Background Report Reference

AP-42 Section Number: 12.20

Background Chapter: 4

Reference Number: 42

Title: Source Test Report of a Tri-Mar Corporation Unit Serving a Hard Chrome Plating Tank at Chrome Plating Company, 1748 Workman Street, Los Angeles,CA 90031

PES

February 1989

ELECTROPLATING

REF. 4-42

PACIFIC ENVIRONMENTAL SERVICES, INC.

WASHINGTON, D.C. • RESEARCH TRIANGLE PARK, NC • LOS ANGELES, CA

Source Test Report of a Tri-Mer Corporation Demonstration Unit Serving a Hard Chrome Plating Tank at Chromal Plating Company, 1748 Workman Street, Los Angeles, CA 90031

Conducted for the
Metal Finishing Association of Southern California
5000 Van Nuys Blvd
Sherman Oaks, CA 91403

Prepared by
Pacific Environmental Services, Inc.
150 E. Foothill Blvd
Arcadia, CA 91006
2/28/89

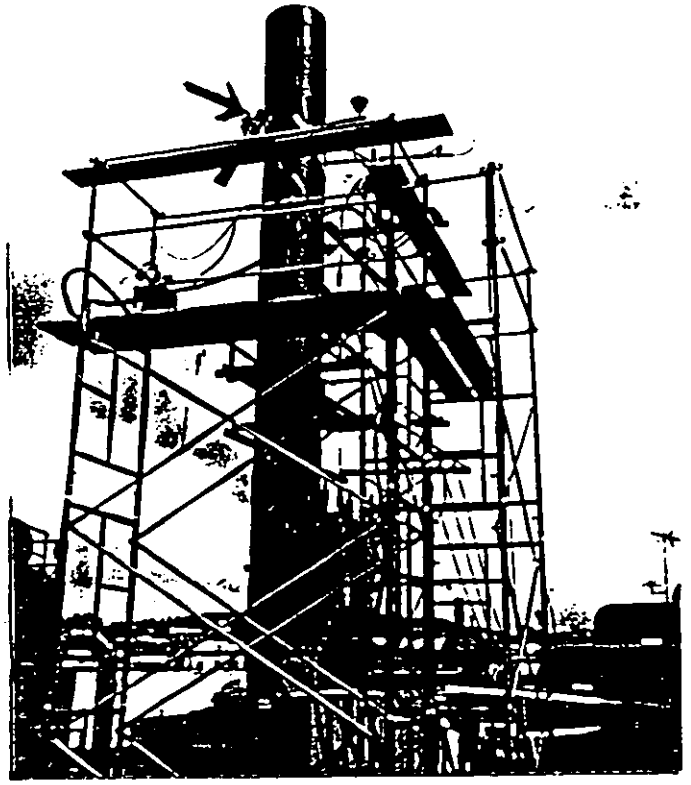
Source Test Report of a Tri-Mer Corporation Demonstration Unit
Serving a Hard Chrome Plating Tank at
Chromal Plating Company, 1748 Workman Street,
Los Angeles, CA 90031

INTRODUCTION

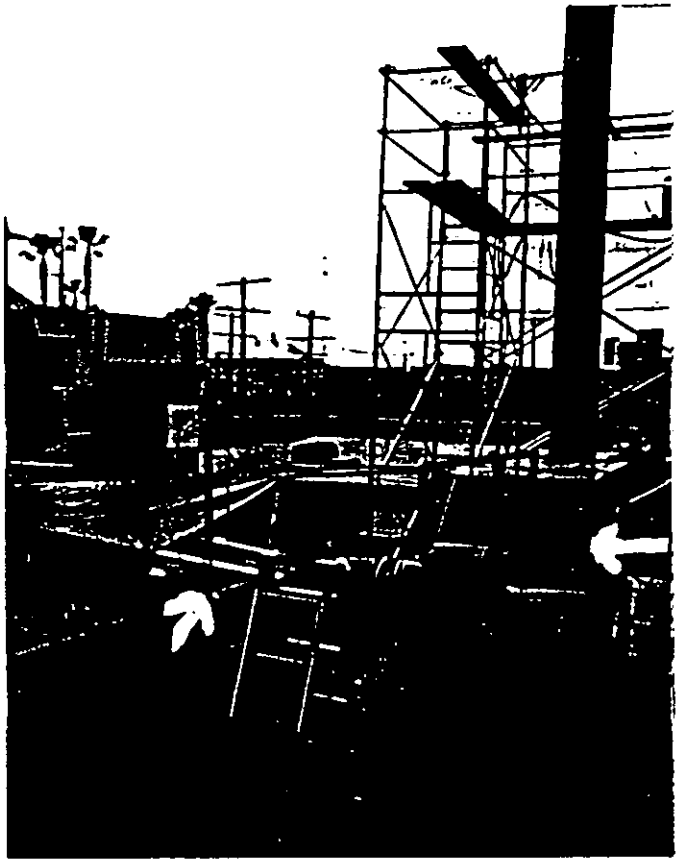
Pacific Environmental Services, Inc. (PES) was contracted by the Metal Finishing Association of Southern California (MFASC), to perform a screening test on the reduction efficiency of a Tri-Mer Corporation demonstration unit used to collect hexavalent chromium emissions from a hard chrome plating operation. Set up and velocity determinations were conducted on February 1, 1989, and the source testing was done on February 2, 1989.

