HIGH LOAD

TEST DATE: 3/1/90
POLLYBALLS: None
ADDITIVE: Dis Mist NP
AMPERAGE: Nominally 2300 A - During Intermittent Plating

DMR-16-L Sample liquid from the impingers in the sample train for test DMR-16.
DMR-16-F Sample caught on the filter in the sample train for test DMR-16.
DMR-17-L Sample liquid from the impingers in the sample train for test DMR-17.
DMR-17-F Sample caught on the filter in the sample train for test DMR-17.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr 6 (mg/l)	Impinger Catch Cr 6 (mg)	Filter Catch Cr 6 (mg)	Total Catch Cr 6 (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr 6 (mg/dscf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr 6 (mg/hour)	AVERAGE AMPERAGE (amps)	EMISSIONS Cr 6 (mg/amp-hour)
DMR-16-L	515	0.0015	0.0008								
DMR-16-F				0.000							
TEST TOTAL					0.0008	97.007	0.00001	2597	1.2	957	0.001
DMR-17-L	550	0.0085	0.0047								
DMR-17-F				0.000							
TEST TOTAL					0.0047	98.146	0.00005	2589	7.4	1030	0.007
AVERAGE							0.00003	2593	4.3	994	0.004

TABLE 8: SUMMARY OF RESULTS AND PERCENT REDUCTION EFFICIENCY WITH MCGEAN ROHCO'S DIS MIST NP

TEST NUMBERS	TEST CONDITIONS	AVERAGE AMP-HOURS USED	AVERAGE EMISSIONS Cr T (mg/amp-hour)	AVERAGE EMISSIONS Cr 6 (mg/amp-hour)	REDUCTION EFFICIENCY Cr T	REDUCTION EFFICIENCY Cr 6
Low Load						
DMR- 1 & DMR- 2	Uncontrolled	328	5.676	4.275		
DMR-10 & DMR-11	Additive	371	0.021	0.010	99.63	99.77
Medium Load						
DMR- 4 & DMR- 5	Uncontrolled	453	4.748	4.001		
DMR-13 & DMR-14	Additive	451	0.000	0.003	100.00	99.93
High Load						
DMR- 7 & DMR- 8	Uncontrolled	919	2.554	2.436		
DMR-16 & DMR-17	Additive	994	0.011	0.004	99.57	99.84
				AVERAGE	99.73	99.84

The field tests were conducted by M.J. Simon and S.G. Parks. Study direction and report preparation were under the supervision of M. Dean High, Vice President of Pacific Environmental Services, Inc.

Approved: M Dean High
M. Dean High

APPENDIX

Plant: Gene's Plating Works
Date: 2-20-90
Source/Sample Number: DMR-1

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(107.313)(1.017)\left[\frac{(30.08) + (2.03/13.6)}{(539.8)}\right]$

$V_{m(std)}$ = 108.074 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 13.3 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 0.626 scf

$V_{W(std)}$ = 0.626 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(0.626)}{(0.626) + (108.074)} = 0.005$

B_{Ws} = 0.005

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{Ws}(18 - M_d) = (29.0) + (0.005)(18 - 29.0)$

M_s = 28.95 lb/lb-mole

Plant: GENE'S PLATING
Date: 2-20-90
Source/Sample Number: DMR-1

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49(0.84)(0.907)\sqrt{\frac{(525.4)}{(28.95)(29.92)}}$$

$V_{s(avg)}$ = 50.7 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (50.7)(0.887)$$

Q_s = 2698 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{(std)} = 17.64(2698)(1-0.005)\frac{(29.92)}{(525.4)}$$

Q_{std} = 2697 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(525.4)(108.074)}{(29.92)(50.7)(0.00074)(120)(1-0.005)}$$

%I = 108.1 %

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-20-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-1

Sample Box Number: 2B

Clean-up Man: Parks - Simon

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-1F

Description of Filter: Dirty

MOISTURE

Impingers

Final Volume:	108 ml	90 ml	1 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	ml	ml	ml
Total H_2O:			-1

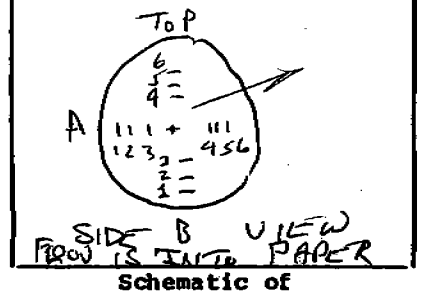
Silica Gel

Final Volume:	660.3 g	g	g
Initial Volume	646 g	g	g
Net Volume	14.3 g	g	g
Total Moisture:			13.3

Description of Impinger Catch: Clear

FIELD DATA

Plant GENE'S PLATING WORKS
Date 2-20-90
Sampling Location INLET ~~STACK~~ DUCT
Sample Type CARB 425 CHROME
Run Number DDM-2
Operator SIMON
Ambient Temperature 65°F
Barometric Pressure 30.08
Static Pressure (P_s) -2.5 "H_2O
Filter Number(s) DDMR2F
Pretest Leak Rate =0.008 cfm @ 11.0 in. Hg
Pretest Pitot Leak Check O.K.
Pretest Orsat Leak Check N.A
Read and Record all Data Every 10 Minutes



Schematic of Traverse Point Layout

Probe Length and Type 20" glass-lined SS
Pitot Tube I.D. No. S-3A
Nozzle I.D. No. & Diameter 40 P
Assumed Moisture, % 1.0
Temp. Readout S/N N.A.
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.30
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp ~~0.0~~ 0.50
Post Test Leak Rate =0.010 cfm @ 10.0 in. Hg
Post Test Pitot Leak Check O.K.
Post Test Orsat Leak Check N.A.

Impinger Box No. 4B ;

Traverse Point Number	Sampling Time, (min)	/ Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B-1	0	1322	459.311	0.75	2.80	2.80	73	79	78	7.0	—	49
B-1	10	1332	467.1	0.76	2.90	2.80	72	84	79	6.5	—	54
B-2	20	1342	475.9	0.75	2.80	2.80	73	87	80	6.5	—	55
B-3	30	1352	484.8	0.76	2.80	2.80	73	89	82	6.5	—	55
B-4	40	1402	494.0	0.75	2.80	2.80	73	91	83	6.0	—	56
B-5	50	1412	502.2	0.79	2.90	2.90	74	91	84	6.5	—	56
B-6	60	1422	511.277	0.50	1.85	1.85	76	90	85	4.0	—	58
A-1 ~~B-7~~	70	1435	518.9	0.77	2.80	2.80	74	92	86	6.0	—	57
A-2 ~~B-8~~	80	1445	527.5	0.76	2.80	2.80	72	93	86	6.5	—	58
A-3 ~~B-9~~	90	1455	537.1	0.87	3.30	3.30	72	93	87	6.5	—	57
A-4 ~~B-10~~	100	1505	546.3	0.86	3.20	3.20	69	94	87	7.0	—	57
A-5 ~~A-1~~	110	1515	555.8	0.85	3.20	3.20	70	95	88	7.0	—	57
A-6 ~~A-2~~	120	1525	569.311	—	—	—	—	—	—	—	—	—
~~A-3~~		/	END OF	TEST								
~~A-4~~		/										
~~A-5~~		/										
~~A-6~~		/			12.93	✓	532.7	✓	547.6			
~~A-7~~		/		10.872								
~~A-8~~		/	108.000									
~~A-9~~		/										
~~A-10~~		/										
		/										
		/										
		/										

SWITCH ST AT 1425

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: GENE'S PLATING
Date: 2-20-90
Source/Sample Number: DMR-2

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(104.000)(1.017)\left[\frac{(30.08) + (2.93/13.6)}{(547.6)}\right]$

$V_{m(std)}$ = 109.206 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 15.0 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 0.70 scf

$V_{W(std)}$ = 0.70 scf

3. Percent Moisture, by volume

$B_{ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(0.7)}{(0.7)+(103.70)} = 0.006$

B_{ws} = 0.006

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{ws}(18 - M_d) = (29.0) + (0.006)(18 - 29.0)$

M_s = 28.93 lb/lb-mole

Plant: Gene's Plating Works
Date: 2-20-90
Source/Sample Number: DMR-2

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49(0.84)(0.8724)\sqrt{\frac{(532.7)}{(29.92)(28.97)}}$$

$V_{s(avg)}$ = 49.2 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (49.2)(0.887)$$

Q_s = 2617 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{(std)} = 17.64(2617)(1-0.006)\frac{(29.92)}{(532.7)}$$

Q_{std} = 2577 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(532.7)(103.266)}{(29.92)(49.2)(0.00271)(120)(1-0.006)}$$

%I = 109.2 %

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-20-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-2

Sample Box Number: 4B

Clean-up Man: Packs - Simon

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR- F

Description of Filter: DIRTY

MOISTURE

Impingers			
Final Volume:	100 ml	96 ml	0 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	ml	ml	(-4) ml
Total H_2O:			
Silica Gel			
Final Volume:	652.8 g	g	g
Initial Volume	633.8 g	g	g
Net Volume	19.0 g	g	19.0 g
Total Moisture:			15.0

Description of Impinger Catch:

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-20-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-3 (BLANK)

Sample Box Number: 1B

Clean-up Man: Parks - Simon

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-3F

Description of Filter:

MOISTURE

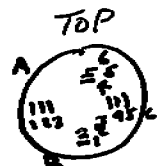
Impingers			
Final Volume:	100 ml	100 ml	0 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	ml	ml	ml
Total H_2O:	0		

Silica Gel			
Final Volume:	662.1 g	g	g
Initial Volume	662.0 g	g	g
Net Volume	g	g	g
Total Moisture:	0.1		

Description of Impinger Catch:

FIELD DATA

Plant Gene's Plating Works
Date 2-21-90
Sampling Location TANK 42 SCRUBBER INLET
Sample Type CARB METHOD 425 CHROME
Run Number DMR-4
Operator SIMON
Ambient Temperature 65°F
Barometric Pressure 30.00 "Hg
Static Pressure (P_s) -2.15" H_2O
Filter Number(s) DMR-4F
Pretest Leak Rate = 0.007 cfm @ 11.0 in. Hg
Pretest Pitot Leak Check O.K.
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 10 Minutes



END VIEW LOOKING TOWARDS SCRUBBER
(FLOW IS INTO PAPER)

Schematic of Traverse Point Layout

Probe Length and Type 20" Glass-lined Stainless Steel
Pitot Tube I.D. No. S-3A
Nozzle I.D. No. & DIAMETER 07p
Assumed Moisture, % 1.0
Temp. Readout S/N N.A
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp 0.42
Post Test Leak Rate = 0.001 cfm @ 12.0 in. Hg
Post Test Pitot Leak Check O.K.
Post Test Orsat Leak Check N.A.