In order to evaluate the effectiveness of the Tri-Mer unit, it was necessary to have a hard chrome plating tank that was outfitted with an emission collection system. Chromal Plating Co. in Los Angeles, Ca, was the site chosen for the testing. Ray Bokelman, General Manager of Chromal Plating, arranged for the hookup of the demonstration unit and the tank operation during source testing.

On February 2, 1989, two locations were chosen for sampling. The first sample, T-I, was taken from the inlet to the unit 2 feet before an elbow connecting into the blower of the Tri-Mer unit. This sample was used to determine the quantity of emissions in the gas stream before entering the Tri-Mer unit. The second sample, T-O, was taken from the outlet stack approximately 13 feet past the scrubber unit (Figure 1). This was done in order to determine the emission rate and subsequently the reduction efficiency of the Tri-Mer Corporation unit for hexavalent chromium emissions. Continuous velocity measurements were taken by type "S" pitot tubes that were connected to the sampling probes.



Outlet Sample Location: T-O-1



Trimer Unit

Inlet Sample Location: T-I-1

Figure 1: Sample Locations

EQUIPMENT AND PROCESS DESCRIPTION

Chromal Plating Company, 1748 Workman Street, Los Angeles, CA 90031, is engaged in the business of hard chrome plating for the aircraft and a wide variety of other industries. During the test, the Trimer Corporation unit served hard chrome plating tank No. 10. Tank No. 10 is a 500 gallon tank that had a chrome concentration of 32 ounces of acid per gallon. During the test the tank had a 4.5" freeboard and was covered 100% by 3/4" polyballs. The temperature of the tank was maintained at 120-125 Fahrenheit, the voltage averaged 4.6 volts, and the amperage averaged 750 amps.

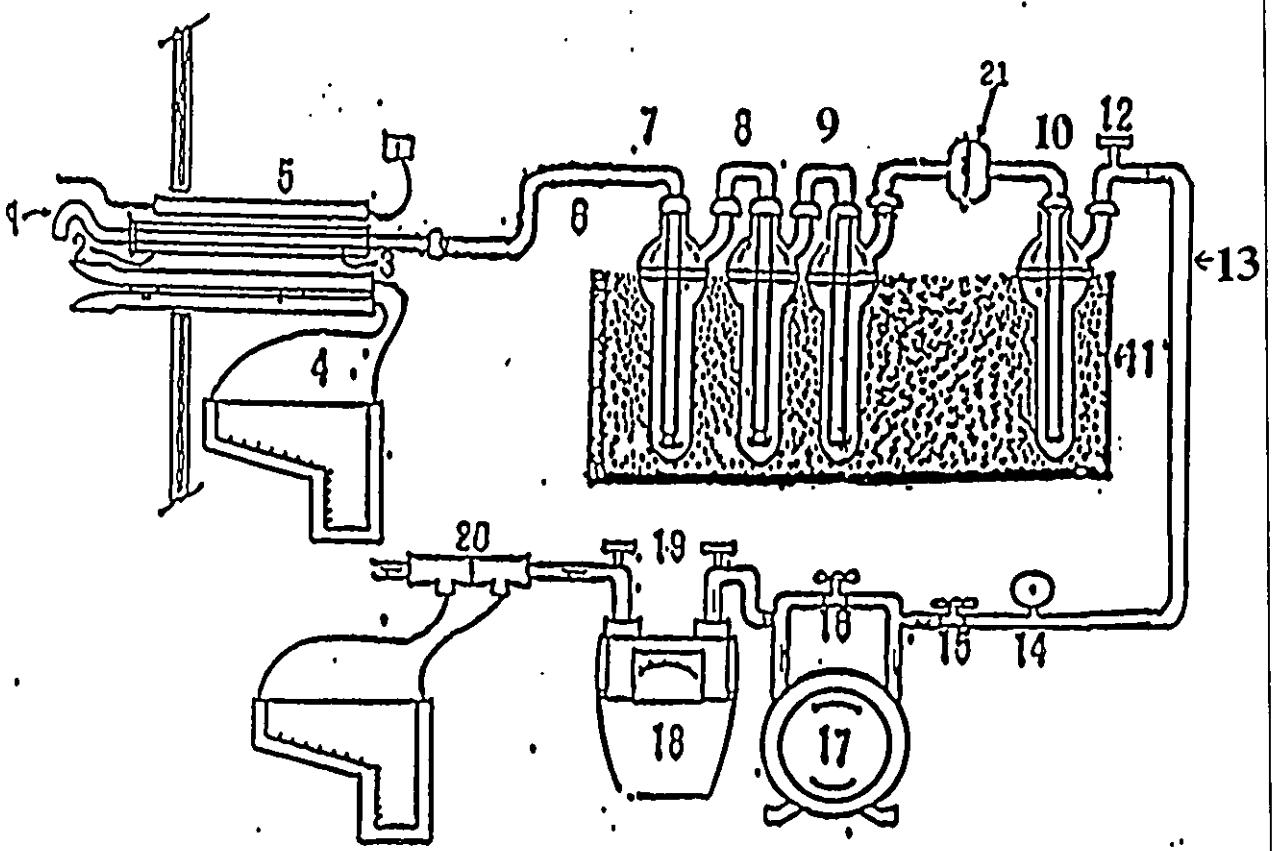
The Trimer Corporation unit was a Model F/S-1 Double Pack Fan Separator. The technology used in the Trimer Corporation unit was a specially designed scrubber involving five separate stages in the scrubber system. The test unit weighed approximately 2000 pounds and was capable of handling up to 2500 SCFM.