Impinger Box No. 2B ; No. of wheels 40

Traverse Point Number	Sampling Time, (min) / Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B1	0 / 1037	565.621	1.00	4.30	✓	70	73	69	9.0	-	51
B1	10 / 1047	576.8	0.91	4.00	✓	72	79	71	9.0	-	55
B2	20 / 1057	586.6	0.72	3.20	✓	72	83	73	7.0	-	56
B3	30 / 1107	594.9	0.76	3.40	✓	72	85	75	7.0	-	55
B4	40 / 1117	605.7	0.75	3.40	✓	72	87	78	7.0	-	55
B5	50 / 1127	615.8	0.72	3.30	✓	70	89	79	7.0	-	56
B-6	60 / 1137	625.909	0.76	3.35	✓	74	89	81	7.0	-	55
A-1	70 / 1150	634.4	0.74	3.40	✓	73	90	82	7.0	-	57
A-2	80 / 1200	643.7	0.71	3.20	✓	74	92	84	7.0	-	57
A-3	90 / 1210	654.5	0.84	3.75	✓	74	93	85	8.0	-	57
A-4	100 / 1220	663.8	0.82	3.7	✓	75	94	86	8.0	-	57
A-5	110 / 1230	674.1	0.84	3.75	✓	75	95	87	8.0	-	56
A-6	120 / 1240	684.098	—	—	—	—	—	—	—	-	—
	/		END TEST								
	/										
	/										
	/		$\overline{\sqrt{\Delta P}}$ =			$\overline{T_s}$ 532.8		$\overline{T_m}$ = 543.3			
	/	$\overline{V_m}$ 118.471	0.842								
	/										
	/		$\overline{\Delta H}$ = 3.56								
	/										
	/										
	/										
	/										

SWITCH START AT 1140

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: Gene's Plating
Date: 2-21-90
Source/Sample Number: DMR-4

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(118.477)(1.017)\left[\frac{(30.00) + (3.56/13.6)}{(543.3)}\right]$

$V_{m(std)}$ = 118.388 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 22.9 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 1.08 scf

$V_{W(std)}$ = 1.08 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(1.08)}{(1.08)+(118.388)} = 0.009$

B_{Ws} = 0.9 %

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{Ws}(18 - M_d) = (29.0) + (.009)(18 - 29.0)$

M_s = 28.90 lb/lb-mole

Plant: GENE'S Plating
Date: 5-21-96
Source/Sample Number: DMR-4

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49(0.84)(0.892)\sqrt{\frac{(532.8)}{(29.84)(28.90)}}$$

$V_{s(avg)}$ = 50.35 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (50.35)(0.8866)$$

Q_s = 2679 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{(std)} = 17.64(2679)(1-0.009)\frac{(29.84)}{(532.8)}$$

Q_{std} = 2623 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(532.8)(118.388)}{(29.84)(50.35)(.000389)(120)(1-0.009)}$$

%I = 108.0 %

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-21-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-4

Sample Box Number: 4R

Clean-up Man:

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-4F

Description of Filter: Grey

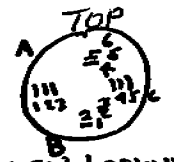
MOISTURE

Impingers			
Final Volume:	655 ml	141 ml	3 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	-45 ml	+41 ml	+3 ml
Total H_2O:			(-1)
Silica Gel			
Final Volume:	665.4 g	g	g
Initial Volume	641.5 g	g	g
Net Volume	g	g	g
Total Moisture:	(23.9)		(+22.9)

Description of Impinger Catch: Clear

FIELD DATA

Plant Gene's Plating Works
Date 2-21-90
Sampling Location TANK 42 SCRUBBER INLET
Sample Type CARB METHOD 425 CHROME
Run Number DMR-5
Operator SIMON
Ambient Temperature 65°F
Barometric Pressure 30.00" Hg
Static Pressure (P_s) -2.10" H_2O
Filter Number(s) DMR-5F
Pretest Leak Rate = 0.00 cfm @ 15.0 in. Hg
Pretest Pitot Leak Check O.K.
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 10 Minutes



END VIEW LOOKING TOWARDS SCRUBBER
(FLOW IS INTO PAPER)

Schematic of Traverse Point Layout

Probe Length and Type 20" Glass-lined Stainless Steel
Pitot Tube I.D. No. 5-3A
Nozzle I.D. No. & Diameter 42P
Assumed Moisture, % 1.0
Temp. Readout S/N N.A
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp 0.50
Post Test Leak Rate = 0.01 cfm @ 15.0 in. Hg
Post Test Pitot Leak Check O.K.
Post Test Orsat Leak Check N.A.

Impinger Box No. 4B ; No. of wheels 40

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B1	0	1318	684.220	0.93	3.50	3.50	77	87	88	9.0	-	55
B-1	10	1328	694.1	0.88	3.30	3.30	77	90	85	8.5	-	55
B-2	20	1338	704.0	0.72	2.80	2.80	77	96	88	7.5	-	60
B-3	30	1348	712.7	0.74	2.90	2.90	78	94	87	7.5	-	55
B-4	40	1358	722.3	0.74	2.90	2.90	78	94	87	7.5	-	56
B-5	50	1408	731.1	0.72	2.80	2.80	78	95	88	7.5	-	56
B-6	60	1418	737.004	0.77	2.95	2.95	78	94	89	7.5	-	55
A-1	70	1430	748.5	0.81	3.10	3.10	77	96	89	8.0	-	56
A-2	80	1440	758.2	0.78	3.00	3.00	78	97	90	8.0	-	56
A-3	90	1450	767.5	0.85	3.20	3.20	78	97	91	8.0	-	58
A-4	100	1500	776.6	0.89	3.40	3.40	78	97	91	8.0	-	59
A-5	110	1510	786.6	0.86	3.25	3.25	78	97	91	8.0	-	58
A-6	120	1520	796.237	—	—	—	—	—	—	—	—	—
			END	TEST								
					$\overline{\Delta H}$							
				0.899	3.09	T_s=		$\overline{T_m}$	557.6			
		$\overline{V_m}$	112.017				537.7					

SWITCH START AT 1420

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: GENES Plating
Date: 2-5-90
Source/Sample Number: DMR-5

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(112.017)(1.017)\left[\frac{(30.00) + (3.69/13.6)}{(551.6)}\right]$

$V_{m(std)}$ = 110.123 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 16.9 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 0.795 scf

$V_{W(std)}$ = 0.795 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(0.795)}{(0.795)+(110.123)} = 0.007$

B_{Ws} = 0.7 %

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{Ws}(18 - M_d) = (29.0) + (0.007)(18 - 29.0)$

M_s = 28.92 lb/lb-mole

Plant: Gene's Plating
Date: 2-5-90
Source/Sample Number: DMR-5

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49(0.84)(0.899)\sqrt{\frac{(537.7)}{(29.85)(28.92)}}$$

$V_{s(avg)}$ = 50.95 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (50.95)(0.8866)$$

Q_s = 2710 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{(std)} = 17.64(2710)(1-0.007)\frac{(29.85)}{(537.7)}$$

Q_{std} = 2635 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(537.7)(116.123)}{(29.85)(50.95)(.002712)(120)(1-0.007)}$$

%I = 113.8 %

Plant: Gene's Plating
Date: 2-22-90
Source/Sample Number: DMR-7

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(100.490)(1.017)\left[\frac{(29.94) + (2.48/13.6)}{(554.3)}\right]$

$V_{m(std)}$ = 97.968 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 14.7 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 0.692 scf

$V_{W(std)}$ = 0.692 scf

3. Percent Moisture, by volume

$B_{ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(0.692)}{(0.692)+(97.968)} = 0.007$

B_{ws} = 0.007

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{ws}(18 - M_d) = (29.0) + (0.007)(18 - 29.0)$

M_s = 25.92 lb/lb-mole

~~30~~ 29.93

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-22-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-8 ~~Blr~~

Sample Box Number: 1R

Clean-up Man: SIMON

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-8F

Description of Filter:

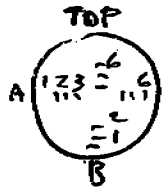
MOISTURE

Impingers			
Final Volume:	107 ml	77 ml	ml
Initial Volume:	100 ml	100 ml	ml
Net Volume:	ml	ml	ml
Total H_2O:			-16
Silica Gel			
Final Volume:	705.7 g	g	g
Initial Volume	677.5 g	g	g
Net Volume	28.2 g	g	g
Total Moisture:			12.2

Description of Impinger Catch:

FIELD DATA

Plant GENE'S PLATING WORKS
Date 2-20-90
Sampling Location TANK 42 DUCT
Sample Type CARB25CHROME
Run Number ~~DMR-1~~ DMR-2
Operator Simon
Ambient Temperature 65°F
Barometric Pressure 30.08
Static Pressure (P_s) -2.2" H2O
Filter Number(s) DMR-1F
Pretest Leak Rate = 0.010 cfm @ 16" in. Hg
Pretest Pitot Leak Check O.K.
Pretest Orsat Leak Check N.A
Read and Record all Data Every 10 Minutes



Schematic of Traverse Point Layout

Probe Length and Type 20" glass lined SS
Pitot Tube I.D. No. S-3A
Nozzle I.D. No. & Diameter 4IP
Assumed Moisture, % 1.0
Temp. Readout S/N —
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting M
Reference Δp 0.50
Post Test Leak Rate = 0.007 cfm @ 16" in. Hg
Post Test Pitot Leak Check NA
Post Test Orsat Leak Check N.A.

45 wheels

Impinger Box No. 2B ;

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
~~A1~~ B1	0	10:31	349.325	1.00	3.60	3.60	66	69	67	3.5	—	51
~~A2~~ B1	10	10:41	359.4	0.90	2.90	2.90	67	76	69	3.5	—	52
B2	20	10:51	367.3	0.82	3.00	3.00	65	81	71	3.5	—	52
B3	30	1101	376.8	0.80	2.90	2.90	64	83	73	3.5	—	52
B4	40	~~1111~~ 1111	385.9	0.81	3.00	3.00	64	84	75	3.5	—	52
B5	50	1121	395.3	0.74	2.80	2.8	64	85	76	4.0	—	52
B6	60	1131	403.643	0.73	2.70	2.70	67	83	77	4.5	—	52
A1	70	1143	412.0	0.78	2.90	2.90	66	86	78	5.0	—	53
A2	80	1153	421.9	0.79	2.90	2.90	66	86	79	5.0	—	53
A3	90	1203	430.7	0.88	3.20	3.20	65	87	80	5.0	—	53
A4	100	1213	439.6	0.86	3.20	3.20	64	87	80	5.0	—	54
A5	110	1223	449.8	0.87	3.20	3.20	67	88	81	5.0	—	55
A6	120	1233	456.648	—	—	—	—	—	—	—	—	—
			END	OF TEST 2								
			107.313	0.907	3.03		525.4		539.8			
			V_m: 107.313									
		θ = 120.0		Ave = 0.907								

SWITCH PORTS START AT 1133

TIME WHEELS INSERTED

1036 1039
1044
1047
1050
1055
1059
1102
1104
1106
1109
1112 1157
1115 1159
1129 1202
1129 1204
1134
1136 1208
1139 1210
1141 1215
1144
1146 1219
1148 1226
1155 1228
1216

PACIFIC ENVIRONMENTAL SERVICES, INC.

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-22-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-89

Sample Box Number: 2B (Blank)

Clean-up Man: SIMON

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-9F

Description of Filter:

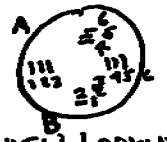
MOISTURE

Impingers			
Final Volume:	100 ml	99 ml	0 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	ml	ml	ml
Total H_2O:			
Silica Gel			
Final Volume:	640.0 g	g	g
Initial Volume	639.5 g	g	g
Net Volume	g	g	g
Total Moisture:			

Description of Impinger Catch:

FIELD DATA

Plant Gene's Plating Works
Date 2-27-90
Sampling Location TANK 42 SCRUBBER INLET
Sample Type CARB METHOD 425 CHROME
Run Number DMR-10
Operator SIMON
Ambient Temperature 75°F
Barometric Pressure 30.00
Static Pressure (P_s) -2.5" H_2O
Filter Number(s) DMR-10F
Pretest Leak Rate = 0.08 cfm @ 10.0 in. Hg
Pretest Pitot Leak Check O.K
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 10 Minutes



END VIEW LOOKING TOWARDS SCRUBBER
(FLOW IS INTO PAPER)

Schematic of Traverse Point Layout

Probe Length and Type 20" Glass-lined Stainless Steel
Pitot Tube I.D. No. S-3A
Nozzle I.D. No. & Diameter 43p
Assumed Moisture, % 1.0
Temp. Readout S/N N.A
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp 0.60
Post Test Leak Rate = 0.00 cfm @ 10.0 in. Hg
Post Test Pitot Leak Check ok
Post Test Orsat Leak Check N.A.

Impinger Box No. 4B ; No. of Wheels 45

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3 (.319 initial)	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B1	0	1104	983.319	0.91	2.80	✓	75	79	79	6.5	-	55
B1	10	1114	007.1	0.82	2.55	✓	76	85	79	6.0	-	587
B2	20	1124	015.1	0.72	2.25	✓	75	89	81	5.5	-	57
B3	30	1134	23.2	0.75	2.30	✓	75	89	82	5.5	-	58
B4	40	1144	32.0	0.75	2.30	✓	73	91	84	5.5	-	58
B5	50	1154	40.9	0.73	2.30	✓	75	91	85	5.5	-	59
B6	60	1204	046.927	0.81	2.50	✓	76	90	86	6.0	-	60
A1	70	1215	055.6	0.74	2.30	✓	76	93	87	5.5	-	60
A2	80	1225	063.4	0.77	2.40	✓	75	93	87	5.5	-	60
A3	90	1235	072.2	0.88	2.75	✓	74	93	87	6.5	-	60
A4	100	1245	081.5	0.86	2.70	✓	73	94	88	6.0	-	60
A5	110	1255	090.8	0.84	2.60	✓	74	94	88	6.0	-	60
A6	120	1305	099.591	—	—	—	—	—	—	—	—	—
			END	OF TEST								
						$\overline{T_s}$	535.8		$\overline{T_m}$	547.2		
				$\overline{\sqrt{\Delta P}}$ 0.893	$\overline{\Delta H}$ 2.48							
		$\overline{V_m}$	116.270									

SWITCH START AT 1205

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: GENE'S Plating
Date: 2-27-90
Source/Sample Number: DMR-10

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(99.272)(1.017)\left[\frac{(30.00) + (2.48/13.6)}{(547.2)}\right]$

$V_{m(std)} =$ 98.232 dscf

2. Volume Water Vapor Collected, Standard Conditions

$V_{lc} =$ 4 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc} =$ 0.188 scf

$V_{W(std)} =$ 0.188 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(0.188)}{(0.188)+(98.232)} =$ 0.002

$B_{Ws} =$ 0.2%

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

$M_d =$ 29.0 lb/lb-mole

$M_s = M_d + B_{Ws}(18 - M_d) = (29.0) + (0.002)(18 - 29.0)$

$M_s =$ 28.98 lb/lb-mole

PES

Plant: Gene's Plating
Date: 2-27-90
Source/Sample Number: DMR-10

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49(0.84)(0.893)\sqrt{\frac{(535.8)}{(29.82)(28.98)}}$$

$V_{s(avg)}$ = 50.5 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (50.5)(0.8866)$$

Q_s = 2686 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{(std)} = 17.64(2686)(1-0.002)\frac{(29.82)}{(535.8)}$$

Q_{std} = 2632 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(535.8)(98.232)}{(29.82)(50.5)(0.0002688)(120)(1-0.002)}$$

%I = 102.6 %

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-27-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-10

Sample Box Number: 48

Clean-up Man: SIMON

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-12F

Description of Filter:

MOISTURE

Impingers			
Final Volume:	90 ml	93 ml	1 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	ml	ml	ml
Total H_2O:			

Silica Gel			
Final Volume:	644.1 g	g	g
Initial Volume	624.1 g	g	g
Net Volume	g	g	g
Total Moisture:			+4

Description of Impinger Catch: Clear

FIELD DATA

Plant Gene's Plating Works
Date 2-27-96
Sampling Location TANK 42 SCRUBBER INLET
Sample Type CARB METHOD #25 CHROME
Run Number DMR11
Operator SIMON
Ambient Temperature 75°F
Barometric Pressure 30.00
Static Pressure (P_s) -2.5"H_2O
Filter Number(s) DMR-11F
Pretest Leak Rate = 0.008cfm @ 10.5in. Hg
Pretest Pitot Leak Check O.K.
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 10 Minutes

END VIEW LOOKING TOWARDS SCRUBBER
(FLOW IS INTO PAPER)

Schematic of Traverse Point Layout

Probe Length and Type 20" Glass-lined Stainless Steel
Pitot Tube I.D. No. 5-3A
Nozzle I.D. No. & DIAMETER 40P
Assumed Moisture, % 1.0
Temp. Readout S/N N.A
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp 0.60
Post Test Leak Rate = 0.008cfm @ 10.0 in. Hg
Post Test Pitot Leak Check O.K
Post Test Orsat Leak Check N.A.

Impinger Box No. 3B ; No. of wheels 44

Traverse Point Number	Sampling Time, (min)	/ Clock Time / (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B1	0	1337	099.735	0.84	2.60	✓	76	88	87	6.0	-	52
B1	10	1347	108.0	0.85	2.70	✓	78	91	87	6.0	-	57
B2	20	1357	116.9	0.71	2.15	✓	78	94	88	6.0	-	59
B3	30	1407	125.5	0.74	2.30	✓	76	95	89	6.0	-	60
B4	40	1417	133.9	0.74	2.30	✓	77	96	90	5.5	-	60
B5	50	1427	141.6	0.73	2.30	✓	76	96	90	5.5	-	60
B6	60	1439	150.366	0.84	2.60	✓	77	94	91	6.0	-	61
A1	70	1449	159.3	0.74	2.30	✓	77	96	91	5.5	-	61
A2	80	1459	167.3	0.71	2.15	✓	76	96	91	5.5	-	61
A3	90	1509	174.8	0.84	2.60	✓	76	96	91	5.5	-	61
A4	100	1519	184.0	0.83	2.60	✓	75	96	91	5.5	-	62
A5	110	1529	192.5	0.82	2.60	✓	75	96	91	5.5	-	62
A6	120	1539	201.037	—	—	—	—	—	—	—	—	—
				END OF TEST								
			101.302		2.43	$\bar{T}_s$	536H	$\bar{T}_m$	552.1			
				$\bar{\Delta P}$ 0.884								

SWITCH START AT 1439

PACIFIC ENVIRONMENTAL SERVICES, INC.

PES

Plant: GENE'S Plating
Date: 2-27-90
Source/Sample Number: DMR-11

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(101.302)(1.017)\left[\frac{(30.00) + (2.43/13.6)}{(552.1)}\right]$

$V_{m(std)}$ = 99.339 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 21.8 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 1.026 scf

$V_{W(std)}$ = 1.026 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(1.026)}{(1.026)+(99.339)} = 0.01$

B_{Ws} = 1%

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{Ws}(18 - M_d) = (29.0) + (0.010)(18 - 29.0)$

M_s = 28.890 lb/lb-mole

Plant: GENE'S Plating
Date: 2-27-90
Source/Sample Number: DMR-11

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49(0.84)(0.884)\sqrt{\frac{(536.4)}{(29.82)(28.89)}}$$

$V_{s(avg)}$ = 50.1 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (50.1)(0.8866)$$

Q_s = 2665 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{s(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{s(std)} = 17.64(2665)(1-0.01)\frac{(29.82)}{(536.4)}$$

$Q_{s(std)}$ = 2587 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(536.4)(99.339)}{(29.82)(50.1)(0.000272)(120)(1-0.01)}$$

%I = 104.6 %

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-27-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-11

Sample Box Number: ~~2B~~ 3B

Clean-up Man: SIMON

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-11F

Description of Filter:

MOISTURE

Impingers			
Final Volume:	90 ml	110 ml	1 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	ml	ml	ml
Total H_2O:			

Silica Gel			
Final Volume:	629.8 g	g	g
Initial Volume	609.0 g	g	g
Net Volume	g	g	21.8 g
Total Moisture:			

Description of Impinger Catch: Clear

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date:

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-12

Sample Box Number:

Clean-up Man:

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-12F

Description of Filter:

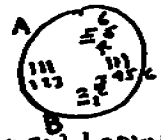
MOISTURE

Impingers			
Final Volume:	100 ml	100 ml	ml
Initial Volume:	100 ml	100 ml	ml
Net Volume:	ml	ml	ml
Total H_2O:			
Silica Gel			
Final Volume:	657.8 g	g	g
Initial Volume	657.2 g	g	g
Net Volume	g	g	g
Total Moisture:			

Description of Impinger Catch:

FIELD DATA

Plant Gene's Plating Works
Date 2-28-90
Sampling Location TANK 42 SCRUBBER INLET
Sample Type CARB METHOD 425 CHROME
Run Number DMR-13
Operator SIMON
Ambient Temperature 75°F
Barometric Pressure 30.00
Static Pressure (P_s) -21" H_2O
Filter Number(s) DMR-13 F
Pretest Leak Rate = 0.002 cfm @ 10.0 in. Hg
Pretest Pitot Leak Check O.K
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 10 Minutes



END VIEW LOOKING TOWARDS SCRUBBER
(FLOW IS INTO PAPER)

Schematic of Traverse Point Layout

Probe Length and Type 20" Glass-lined Stainless Steel
Pitot Tube I.D. No. S-3A
Nozzle I.D. No. & Diameter 41P
Assumed Moisture, % 1.0
Temp. Readout S/N N.A
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp 0.60
Post Test Leak Rate = 0.005 cfm @ 10 in. Hg
Post Test Pitot Leak Check OK
Post Test Orsat Leak Check N.A.

Impinger Box No. 4B ; No. of wheels 40

Traverse Point Number	Sampling Time, (min)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B1	0	1045	0.90 <-> 201.045	2.80	2.80		77	74	73	7.0	-	57
B1	10	1055	208.9	0.88	2.70	✓	77	79	74	7.0	-	52
B2	20	1105	217.6	0.75	2.30	✓	72	83	76	~~7.0~~ 6.0	-	54
B3	30	1115	226.1	0.75	2.30	✓	74	86	78	6.0	-	55
B4	40	1125	233.5	0.74	2.25	✓	72	88	80	6.0	-	55
B5	50	1135	242.2	0.74	2.25	✓	73	89	82	6.0	-	55
B6	60	1145	252.0	0.91	2.80	✓	72	90	84	7.0	-	55
A1	70	1157	258.6	0.73	2.20	✓	74	92	84	6.0	-	57
A2	80	1207	266.6	0.72	2.20	✓	75	92	85	6.0	-	57
A3	90	1217	274.1	0.84	2.6	✓	75	93	86	6.5	-	58
A4	100	1227	281.8	0.84	2.6	✓	75	94	86	6.5	-	58
A5	110	1237	291.4	0.83	2.6	✓	75	94	87	6.5	-	58
A6	120	1247	299.325	—	—	—	—	—	—	—	—	—
				END OF	TEST	13						
												68
			V_m=98.[illegible]		Ave=2.23		T_s=534		T_m=544.5			
				Ave=0.[illegible]								

Switch Stack At 1147

FIXED PROBE TEMP. SENSOR'S CONNECTOR

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: Gene's Plating Works
Date: 2-28-90
Source/Sample Number: DMR-13

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(098.280)(1.017)\left[\frac{(30.00) + (2.23/13.6)}{(544.5)}\right]$

$V_{m(std)}$ = 97.673 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = +19.8 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 0.932 scf

$V_{W(std)}$ = 0.932 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(0.932)}{(0.932)+(97.673)} = 0.0095$

B_{Ws} = 0.9%

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\ -\ ) + 0.320(\ -\ ) + 0.280(\ -\ )$

M_d = Use 29.0 lb/lb-mole

$M_s = M_d + B_{Ws}(18 - M_d) = (29.0) + (0.009)(18 - 29.0)$

M_s = 28.9 lb/lb-mole

Plant: Gene's Plating Works
Date: 2-28-90
Source/Sample Number: DMR-13

5. Stack Gas Velocity Average

$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$

$V_{s(avg)} = 85.49(0.84)(0.895)\sqrt{\frac{(534)}{(\cancel{30.154})(29.9)}}$ 29.846

$V_{s(avg)}$ = 50.6 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$Q_s = 60\ V_s\ A = 60\ (50.6)\left(\frac{\left(\frac{12.75}{2}\right)^2 \pi}{144}\right)$

Q_s = 2,692 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$

$Q_{(std)} = 17.64(2,692)(1-0.09)\frac{(29.846)}{(534)}$

Q_{std} = 2,630 dscfm

8. Isokinetic Variation

$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$

$= 0.0945\ \frac{(534)(97.673)}{(29.846)(50.6)(\quad)(120)(1-0.09)}$

$\left(\frac{\frac{0.224}{2}}{12}\right)^2 \pi$

%I = 100.3 %

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-28-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR- 13

Sample Box Number: 4B

Clean-up Man:

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR- F

Description of Filter:

MOISTURE

Impingers			
Final Volume:	115 ml	90 ml	1 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	+15 ml	-10 ml	+1 ml
Total H_2O:			+6

Silica Gel			
Final Volume:	748.8 g	g	g
Initial Volume	735.0 g	g	g
Net Volume	+ 13.8 g	g	g
Total Moisture:			+19.8

Description of Impinger Catch: CLEAR

FIELD DATA

Plant Gene's Plating Works
Date 2-28-90
Sampling Location TANK 42 SCRUBBER INLET
Sample Type CARB METHOD 425 CHROME
Run Number DMR-14
Operator SIMON
Ambient Temperature 75°F
Barometric Pressure 30.00" Hg
Static Pressure (P_s) -2.1" H2O
Filter Number(s) DMR-14F
Pretest Leak Rate = 0.008 cfm @ 10.0 in. Hg
Pretest Pitot Leak Check O.K.
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 10 Minutes

END VIEW LOOKING TOWARDS SCRUBBER
(FLOW IS INTO PAPER)

Schematic of Traverse Point Layout

Probe Length and Type 20" Glass-lined Stainless Steel
Pitot Tube I.D. No. S-3A
Nozzle I.D. No. & Diameter 07P
Assumed Moisture, % 1.0
Temp. Readout S/N N.A
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp 0.43
Post Test Leak Rate = 0.01 cfm @ 10.0 in. Hg
Post Test Pitot Leak Check O.K.
Post Test Orsat Leak Check N.A.