TESTING METHODOLOGY

The samples at each of two locations were extracted with modified CARB method 425 source testing trains as described in a 1/20/89 CARB protocol (Figure 2). The source sampling trains consisted of a 0.302" I.D. glass nozzle, a glass probe, two impingers each with 100 ml of 0.1N sodium hydroxide, an empty impinger, an 89mm teflon coated glass fiber filter placed after the empty impinger, an impinger filled with silica gel, an umbilical cord connected to a vacuum pump, a dry gas meter, and a calibrated orifice connected to an inclined manometer.

Sampling at the two ports was conducted simultaneously for a period of eight hours. Sampling was done by traversing at both the inlet and outlet. Velocity and temperature of the emission streams were measured and recorded every hour during the test. The meter temperature and the volume of the gas through the meter also were measured and recorded every hour. Applied voltage, bath temperature, and amperage applied to the chrome plating tank was also recorded. All information was recorded on field data sheets (Appendix).

Laboratory analyses were conducted by Thermo Analytical Laboratory in Monrovia, CA. Total chrome and hexavalent chrome concentrations were determined for the two stack samples, a blank, and the plating bath solution. Analyses for total chrome used atomic absorption spectrophotometry and analyses for hexavalent chrome used diphenylcarbazide colorimetric techniques.



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 - dry
10. Modified Greenburg-Smith impinger filled with 200 grams of silica gel
11. Impinger case filled with ice
12. Impinger exit gas temperature sensor
13. Umbilical line to meter box
14. Vacuum gauge
15. Coarse adjustment valve
16. By-pass valve to adjust ΔH
17. Leak free vacuum pump
18. Dry gas meter
19. Dry gas meter inlet and outlet temperature sensors
20. Orifice meter with manometer for ΔH readings
21. Filter Holder with teflon-lined glass fiber filter.

FIGURE 2
Diagram Of Sampling Train

RESULTS OF TESTING

Calculations were made from the field data sheets to determine sample volume, molecular weight, velocities, flow rates, and isokinetic testing for the gas at each sample location. Stack gas volumes were calculated from the velocity measurements taken during sample extraction. Results are shown on the emission test calculation sheets (Appendix).

The inlet loading to the Trimer demonstration unit was 0.642 mg/amp-hour for total chrome and 0.573 mg/amp-hour for hexavalent chrome. The outlet emissions were 0.009 mg/amp-hour for total chrome and 0.002 mg/amp-hour for hexavalent chrome. The control efficiency for total chrome was calculated at 98.5% and for hexavalent chrome was calculated at 99.6% (Table 1).

CONTROL EFFICIENCY OF THE TRIMER CORPORATION SCRUBBER FOR CHROME EMISSIONS
Test Date: 2/2/89

Control Efficiency of the Trimer Corporation Scrubber for Total Chrome.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr T (mg/l)	Total Catch Cr T (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr T (mg/scf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr T (mg/hour)	AVERAGE AMP-HOURS	EMISSIONS Cr T (mg/amp-hour)	CONTROL EFFICIENCY Cr T %
T-I-1	180	6.06	1.0908							
T-I-2	308	0.90	0.2772							
INLET TOTAL			1.3680	338.129	0.00405	1984	481.611	750	0.64215	
T-O-1	255	0.028	0.0071							
T-O-2	400	0.036	0.0144							
OUTLET TOTAL			0.0215	343.518	0.00006	1892	7.118	750	0.00949	98.5 %

Control Efficiency of the Trimer Corporation Scrubber for Hexavalent Chrome.