Impinger Box No. 1B ; No. of wheels ____

Traverse Point Number	Sampling Time, (min)	/ Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B1	~~124~~ 0	1314	299.428	0.88	3.65	3.55	77	89	86	9.5	-	54
B1	10	1324	309.2	0.81	3.40	3.40	76	92	87	9.0	-	60
B2	20	1334	318.7	0.70	2.90	2.90	78	94	88	8.0	-	62
B3	30	1344	327.8	0.74	3.10	3.10	75	95	89	8.0	-	61
B4	40	1354	336.9	0.73	3.10	3.10	77	96	89	8.0	-	61
B5	50	1404	346.6	0.76	3.20	3.20	77	96	90	8.5	-	62
B6	60	1414	355.885	0.91	3.80	3.80	76	95	91	10.0	-	61
A1	70	1426	366.0	0.73	3.10	3.10	77	97	91	9.0	-	62
A2	80	1436	375.5	0.66	2.80	2.80	76	97	91	8.5	-	62
A3	90	1446	384.5	0.86	3.65	3.65	76	97	92	9.5	-	62
A4	100	1456	394.7	0.83	3.50	3.50	76	97	91	9.5	-	63
A5	110	1506	405.0	0.84	3.50	3.50	75	97	91	9.5	-	63
A6	120	1516	414.571	—	—	—	—	—	—	—	-	—
			END OF	TEST 14								
			$\bar{V}_m$ 115.143	$\bar{\Delta P}$ = 0.882	$\bar{\Delta H}$ 3.32		$\bar{T}_s$ = 536.3		$\bar{T}_m$ 552.4			

SWITCH START AT 1416

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: Gene's Plating
Date: 2-28-96
Source/Sample Number: DMR-14

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(115.143)(1.017)\left[\frac{(30.00) + (3.32/13.6)}{(552.4)}\right]$

$V_{m(std)}$ = 113.095 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 21.3 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 1.003 scf

$V_{W(std)}$ = 1.003 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(1.003)}{(1.003)+(113.095)} = 0.009$

B_{Ws} = 0.009

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{Ws}(18 - M_d) = (29.0) + (0.009)(18 - 29.0)$

M_s = 28.90 lb/lb-mole

Plant: Gene's Plating
Date: 2-28-90
Source/Sample Number: DMR-14

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49 (0.84)(0.882) \sqrt{\frac{(536.3)}{(29.85)(28.90)}}$$

$V_{s(avg)}$ = 49.9 - ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (49.9)(0.8866)$$

Q_s = 2654 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{(std)} = 17.64(2654)(1-0.009)\frac{(29.85)}{(536.3)}$$

Q_{std} = 2582 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(536.3)(113.095)}{(29.85)(49.9)(0.000300)(120)(1-0.009)}$$

%I = 107.4 %

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-28-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-14

Sample Box Number: 1B

Clean-up Man:

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR- F

Description of Filter:

MOISTURE

Impingers			
Final Volume:	102 ml	92 ml	1 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	ml	ml	ml
Total H_2O:			(-5)
Silica Gel			
Final Volume:	733.2 g	g	g
Initial Volume	706.4 g	g	g
Net Volume	(26.8) g	g	(21.8) g
Total Moisture:			

Description of Impinger Catch: CLEAR

2-27 Barometer = 29.90
2-28 Barometer = 29.99

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 2-28-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-15 (BLANK)

Sample Box Number: 2B

Clean-up Man:

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-15F

Description of Filter:

MOISTURE

Impingers			
Final Volume:	110 ml	90 ml	0 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	r ml	ml	ml
Total H_2O:			
Silica Gel			
Final Volume:	706.2 g	g	g
Initial Volume	700.0 g	g	g
Net Volume	g	g	+6.2 g
Total Moisture:			

Description of Impinger Catch:

FIELD DATA

Plant Gene's Plating Works
Date 3-1-90
Sampling Location TANK 42 SCRUBBER INLET
Sample Type CARB METHOD #25 CHROME
Run Number DMR-16
Operator SIMON
Ambient Temperature 75°F
Barometric Pressure 29.92" Hg
Static Pressure (P_s) -2.1" H_2O
Filter Number(s) DMR-16F
Pretest Leak Rate =0.016 cfm @ 11.0 in. Hg
Pretest Pitot Leak Check O.K.
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 10 Minutes

END VIEW LOOKING TOWARDS SCRUBBER (FLOW IS INTO PAPER)

Schematic of Traverse Point Layout

Probe Length and Type 20" Glass-lined Stainless Steel
Pitot Tube I.D. No. S-3A
Nozzle I.D. No. & Diameter 41p
Assumed Moisture, % 1.0
Temp. Readout S/N N.A
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp 0.60
Post Test Leak Rate =0.011 cfm @ 10.0 in. Hg
Post Test Pitot Leak Check O.K.
Post Test Orsat Leak Check N.A.

Impinger Box No. 4B ; No. of wheels 42

113271

Traverse Point Number	Sampling Time, (min) /	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B1	0	1043	415.385	0.90	2.80	✓	73	74	74	6.5	-	46
B1	10	1053	424.0	0.76	2.40	✓	70	79	73	6.0	-	50
B2	20	1103	432.1	0.72	2.25	✓	69	83	75	6.0	-	51
B3	30	1113	440.0	0.76	2.40	✓	68	85	77	6.50	-	51
B4	40	1123	448.2	0.73	2.25	✓	68	86	78	6.0	-	51
B5	50	1133	456.2	0.70	2.20	✓	70	87	80	5.5	-	51
B6	60	1143	463.792	0.84	2.60	✓	70	85	81	6.5	-	52
A1	70	1155	471.8	0.82	2.55	✓	69	88	82	6.5	-	52
A2	80	1205	481.2	0.68	2.10	✓	71	89	82	6.0	-	53
A3	90	1215	488.6	0.82	2.55	✓	68	88	83	6.0	-	53
A4	100	1225	496.8	0.83	2.55	✓	70	89	83	6.0	-	54
A5	110	1235	505.1	0.80	2.50	✓	70	89	84	6.0	-	54
A6	120	1245	513.011	—	—	—	—	—	—	—	—	—
					END OF TEST							
		$\overline{V_m}$=	97.426	$\overline{\sqrt{\Delta P}}$= 0.883	$\overline{\Delta H}$= 2.43		$\overline{T_s}$ 529.7		$\overline{T_m}$= 542.3			

SWITCH START AT: 1145

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: Gene's Plating
Date: 3-1-90
Source/Sample Number: DMR-16

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(97.426)(1.017)\left[\frac{(29.92) + (2.43/13.6)}{(542.3)}\right]$

$V_{m(std)}$ = 97.007 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 23.8 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 1.12 scf

$V_{W(std)}$ = 1.12 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(1.12)}{(1.12)+(97.007)} = 0.011$

B_{Ws} = 1.1%

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{Ws}(18 - M_d) = (29.0) + (0.011)(18 - 29.0)$

M_s = 28.88 lb/lb-mole

Plant: Gene's Plating
Date: 3-1-90
Source/Sample Number: DMR-16

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49(0.84)(0.883)\sqrt{\frac{(529.7)}{(29.77)(28.88)}}$$

$V_{s(avg)}$ = 49.8 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (49.8)(0.8866)$$

Q_s = 2649 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{(std)} = 17.64(2649)(1-0.011)\frac{(29.77)}{(529.7)}$$

Q_{std} = 2597 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(529.7)(97.007)}{(29.77)(49.8)(0.000274)(120)(1-0.011)}$$

%I = 100.8 %

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 3-1-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-16

Sample Box Number: 4B

Clean-up Man: SIMON

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-16F

Description of Filter: DIRTY

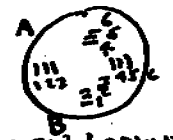
MOISTURE

Impingers			
Final Volume:	98 ml	108 ml	ml
Initial Volume:	100 ml	100 ml	ml
Net Volume:	ml	ml	46 ml
Total H_2O:			
Silica Gel			
Final Volume:	711.1 g	g	g
Initial Volume	693.3 g	g	g
Net Volume	17.8 g	g	23.8 g
Total Moisture:			

Description of Impinger Catch:

FIELD DATA

Plant Gene's Plating Works
Date 3-1-90
Sampling Location TANK 42 SCRUBBER INLET
Sample Type CARB METHOD 425 CHROME
Run Number DMR-IT
Operator SIMON
Ambient Temperature 70°F
Barometric Pressure 29.92" Hg
Static Pressure (P_s) -2-2" H_2O
Filter Number(s) DMR-17F
Pretest Leak Rate = 0.006 cfm @ 10.0 in. Hg
Pretest Pitot Leak Check O.K.
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 10 Minutes



END VIEW LOOKING TOWARDS SCRUBBER
(FLOW IS INTO PAPER)

Schematic of Traverse Point Layout

Probe Length and Type 20" Glass-lined Stainless Steel
Pitot Tube I.D. No. S-3A
Nozzle I.D. No. & Diameter 42P
Assumed Moisture, % 1.0
Temp. Readout S/N N.A
Meter Box Number 1A
Meter $\Delta H_@$ 2.13
C Factor 1.20
Meter Gamma 1.017
Heater Box Setting N.A.
Reference Δp 0.60
Post Test Leak Rate = 0.010 cfm @ 12.0 in. Hg
Post Test Pitot Leak Check O.K.
Post Test Orsat Leak Check N.A.

Impinger Box No. 1B ; No. of wheels 42

Traverse Point Number	Sampling Time, (min) / Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
B1	0 / 1314	513.672	0.96	3.00	✓	73	78	77	5.0	-	60
B1	10 / 1324	523.0	0.88	2.70	✓	74	83	78	5.0	-	59
B2	20 / 1334	530.8	0.70	2.15	✓	75	86	79	4.0	-	60
B3	30 / 1344	538.3	0.71	2.15	✓	72	84	79	4.0	-	60
B4	40 / 1354	546.6	0.70	2.15	✓	71	83	79	4.0	-	60
B5	50 / 1404	554.4	0.69	2.10	✓	73	84	79	4.0	-	61
B6	60 / 1414	561.820	0.82	2.50	✓	73	82	79	4.5	-	61
START 1416 A71	70 / 1424	570.8	0.73	2.25	✓	74	85	79	4.5	-	62
A82	80 / 1434	578.6	0.70	2.15	✓	74	85	80	4.0	-	61
A93	90 / 1444	586.5	0.85	2.65	✓	74	86	81	5.0	-	62
A104	100 / 1454	595.0	0.84	2.55	✓	73	87	81	5.0	-	62
A 5	110 / 1504	603.3	0.80	2.45	✓	74	87	81	4.5	-	62
A 6	120 / 1516	612.158	—	—	—	—	—	—	—	—	—
	/	STOP-	END OF	TEST							
	/										
	/										
	/		$\overline{\Delta P}$ =	44=24		$\overline{T_s}$	533.3	T_m =	541.8		
	/	V_m	98.486	0.883							
	/										
	/										
	/										
	/										
	/										
	/										

PACIFIC ENVIRONMENTAL SERVICES, INC.

Plant: Gene's Plating
Date: 3-1-90
Source/Sample Number: DMR-17

1. $V_{m(std)} = 17.64\ V_m\ Y \left[\frac{P_{bar} + (\Delta H/13.6)}{T_m}\right]$

$V_{m(std)} = 17.64(98.486)(1.017)\left[\frac{(29.92) + (2.4/13.6)}{(541.8)}\right]$

$V_{m(std)}$ = 98.146 dscf

2. Volume Water Vapor Collected, Standard Conditions

V_{lc} = 20.0 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc}$ = 0.941 scf

$V_{W(std)}$ = 0.941 scf

3. Percent Moisture, by volume

$B_{ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(0.941)}{(0.941) + (98.146)} = 0.009$

B_{ws} = 0.9%

4. Molecular Weight, Stack gas

Dry Molecular Wight

$M_d = 0.440\ (\%\ CO_2) + 0.320\ (\%\ O_2) + 0.280\ (\%\ N_2 + \%\ CO)$

$M_d = 0.440(\quad) + 0.320(\quad) + 0.280(\quad)$

M_d = 29.0 lb/lb-mole

$M_s = M_d + B_{ws}(18 - M_d) = (29.0) + (0.009)(18 - 29.0)$

M_s = 28.90 lb/lb-mole

Plant: Genes Plating
Date: 3-1-90
Source/Sample Number: DMR-17

5. Stack Gas Velocity Average

$$V_{s(avg)} = 85.49\ C_p \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_{s(avg)} = 85.49(0.84)(0.883)\sqrt{\frac{(533.3)}{(29.76)(28.90)}}$$

$V_{s(avg)}$ = 49.9 ft/sec.

6. Stack Volumetric Flow Rate, Actual Conditions (Stack Temperature and Pressure)

$$Q_s = 60\ V_s\ A = 60\ (49.9)(0.8866)$$

Q_s = 2654 acfm

7. Stack volumetric flow rate, standard conditions (68° F, 29.92 Hg)

$$Q_{(std)} = 17.64\ Q_s\ (1-B_{ws})\ \frac{P_s}{T_s} =$$

$$Q_{(std)} = 17.64(2654)(1-0.009)\frac{(29.76)}{(533.3)}$$

Q_{std} = 2589 dscfm

8. Isokinetic Variation

$$\%I = K\ \frac{T_s\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1-B_{ws})}$$

$$= 0.0945\ \frac{(533.3)(98.146)}{(29.76)(49.9)(0.00027\ 12)(120)(1-0.009)}$$

%I = 103.2 %

Barometer - 29.92

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 3-1-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-17

Sample Box Number: 1B

Clean-up Man: SIMON

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-17F

Description of Filter: DIRTY

MOISTURE

Impingers			
Final Volume:	98 ml	102 ml	ml
Initial Volume:	100 ml	100 ml	ml
Net Volume:	ml	ml	0 ml
Total H_2O:			

Silica Gel			
Final Volume:	692.2 g	g	g
Initial Volume	672.2 g	g	g
Net Volume	g	g	20.0 g
Total Moisture:			

Description of Impinger Catch:

PES

SAMPLE RECOVERY DATA

Plant: Gene's Plating Works

Date: 3-1-90

Sampling Location: TANK 42 SCRUBBER INLET

Sample Type: CARB METHOD 425 CHROME

Run Number: DMR-18 (BLANK)

Sample Box Number: 2B

Clean-up Man: SIMON

Job Number: 3985

Comments:

FRONT HALF

Filter Number: DMR-18 F

Description of Filter:

MOISTURE

Impingers			
Final Volume:	99 ml	98 ml	0 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	ml	ml	-3 ml
Total H_2O:			
Silica Gel			
Final Volume:	686.6 g	g	g
Initial Volume	686.6 g	g	g
Net Volume	g	g	-3 g
Total Moisture:			

Description of Impinger Catch:

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Genes Plating
DATE 2-15-90
SAMPLING LOCATION
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A)
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B)
STACK I.D., (DISTANCE A - DISTANCE B)
NEAREST UPSTREAM DISTURBANCE
NEAREST DOWNSTREAM DISTURBANCE
CALCULATOR PARKS

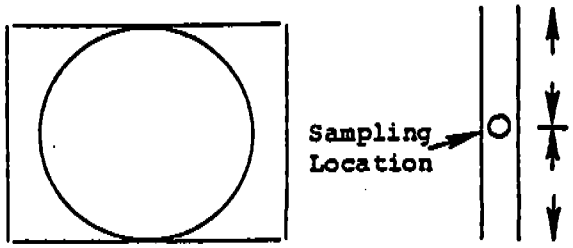
SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
A1	0.044	12.75"	1/2"		
A2	0.146		1 7/8"		
A3	0.296		3 3/4"		
A4	0.704		9"		
A5	0.854		10 7/8"		
A6	0.956		12 1/4"		
B1	0.044		1/2"		
B2	0.146		1 7/8"		
B3	0.296		3 3/4"		
B4	0.704		9"		
B5	0.854		10 7/8"		
B6	0.956		12 1/4"		

PES

PRELIMINARY VELOCITY TRAVERSE

Plant: Gene's Plating
Date: 2-15-90
Location: Exhaust Duct
Stack I.D.: 12.75"
Barometric Pressure, in. Hg: 29.76
Stack Gauge Pressure, in. H_2O: -0.67
Operators: PARKS
Pitot Tube I.D. Number: 15
Temperature Readout I.D.: #4
Pitot Tube Leak Check: OK



Schematic of Traverse Point Layout

Traverse Point Number	Velocity Head (Δp_s) in. H_2O	Stack Temp. (T_s), °F	Cyclonic Flow Check ° from Null
A1	0.60	61 °F	
A2	0.71		
A3	0.61		
A4	0.70		
A5	0.67		
A6	0.57		
B1	0.63		
B2	0.80		
B3	0.80		
B4	0.72		
B5	0.66		
B6	0.57		
$\overline{\Delta P}$ AVG	= 0.67		
	$\sqrt{\Delta P}$ AVE		
Average	0.8172		

Traverse Point Number	Velocity Head (Δp_s) in. H_2O	Stack Temp. (T_s), °F	Cyclonic Flow Check ° from Null
Average			

PES

CHROME PLATING OR ANODIZING PROCESS DATA

Test #1 Load-1 wheel cycle

PLATING SHOP: Genes Plating
TEST DATE: 2/20/90
TEST NUMBER: DOM 1 & ~~DOM 2~~
TANK NUMBER: 42
LENGTH: 5'
WIDTH: 3'
DEPTH: 4'
FREEBOARD:
HOOD TYPE: 1 Side
POLLYBALLS: NO — SIZE: — PERCENT COVERAGE:
ADDITIVE: NO — MANUFACTURER: — PRODUCT:
AGITATION AIR: NO
ACID STRENGTH: Gary
BATH TEMP: 100°F
CONTROL EQUIPMENT: Scrubber

RECTIFIER NO.: — RECTIFIER NO.: ~~[illegible]~~

TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
START DOM-1						
10:30	6.6	775	093730			
10:45	6.5	1000	093810			
11:00	6.5	900	093846			
11:15	7.0	950	093985			
11:30	6.0	800	094030			
11:45	6.0	800	094122			
12:00	7.0	930	094185			
12:15	6.5	900	094282			
12:30	7.0	800	094385			
~~12:45~~		END DOM-2				
12						
		AVG-873	328 AMP/HOUR			

1130			
~~1030~~	~~IN~~	~~1030~~	~~IN~~
~~1037~~	~~OUT~~	~~1037~~	~~OUT~~
1040	45	out	
1044	20	in	
1042	05	out	
1040	45	in	
1046	48	in	
1048	10	out	
1049	30	IN	
1050	20	OUT	
1051	54	in	
1052	58	OUT	
1055	50	in	
1057	00	out	
1058	08	in	
1059	20	out	
1101	00	in	
1101	30	OUT	
1103	00	in	
1104	04	out	
1104	36	in	
1105	45	out	
1157	20	IN	1107 09 in
1158	06	OUT	1108 30 out
1200	17	IN	
1201	20	OUT	1109 16 in
1202	00	IN	1110 23 out
1203	10	OUT	1113 20 in
1204	34	IN	1114 30 out
1206	08	OUT	1115 58 in
1208	10	IN	1117 09 out
1210	10	OUT	1117 50 in
1209	36	IN	1118 [illegible] out
1210	36	OUT	1123 20 IN
1212	30	IN	1128 30 out
1213	40	OUT	1129 [illegible] IN
1214	35	IN	1129 58 OUT
1215	46	OUT	1131 10 IN
1216	30	IN	1130 10 OUT
1217	30	OUT	1134 30 IN
1219	00	IN	1135 36 OUT
1220	36	OUT	1136 04 IN
1221	40	IN	1137 04 OUT
1222	47	OUT	1139 20 IN
1223	08	IN	1140 48 OUT
1224	20	OUT	1141 12 IN
1225	00	IN	1142 12 OUT
1226	08	OUT	1143 50 IN
1226	42	IN	1144 10 OUT
1227	38	OUT	1146 00 IN
1228	00	IN	1147 20 OUT
1228	30	OUT	1148 51 IN
1229	30	IN	1149 47 OUT
1230	40	OUT	1155 19 IN
			1156 30 OUT

CARLOS COUNTED 45 WHEELS

PES

CHROME PLATING OR ANODIZING PROCESS DATA

PLATING SHOP: GENES PLATING
TEST DATE: 2-20-90
TEST NUMBER: DOM 2
TANK NUMBER: 42
LENGTH: 5'
WIDTH: 3'
DEPTH: 4'
FREEBOARD:
HOOD TYPE: 1 SIDE
POLLYBALLS: NO SIZE: PERCENT COVERAGE:
ADDITIVE: NO MANUFACTURER: PRODUCT:
AGITATION AIR: NO
ACID STRENGTH: - CARN
BATH TEMP: 100°F
CONTROL EQUIPMENT: Scrubber

	RECTIFIER NO.			RECTIFIER NO.		
TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
				46 → WHEELS		
1320	6.5	900	094534			
1337	6.2	800	094624			
1352	6.5	900	094719			
1407	6.5	900	094800			
1422	6.5	900	094894			
1437	6.5	900	094942			
1452	7.0	900	095027			
1507	7.0	900	095052			
1524	7.0	900	095201			
	AVG =	878	328			

PES

CHROME PLATING OR ANODIZING PROCESS DATA

PLATING SHOP Gene's Plating Works
TEST DATE 2-21-90
TEST NUMBER DMR-4
TANK NUMBER 42
LENGTH
WIDTH
DEPTH
FREEBOARD
HOOD TYPE
POLLYBALLS NONE SIZE PERCENT COVERAGE
ADDITIVE NONE MANUFACTURER PRODUCT
AGITATION AIR NONE
ACID STRENGTH
BATH TEMP
CONTROL EQUIPMENT SCRUBBER

RECTIFIER NO. RECTIFIER NO.

TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
	START	DMR-4				
1037	7.0	1350	095837			
1053	7.0	1500	095950			
1108	7.0	1500	~~096006~~ 096065			
1131	7.0	1400	096141			
1134	0	0	096229			
1136	7.0	1350				
1140	0	0	096280			
1146	7.0	1350	096308			
1154	7.0	1400	096379			
1210	6.8	1400	096476			
1226.5	6.2	1000	096625			
1240	0	0	096767			
		END	DMR-4			
	AVG =	1361	454 Amp/HOUR			

CHROME PLATING OR ANODIZING PROCESS DATA

PLATING SHOP Gene's Plating Works
TEST DATE 2-21-90
TEST NUMBER DMR-5
TANK NUMBER 42
LENGTH 5'
WIDTH 3'
DEPTH 4'
FREEBOARD 8.5"
HOOD TYPE SLOT (REAR)
POLLYBALLS NONE SIZE _____ PERCENT COVERAGE _____
ADDITIVE NONE MANUFACTURER _____ PRODUCT _____
AGITATION AIR NONE
ACID STRENGTH _____
BATH TEMP _____
CONTROL EQUIPMENT SCRUBBER

	RECTIFIER NO. _____			RECTIFIER NO. _____		
TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
	START DMR-5					
1318	0	0	096796			
1320	7.0	1450	096800			
1335	7.0	1500	096971			
1352	0	0	097028			
1409	7.0	1500	097113			
1423	0	0	097260			
1424	7.0	1500	097265			
1432,5	6.9	1350	097345			
1446	7.0	1400	097465			
1459	0	0	097542			
1503	6.5	1300	0976561			
1520	7.0	1500	097715			
		END TEST				
	AVG=	1438	452			

PES

CHROME PLATING OR ANODIZING PROCESS DATA

PLATING SHOP GENE'S PLATING WORKS
TEST DATE 1-22-90
TEST NUMBER DMR-17
TANK NUMBER 42
LENGTH 5'
WIDTH 3'
DEPTH 4'
FREEBOARD 8½" with parts inserted
HOOD TYPE SLOT ON REAR OF TANK
POLLYBALLS NO SIZE PERCENT COVERAGE
ADDITIVE NO MANUFACTURER PRODUCT
AGITATION AIR NO
ACID STRENGTH
BATH TEMP
CONTROL EQUIPMENT SCRUBBER ONLY

RECTIFIER NO. LARGE GREY 500A RECTIFIER NO.

TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
		START TEST				
1321	0	0	099501			
1322	7.0	2300	099517			
1355	7.75	2250	099713			
1406	0	0	099799			
1410	7.0	2200	099823			
1426	7.0	2300	099884			
1430	0	0	099918			
1500	0	0	100049			
1501	7.25	2250	100053			
1512.5	7.00	2300	100116			
1523	7.0	2300	100198			
		END TEST				
	AVG	2271	343			

2 DUMMY WHEELS
2 WHEEL CENTERS UNCONTROLLED
1 "LIVE" WHEEL

x 8 SF
CARLOS

PES

CHROME PLATING OR ANODIZING PROCESS DATA

PLATING SHOP Gene's Plating Works
TEST DATE 2-22-90
TEST NUMBER DMR-8
TANK NUMBER 42
LENGTH 5'
WIDTH 3'
DEPTH 4'
FREEBOARD 8.5" w/ parts in
HOOD TYPE NONE SLOTS (IN REAR OF TANK)
POLLYBALLS NONE SIZE _____ PERCENT COVERAGE _____
ADDITIVE NONE MANUFACTURER _____ PRODUCT _____
AGITATION AIR NONE
ACID STRENGTH _____
BATH TEMP _____
CONTROL EQUIPMENT SCRUBBER

RECTIFIER NO. LARGE GREY 500A RECTIFIER NO. _____

TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
		START TEST				
1549	0	0	100200			
1552	8.0	2350	100227			
1619	0	0	100371			
1621	8.0	2300	100385			
1639	7.5	2300	100492			
1657.5	00	0	100602			
1716	7.5	2300	100723			
1731	8.0	2400	100821			
1751	7.0	2300	100952			
		END	TEST			
	AVG =	2325	370			

PES

CHROME PLATING OR ANODIZING PROCESS DATA

PLATING SHOP: GENE'S PLATING WORKS
TEST DATE: 2-27-90
TEST NUMBER: DMR-10 and 11
TANK NUMBER: 42
LENGTH: 5'
WIDTH: 3'
DEPTH: 4'
FREEBOARD: 8¼" TO TOP Foam, Foam is ≈½" thick (with parts in)
HOOD TYPE: SLOTS ON REAR OF TANK
POLLYBALLS: NONE SIZE _____ PERCENT COVERAGE _____
ADDITIVE: YES MANUFACTURER ~~ARGEANARDO~~ McGean-Rohco PRODUCT: DIS-MIST NP
AGITATION AIR: NO
ACID STRENGTH: _____
BATH TEMP: _____
CONTROL EQUIPMENT: SCRUBBER, ADDITIVE

RECTIFIER NO. 202-2582 (small) RECTIFIER NO. _____

TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
		START TEST				
1104	7.0	980	107809			
1120.5	0	0	107912			
1128	6.25	900	107944			
1152	7.0	850	108075			
1211	0	0	108178	AVG		
1216.5	7.0	975	108215	DMR-10	921	366 Amp-Hours
1243	7.8	1100	108385			
1307	0	0	108559			
		END TEST				
		START TEST				
1337	7.0	1100	108559			
1345	7.0	1100	108684	AVG		
1358	0	0	108690	DMR11	1008	375 Amp-Hours
1420	7.0	750	108852			
1435	7.5	1300	108943			
1444	7.0	1000	108983			
1506	6.6	800	109130			
1529	0	0	109256			
1539	0	0	109322			

PES

CHROME PLATING OR ANODIZING PROCESS DATA

PLATING SHOP GENE'S PLATING WORKS
TEST DATE 2-28-90
TEST NUMBER DMR-13 + DMR-14
TANK NUMBER 42
LENGTH 5'
WIDTH 3'
DEPTH 4'
FREEBOARD 8½" solution to bottom of slot 7½" w/Foam
HOOD TYPE Slots on rear of tank
POLLYBALLS NONE SIZE PERCENT COVERAGE
ADDITIVE YES MANUFACTURER McGean-Rohco PRODUCT DIS-MIST NP
AGITATION AIR NO
ACID STRENGTH
BATH TEMP
CONTROL EQUIPMENT Additive & Scrubber

RECTIFIER NO. SMALL RECTIFIER NO. _____

TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
		START DMR-13				
1045	0	0	109902			
1051	8.0	1400	109969			
1116	7.5	1250	110151			
1124	6.0	1000	110220			
1130	7.5	950	110377			
1155	0	0	110477	AVG=	1130	461 AMP HOURS
1208	6.8	1050	110545			
1228	6	0	110702			
1247	0	0	110870			
		END DMR-13				
		START DMR-14				
1314	0	0	110870			
1320.5	7.8	1300	110885			
1344.5	6.8	990	111066			
1357	7.0	1200	111148	AVG	1207	440 AMP HOURS
1419	0	0	111291			
1431	7.0	1200	111350			
1457	7.0	1250	111601			
1516	7.5	1300	111734			

PES

CHROME PLATING OR ANODIZING PROCESS DATA

PLATING SHOP GENE'S PLATING WORKS
TEST DATE 3-1-90
TEST NUMBER DMR-16 & 17
TANK NUMBER 42
LENGTH
WIDTH
DEPTH
FREEBOARD 7" To top of Foam at beginning of Test 16
HOOD TYPE SLOT - Rear of Tank
POLLYBALLS NONE SIZE — PERCENT COVERAGE —
ADDITIVE YES MANUFACTURER McGEAN-ROHCO DIST-MIST NP
AGITATION AIR NO
ACID STRENGTH
BATH TEMP
CONTROL EQUIPMENT SCRUBBER, ADDITIVE

LARGE RECTIFIER
TANK NO. 42 ~~TANK NO.~~

TIME	VOLTS	AMPS	AMP-HOURS	VOLTS	AMPS	AMP-HOURS
		START DMR-16				
1043	0	0	112529			
1045	NO	OBSERVED	112578			
1051	7.5	2400	112644			
1107	7.5	2350	112700	AVE	2392	365 Amp/Hours
1128	7.5	2500	112800			
1149	7.5	2400	112900			
1153	0	0	112935			
1207	0	0	113060			
1216	7.5	2356	113099			
1228	7.5	2350	113194			
1245	0	0	113271			
	END TEST 16					
	START TEST 17					
1314	0	0	113271			
1319	7.0	2250	113312			
1336	0	0	113474			
1339	7.5	2950	113485			
1357	7.5	2350	113571			
1417.5	0	0	113684	AVE	2575	425 Amp/Hours
1420	7.5	2450	113558			
1501	7.5	2500	113761			
1503	8.75	2450	114087			
1511	0	0	114098			
1516	0	0	114135			

114150
114130
20/w

PACIFIC ENVIRONMENTAL SERVICES, INC.

~~FIGURE 3~~

~~PES Process Data Sheet (3/4 of actual size)~~

2-20-90

9:30 am. T = 74°F sp-gr = 1.21

47 drops

46 drops.

S.T. 74.8

11:30 am T = 101°F sp.gr. = 1.21

46 drops

S.T. 74.8

12:30 pm T = 74°F sp.gr. = 1.21

45 drops

45 drops.

S.T. 76.4

1:40 pm T = 73°F sp.gr. 1.21

45 drops

S.T. 76.4

2:30 pm T = 74°F sp.gr = 1.21

45 drops

45 drops

S.T. 76.4

2-21-90

10:40 am T = 74°F sp. gr. = 1.21
45 DROPS S.T. 76.4

12:40 pm T = 73°F sp. gr. = 1.20
45 DROPS S.T. 75.8

1:10 pm T = 73°F sp. gr = 1.20
45 DROPS S.T. 75.8

3:20 pm T = 74°F sp. gr. = 1.20
45 DROPS S.T. 75.8

2-22-90

12:40 pm T=74°F sp.gr.: 1.21
45 DROPS S.T. 76.4

3:00 pm T=74°F sp.gr: 1.21
45 DROPS S.T. 76.4

T=74°F sp.gr 1.21
45 DROPS S.T. 76.4

T=74°F sp.gr.-1.21
45 DROPS S.T. 76.4

2-27-90

9:30 am T = 106°F sp-gr: 1.22

49 Drops

48 Drops S.T. 72.3

10:30 am ADDED 1000 ml DIS-MIST NP

10:55 am T = 106°F sp-gr: 1.22

~~60~~ Drops

55 S.T. 63.0

55

~~52~~

1:05 pm T = 106°F Sp. gr. 1.22

~~55~~ Drops S.T. 70.8

~~51~~

49

49

1:30 pm ADDED 1000 ml DIS-MIST NP

1:45 pm T = 106°F Sp. gr. 1.22

55 Drops

55 S.T. 63.1

53

1:40 pm T = 106°F Sp-gr 1.22

49 Drops S.T. 70.8

49

7-28-90

10:20 am T = 107°F sp. gr. 1.21
45 DROPS S.T. 76.4

10:30 am ADDED 1000 ml DIS-MIST NP

10:50 am T = 106°F sp. gr. 1.21
48 DROPS
49 DROPS S.T. 70.2

12:50 pm T = 107°F sp. gr. 1.21
46 46 46 DROPS S.T. 74.8

1:15 pm ADDED 1000 ml DIS-MIST NP

1:30 pm T = 106°F sp. gr. 1.21
49 49 49 DROPS S.T. 70.2

3:15 pm T = 105°F sp. gr. 1.21
47 47 47 DROPS
S.T. 73.2

3-1-90.

10:15 am T = 107°F sp.gr 1.20
45 drops S.T. 75.8

10:35 am ADDED 1000 ml DIS-MIST NP

10:40 am T = 107°F sp.gr. 1.21
48 drops S.T. 71.7

11:15 am T = 107°F sp.gr. 1.21
48 drops S.T. 71.7

12:50 pm T = 108°F sp.gr. 1.21
46 46 drops S.T. 74.8

1:10 pm ADDED 1000 ml DIS-MIST NP

1:15 pm T = 108°F sp.gr. 1.21
48 48 drops S.T. 71.7

3:20 pm T = 109°F sp.gr. 1.21
46 46 drops S.T. 74.8

NUMBER OF DROPS OF WATER

72°F	106°F
39 DROPS	38 DROPS
38	39
39	39
39	39

$$\text{FACTOR (F)} = \frac{\text{DROPS OF WATER}}{\text{Sp-gr. OF WATER}} \times 72.75$$

$$= 2843$$

$$\text{SURFACE TENSION} = F \times \frac{\text{Sp. gr. OF UNKNOWN}}{\text{DROPS OF UNKNOWN}}$$

ACCORDING TO GARY, SURFACE TENSION SHOULD BE NO GREATER THAN 70 dynes/cm^2.

TMA Chain of Custody Record

Therm nalytical Inc.

160 Taylor Street
Post Office Box 2360
Monrovia, CA 91016
(818) 357-3247

DATE 2-21-90 PAGE 1 OF 1

CLIENT: Pacific Environmental Services
ADDRESS: (818) 357-1993
PROJECT: 3985
SAMPLERS (SIGNATURE): Scott G Parks

SAMPLE NO	DATE	TIME	LOCATION	CAM Metals (17)	Pr. Pollutant Metals (13)	Hazardous Char. (Request List)	Gen. Minerals (Request List)	TPHC 418.1	Base/Neu/Acids (Organics)	Pesticides	Volatile Orgs. (601/602)	8015 Modified	Volatile Orgs. (624/8240)	Total Chrome	Hexavalent Chrome	Volume	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
DMR-1L	2-21-90	10:00												X	X	X	Liquid	1	
DMR-2L	↓													X	X	X	Liquid	1	
DMR-3L														X	X	X	Liquid	1	
DMR-1F														X	X		Filter	1	
DMR-2F														X	X		Filter	1	
DMR-3F	↓													X	X		Filter	1	

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature: Scott G Parks	2-21-90	Signature: Brian Davis	2-21-90	Signature:		Signature:	
Printed Name: Scott G. Parks	TIME 10:00 AM	Printed Name: BRIAN DAVIS	TIME 10:00 AM	Printed Name:	TIME	Printed Name:	TIME
Company: P.E.S.		Company: TMA		Company:		Company:	

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (laboratory)	DATE
Signature:		Signature:		Signature:		Signature:	
Printed Name:	TIME	Printed Name:	TIME	Printed Name:	TIME	Printed Name: TMA, Inc./ARLI	TIME
Company:		Company:		Company:			

6 TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT: Delivered Personally

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS: Do not use more sensitive concentration methods. Expect normal concentrations.

Chain of Custody Record

TMA
Thermo Analytical Inc.

160 Taylor Street
Post Office Box 2360
Monrovia, CA 91016
(818) 357-3247

DATE 2-23-90 PAGE 1 OF 1

CLIENT Pacific Environmental Services
ADDRESS (818) 357-1993
PROJECT 3985
SAMPLERS (SIGNATURE)

SAMPLE NO	DATE	TIME	LOCATION	CAM Metals (17)	Pr. Pollutant Metals (13)	Hazardous Char. (Request List)	Gen. Minerals (Request List)	TPHC 418.1	Base/Neu/Acids (Organics)	Pesticides	Volatile Orgs. (601/602)	8015 Modified	Volatile Orgs. (624/8240)	Total Chrome	Hex Chrome	Volume	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
DMR-4														X	X	X	Liquid	1	
DMR-5L														X	X	X	"	1	
DMR-6L														X	X	X	"	1	
DMR-4F														X	X		Filter	1	
DMR-5F														X	X		"	1	
DMR-6F														X	X		"	1	
DMR-7F														X	X		"	1	
DMR-8F														X	X		"	1	
DMR-9F														X	X		"	1	
DMR-7L														X	X	X	Liquid	1	
DMR-8L														X	X	X	"	1	
DMR-9L														X	X	X	"	1	
~~DMR~~																			

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature: Scott G Parks	2/07/90	Signature: Robert Maurek	2-7-90	Signature:		Signature:	
Printed Name: Scott G Parks	TIME	Printed Name: ROBERT MAURER	TIME 10:30 AM	Printed Name:	TIME	Printed Name:	TIME
Company: PES		Company: TMA/ARLI		Company:		Company:	

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (laboratory)	DATE
Signature:		Signature:		Signature:		Signature:	
Printed Name:	TIME	Printed Name:	TIME	Printed Name:	TIME	Printed Name: TMA, Inc./ARLI	TIME
Company:		Company:		Company:			

TOTAL NUMBER OF CONTAINERS: 12

METHOD OF SHIPMENT: Delivered Personally

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS: Normal Concentrations

TMA Thermo Analytical Inc. — Chain of Custody Record

160 Taylor Street
Post Office Box 2360
Monrovia, CA 91016
(818) 357-3247

DATE 3-1-90 PAGE 1 OF 1

CLIENT: Pacific Environmental
ADDRESS: (818) 357-1993
PROJECT: 3985
SAMPLERS (SIGNATURE):

SAMPLE NO	DATE	TIME	LOCATION	CAM Metals (17)	Pr. Pollutant Metals (13)	Hazardous Char. (Request List)	Gen. Minerals (Request List)	TPHC 418.1	Base/Neu/Acids (Organics)	Pesticides	Volatile Orgs. (601/602)	8015 Modified	Volatile Orgs. (624/8240)	Total Chrome	Hexavalent Chrome	Volume	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
DMR - 10L	3-1-90	11:50												X	X	X	Liquid	1	
DMR - 11L	"													X	X	X	"	1	
DMR - 12L														X	X	X	"	1	
DMR - 13L														X	X	X	"	1	
DMR - 14L														X	X	X	"	1	
DMR - 15L														X	X	X	"	1	
DMR - 10F	"													X	X		Filter	1	
DMR - 11F														X	X		"	1	
DMR - 12F														X	X		"	1	
DMR - 13F														X	X		"	1	
DMR - 14F														X	X		"	1	
DMR - 15F	"													X	X		"	1	

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Signature: Scott G. Parks	3-1-90	Signature:		Signature:		Signature:	
Printed Name: Scott G. Parks	TIME: 11:50	Printed Name:	TIME:	Printed Name:	TIME:	Printed Name:	TIME:
Company: PES		Company:		Company:		Company:	
RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (Laboratory)	DATE
Signature:		Signature:		Signature:		Signature: Robert Marquez	3-1-90
Printed Name:	TIME:	Printed Name:	TIME:	Printed Name:	TIME:	Printed Name: ROBERT MARQUEZ	TIME: 11:47 AM
Company:		Company:		Company:		Company: TMA, Inc./ARLI	

12 TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT: Delivered Personally

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS

Chain of Custody Record

THA
Thermo Analytical Inc.
Post Office Box 2360
Monrovia, CA 91016
(818) 357-3247

DATE March 3, '90 PAGE 1 OF 1

CLIENT PES
ADDRESS (818) 357-1993
Project Mgr = DEAN HIGH
PROJECT 3985
SAMPLERS (SIGNATURE) Mark J. Simon

SAMPLE NO	DATE	TIME	LOCATION	CAM Metals (17)	Pr. Pollutant Metals (13)	Hazardous Char. (Request List)	Gen. Minerals (Request List)	TPHC 418.1	Base/Neu/Acids (Organics)	Pesticides	Volatile Orgs. (601/602)	8015 Modified	Volatile Orgs. (624/8240)	Hexavalent Chromium	Total Chromium	Volume	Sample Type	NUMBER OF CONTAINERS	Observations/ Comments
DMR-16L	3-1-90		Gene's											+	+	+	Liquid	1	
DMR-17L	"													+	+	+	"	1	
DMR-18L	"													+	+	+	"	1	
DMR-16F	"													+	+		Filter	1	
DMR-17F	"													+	+		"	1	
DMR-18F	"													+	+		"	1	

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY	DATE
Mark J. Simon							
Signature: Mark J. Simon	3-2	Signature		Signature		Signature	
Printed Name: PES	TIME	Printed Name	TIME	Printed Name	TIME	Printed Name	TIME
Company		Company		Company		Company	

RELINQUISHED BY	DATE	RECEIVED BY	DATE	RELINQUISHED BY	DATE	RECEIVED BY (laboratory)	DATE
						Robert Mazurek	3-2-90
Signature		Signature		Signature		Signature	
Printed Name	TIME	Printed Name	TIME	Printed Name	TIME	ROBERT MAZUREK	TIME 10:04
Company		Company		Company		THA, Inc./ARLI	

6 TOTAL NUMBER OF CONTAINERS

METHOD OF SHIPMENT: Delivered Personally

SPECIAL SHIPMENT/HANDLING OR STORAGE REQUIREMENTS: —

Received: 02/21/90 02/26/90 10:44:11

REPORT TO
Pacific Environmental Service
150 E. Foothill Blvd.
Arcadia, CA 91006

ATTEN Mr. Dean High

CLIENT PACIFIC ENVI SAMPLES 6
COMPANY Pacific Environmental Service
FACILITY

WORK ID 3985
TAKEN By Pacific Environ. Staff
TRANS By Pacific Environ. Staff
TYPE Liquid and filters
P.O. # 3985
INVOICE under separate cover

PREPARED BY
Thermo Analytical, Inc.
160 Taylor Street
Monrovia, CA 91016

ATTEN Ms. Carole Harris
PHONE 818-357-3247

Robert S. Ferguson
CERTIFIED BY

CONTACT RSF

This report is for the sole and exclusive use of the client to whom it is addressed and represents only those samples herein described. Samples not destroyed in testing are retained a maximum of 30 days unless otherwise requested.

SAMPLE IDENTIFICATION

01 DMR-1L
02 DMR-2L
03 DMR-3L
04 DMR-1F
05 DMR-2F
06 DMR-3F

TEST CODES and NAMES used on this report

CRHEXS	Hexavalent Chromium
CRHGAA	Chromium - Air
CR HEX	Hexavalent Chromium
CR L	Chromium - Liquids
VOL L	Sample Volume

Received: 02/21/90 Results by Sample

SAMPLE ID DMR-1L SAMPLE # 01 FRACTIONS: A
Date & Time Collected 02/21/90 Category

CR_HEX 1.89 mg/L CR_L 2.74 mg/L VOL_L 510 mls

SAMPLE ID DMR-2L SAMPLE # 02 FRACTIONS: A
Date & Time Collected 02/21/90 Category

CR_HEX 1.82 mg/L CR_L 2.19 mg/L VOL_L 500 mls

SAMPLE ID DMR-3L SAMPLE # 03 FRACTIONS: A
Date & Time Collected 02/21/90 Category

CR_HEX <.003 mg/L CR_L 0.011 mg/L VOL_L 640 mls

SAMPLE ID DMR-1F SAMPLE # 04 FRACTIONS: A
Date & Time Collected 02/21/90 Category

CRHEXS <0.5 ug/Filter CRHGAA 5.84 ug/Filter

Received: 02/21/90 Results by Sample

SAMPLE ID DMR-2F SAMPLE # 05 FRACTIONS: A
Date & Time Collected 02/21/90 Category

CRHEXS <0.5 ug/Filter CRHGAA 3.86 ug/Filter

SAMPLE ID DMR-3F SAMPLE # 06 FRACTIONS: A
Date & Time Collected 02/21/90 Category

CRHEXS <0.5 ug/Filter CRHGAA 6.22 ug/Filter

Pacific Environmental Service

Three liquids and three filters were analyzed for hexavalent and total chromium content, according to EPA Method 425. The volumes of the liquids were measured.

QC Data

Sa#	Hex Cr	Total Cr
DMR-2L	1.82	2.19
DMR-2L Dup.	1.88	2.30
DMR-2L Spike	96%	103%

Received: 02/23/90 03/02/90 08:32:12

REPORT TO: Pacific Environmental Service
150 E. Foothill Blvd.
Arcadia, CA 91006

ATTEN: Mr. Dean High

CLIENT: PACIFIC ENVI SAMPLES: 12
COMPANY: Pacific Environmental Service
FACILITY:

WORK ID: 3985
TAKEN: By Pacific Environ. Staff
TRANS: By Pacific Environ. Staff
TYPE: Liquid and filters
P.O. #: 3985
INVOICE: under separate cover

PREPARED BY: Thermo Analytical, Inc.
160 Taylor Street
Monrovia, CA 91016

ATTEN: Ms. Carole Harris
PHONE: 818-357-3247

Robert S. Ferguson
CERTIFIED BY

CONTACT: RSF

This report is for the sole and exclusive use of the client to whom it is addressed and represents only those samples herein described. Samples not destroyed in testing are retained a maximum of 30 days unless otherwise requested.

SAMPLE IDENTIFICATION

01	DMR-4L
02	DMR-5L
03	DMR-6L
04	DMR-7L
05	DMR-8L
06	DMR-9L
07	DMR-4F
08	DMR-5F
09	DMR-6F
10	DMR-7F
11	DMR-8F
12	DMR-9F

TEST CODES and NAMES used on this report

CRHEXS	Hexavalent Chromium
CRHGAA	Chromium - Air
CR HEX	Hexavalent Chromium
CR L	Chromium - Liquids
VOL L	Sample Volume

SAMPLE ID DMR-4L SAMPLE # 01 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CR_HEX 2.48 mg/L CR_L 3.16 mg/L VOL_L 535 mls

SAMPLE ID DMR-5L SAMPLE # 02 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CR_HEX 2.11 mg/L CR_L 2.33 mg/L VOL_L 615 mls

SAMPLE ID DMR-6L SAMPLE # 03 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CR_HEX <0.003 mg/L CR_L 0.013 mg/L VOL_L 420 mls

SAMPLE ID DMR-7L SAMPLE # 04 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CR_HEX 2.52 mg/L CR_L 2.82 mg/L VOL_L 510 mls

SAMPLE ID DMR-8L SAMPLE # 05 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CR_HEX 3.57 mg/L CR_L 3.54 mg/L VOL_L 425 mls

SAMPLE ID DMR-9L SAMPLE # 06 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CR_HEX <0.003 mg/L CR_L 0.012 mg/L VOL_L 465 mls

SAMPLE ID DMR-4F SAMPLE # 07 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CRHEXS <0.5 ug/filter CRHGAA 10.2 ug/filter

SAMPLE ID DMR-5F SAMPLE # 08 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CRHEXS <0.5 ug/filter CRHGAA 5.3 ug/filter

SAMPLE ID DMR-6F SAMPLE # 09 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CRHEXS <0.5 ug/filter CRHGAA 3.2 ug/filter

SAMPLE ID DMR-7F SAMPLE # 10 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CRHEXS <0.5 ug/filter CRHGAA 3.0 ug/filter

SAMPLE ID DMR-8F SAMPLE # 11 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CRHEXS <0.5 ug/filter CRHGAA 4.6 ug/filter

SAMPLE ID DMR-9F SAMPLE # 12 FRACTIONS: A
Date & Time Collected 02/23/90 Category

CRHEXS <0.5 ug/filter CRHGAA 4.2 ug/filter

Pacific Environmental Service

Three liquids and three filters were analyzed for hexavalent and total chromium content, according to EPA Method 425. The volumes of the liquids were measured.

QC Data

Sa#	Hex Cr	Total Cr
DMR-9L	<0.003	0.015
DMR-9L dup	<0.003	0.008
DMR-9L spike	96%	----
DMR-6L spike	----	96%

Received: 03/01/90 03/09/90 08:39:37

REPORT TO: Pacific Environmental Service
150 E. Foothill Blvd.
Arcadia, CA 91006

ATTEN: Mr. Dean High

CLIENT: PACIFIC ENVI SAMPLES 12
COMPANY: Pacific Environmental Service
FACILITY:

WORK ID: 3985
TAKEN: By Pacific Environ. Staff
TRANS: By Pacific Environ. Staff
TYPE: Liquid and Filters.
P.O. #: 3985
INVOICE: under separate cover

PREPARED BY: Thermo Analytical, Inc.
160 Taylor Street
Monrovia, CA 91016

ATTEN: Ms. Carole Harris
PHONE: 818-357-3247

Robert S. Ferguson
CERTIFIED BY

CONTACT REF

This report is for the sole and exclusive use of the client to whom it is addressed and represents only those samples herein described. Samples not destroyed in testing are retained a maximum of 30 days unless otherwise requested.

SAMPLE IDENTIFICATION

01 DMR-10L
02 DMR-11L
03 DMR-12L
04 DMR-13L
05 DMR-14L
06 DMR-15L
07 DMR-10F
08 DMR-11F
09 DMR-12F
10 DMR-13F
11 DMR-14F
12 DMR-15F

TEST CODES and NAMES used on this report

CRHEXS	Hexavalent Chromium
CRHGAA	Chromium - Air
CR HEX	Hexavalent Chromium
CR L	Chromium - Liquids
VOL L	Sample Volume

Received: 03/01/90 Results by Sample

SAMPLE ID DMR-10L SAMPLE # 01 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR HEX 0.003 mg/L CR L 0.013 mg/L VOL L 510 mls

SAMPLE ID DMR-11L SAMPLE # 02 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR HEX 0.010 mg/L CR L 0.027 mg/L VOL L 490 mls

SAMPLE ID DMR-12L SAMPLE # 03 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR HEX <0.003 mg/L CR L 0.005 mg/L VOL L 460 mls

SAMPLE ID DMR-13L SAMPLE # 04 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR HEX <0.003 mg/L CR L 0.004 mg/L VOL L 545 mls

Received: 03/01/90 Results by Sample

SAMPLE ID DMR-14L SAMPLE # 05 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR_HEX <0.003 mg/L CR_L 0.005 mg/L VOL_L 630 mls

SAMPLE ID DMR-15L SAMPLE # 06 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR_HEX <0.003 mg/L CR_L 0.014 mg/L VOL_L 420 mls

SAMPLE ID DMR-10F SAMPLE # 07 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 1.0 ug/filter

SAMPLE ID DMR-11F SAMPLE # 08 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 1.0 ug/filter

Received: 03/01/90 Results by Sample

SAMPLE ID DMR-12F SAMPLE # 09 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 1.0 ug/filter

SAMPLE ID DMR-13F SAMPLE # 10 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 2.8 ug/filter

SAMPLE ID DMR-14F SAMPLE # 11 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 1.0 ug/filter

SAMPLE ID DMR-15F SAMPLE # 12 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 0.7 ug/filter

Pacific Environmental Service

Three liquids and three filters were analyzed for hexavalent and total chromium content, according to EPA Method 425. The volumes of the liquids were measured.

QC Data

Sa#	Hex Cr	Total Cr
DMR-10L	0.003	0.013
DMR-10L Dup	0.003	0.012
DMR-10L Spike	99.%	94.%

Received: 03/02/90 Results by Sample

SAMPLE ID DMR-16L SAMPLE # 01 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR HEX <0.003 mg/L CR L 0.024 mg/L VOL L 515 mls

SAMPLE ID DMR-17L SAMPLE # 02 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR HEX 0.010 mg/L CR L 0.022 mg/L VOL L 550 mls

SAMPLE ID DMR-18L SAMPLE # 03 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CR HEX <0.003 mg/L CR L 0.005 mg/L VOL L 500 mls

SAMPLE ID DMR-16F SAMPLE # 04 FRACTIONS: A
Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 3.0 ug/filter

TMA INC. REPORT Work Order # AW-03-018

Received: 03/02/90 03/09/90 08:40:33

REPORT TO
Pacific Environmental Service
150 E. Foothill Blvd.
Arcadia, CA 91006

ATTEN Mr. Dean High

CLIENT PACIFIC ENVI SAMPLES 6
COMPANY Pacific Environmental Service
FACILITY

WORK ID 3985
TAKEN By Pacific Environ. Staff
TRANS By Pacific Environ. Staff
TYPE Liquid and Filters
P O # 3985
INVOICE under separate cover

PREPARED BY
Thermo Analytical, Inc.
160 Taylor Street
Monrovia, CA 91016

ATTEN Ms. Carole Harris
PHONE 818-357-3247

Robert S. Ferguson
CERTIFIED BY

CONTACT RSF

This report is for the sole and exclusive use of the client to whom it is addressed and represents only those samples herein described. Samples not destroyed in testing are retained a maximum of 30 days unless otherwise requested.

SAMPLE IDENTIFICATION

01 DMR-16L
02 DMR-17L
03 DMR-18L
04 DMR-16F
05 DMR-17F
06 DMR-18F

TEST CODES and NAMES used on this report

CRHEXS	Hexavalent Chromium
CRHGAA	Chromium - Air
CR HEX	Hexavalent Chromium
CR L	Chromium - Liquids
VOL L	Sample Volume

Received: 03/02/90

Results by Sample

SAMPLE ID DMR-17F

SAMPLE # 05 FRACTIONS: A

Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 1.9 ug/filter

SAMPLE ID DMR-18F

SAMPLE # 06 FRACTIONS: A

Date & Time Collected 03/01/90 Category

CRHEXS <0.5 ug/filter CRHGAA 2.0 ug/filter

Received: 03/02/90 03/09/90 08:40:33

Pacific Environmental Service

Three liquids and three filters were analyzed for hexavalent and total chromium content, according to EPA Method 425. The volumes of the liquids were measured.

QC Data

Sa#	Hex Cr	Total Cr
DMR-16L	<0.003	0.024
DMR-16L Dup	<0.003	0.024
DMR-16L Spike	113.%	110.%

DRY GAS METER AND ORIFICE CALIBRATION

Dry Gas Meter No. 6846739 Meter Box No. 1A NUTECH Reference Dry Gas Meter No. Rockwell 25507

Barometric Pressure 29.74" Hg=P_b Calibration Performed By Mark J. Simon Date 2/12/90

Note: Vacuum = 5" Hg (ALL)

Orifice Manometer Setting ΔH="H_2O	Initial Reference DGM Reading V = ft^3	Final Reference DGM Reading V = ft^3	Reference Gas Volume V_r = ft^3	Initial DGM Reading V = ft^3	Final DGM Reading V = ft^3	Test DGM Volume V_d = ft^3	Temperature: Reference DGM t_r = °F	Temperature: Box DGM Inlet t = °F	Temperature: Box DGM Outlet t = °F	Temperature: Box DGM Average t_d	Run Time θ = minutes	Flow Rate Q = cfm	γ	$\Delta H_@$
0.5	486.727	496.041	9.314	286.825	295.901	9.076	73	74	73	73.5	27.1	0.375	1.025	2.403
1.0	496.256	506.550	10.294	296.195	306.356	10.161	74	80	76	78.0	18.8	0.575	1.018	1.884
2.0	506.861	516.498	9.637	306.674	316.156	9.482	75	85	79	82.0	12.75	0.741	1.025	1.971
4.0	517.105	527.345	10.240	316.808	326.941	10.133	75	88	81	84.5	9.5	1.057	1.018	1.929
6.0	527.790	538.805	11.015	327.478	338.490	11.012	75	91	82	86.5	8.4	1.286	1.001	2.597
8.0	539.394	549.780	10.386	338.780	349.126	10.346	76	96	85	90.5	7.0	1.452	1.011	2.024
												Average	1.017	2.13

Calculations:

$$\gamma = \frac{V_r \; P_b \; (t_d + 460)}{V_d \; (P_b + \frac{\Delta H}{13.6}) \; (t_r + 460)}$$

$$Q = \frac{17.64 \; P_b V_r}{(T_r + 460)\,\theta}$$

$$\Delta H_@ = \frac{0.0317 \; \Delta H}{P_b \; (t_d + 460)} \left[\frac{(t_r + 460)\,\theta}{V_r} \right]^2$$

Definitions:

γ = ratio of accuracy of reference dry gas meter to dry test meter. Tolerance = 0.02 from average

$\Delta H_@$ = orifice pressure differential that gives 0.75 cfm of air at 70 degrees Fahrenheit and 29.92 inches of mercury, in inches H_2O.