SAMPLE RUN NUMBER	SAMPLE VOLUME (ml)	Conc. Cr 6 (mg/l)	Total Catch Cr 6 (mg)	SAMPLE METER VOL (dscf)	EMISSIONS Cr 6 (mg/scf)	STACK FLOW RATE (dscfm)	ACTUAL EMISSIONS Cr 6 (mg/hour)	AVERAGE AMP-HOURS	EMISSIONS Cr 6 (mg/amp-hour)	CONTROL EFFICIENCY Cr 6 %
T-I-1	180	5.00	0.9000							
T-I-2	308	1.04	0.3203							
INLET TOTAL			1.2203	338.129	0.00361	1984	429.620	750	0.57283	
T-O-1	255	0.009	0.0023							
T-O-2	400	0.006	0.0024							
OUTLET TOTAL			0.0047	343.518	0.00001	1892	1.552	750	0.00207	99.6 %

* The filters showed no detectable chrome concentrations. Laboratory results are appended.

APPENDICES

EMISSION TEST CALCULATIONS

Definition of Symbols

A = cross-sectional area of stack, ft^2

A_n = Cross-sectional area of Nozzle, ft^2

B_{ws} = Water vapor in gas stream, proportional by volume

C_p = Pilot tube coefficient

I = Percent of Isokinetic Sampling

M_d = dry molecular weight, lb/lb-mole

M_s = Molecular weight of stack gas, lb/lb-mole

P_{bar} = Barometric Pressure at the sampling site, in Hg

P_s = Stack gas pressure, in. Hg

Q_s = Stack volumetric flow rate, actual condition acfm

$Q_{(std)}$ = stack volumetric flow rate, actual conditions dscfm

T_m = Average dry gas meter temperature, $R = 460^\circ + F^\circ$

T_s = Average stack gas temperature, $^\circ R = 460^\circ + F^\circ$

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml

V_m = Volume of gas sample as measured by dry gas meter, dscf

$V_{m(std)}$ = V_m corrected to standard conditions, dscf

$V_{w(std)}$ = Volume of water vapor in gas sample corrected to standard conditions, scf

V_s = Stack gas velocity, ft/sec

Y = Dry gas meter calibration factor

ΔH = Average pressure differential across the orifice meter, in. H_2O

θ = Total Sampling Time, min.

13.6 = Specific gravity of Mercury

PES

Plant: Thermal Plating Co.
Date: 2-2-89
Source/Sample Number: [redacted] T-I-1 (Inlet)

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

$V_{m(std)} = 17.64(328.657)(.993)\left[\frac{(30.56) + (1.65/13.6)}{(522.4)}\right]$

$V_{m(std)} =$ 338.129 dscf

2. Volume Water Vapor Collected, Standard Conditions

$V_{lc} =$ 36.4 condensate from impingers and Silica Gel

$V_{W(std)} = .04707\ V_{lc} =$ 1.71 scf

$V_{W(std)} =$ 1.71 scf

3. Percent Moisture, by volume

$B_{Ws} = \frac{V_{W(std)}}{V_{W\ std} + V_{m\ (std)}} = \frac{(1.71)}{(1.71)+(338.124)} =$ 0.005

$B_{Ws} =$ 0.5%

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 (40 CFR Standard for air)

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

$M_s =$ 28.94 lb/lb-mole

PES

Plant: Chromal Plating Trimer Unit
Date: 2-2-89
Source/Sample Number: T-T-1

5. Stack Gas Velocity Average

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

$$V_{s(avg)} = 85.49(0.84)(0.7428)\sqrt{\frac{(517)}{(30.32)(28.99)}}$$

$V_{s(avg)}$ = 40.9 ft/sec.

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

$$Q_s = 60\ V_s\ A = 60\ (40.9)(\pi/4)$$

Q_s = 1927 acfm

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

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

$$Q_{(std)} = 17.64(1927)(1-0.005)\frac{(30.32)}{(517)}$$

Q_{std} = 1984 dsofm

8. Isokinetic Variation

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

$$= 0.0945\ \frac{(517)(338.129)}{(30.32)(40.9)(0.00304)(480)(1-0.005)}$$

%I = 91.8 %

PES

Plant: Chromal Plating Co
Date: 2-2-89
Source/Sample Number: T-O-1 (Outlet)

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

$V_{m(std)} = 17.64(329.220)(1.004)\left[\frac{(.2056) + (1.72/13.6)}{(520.9)}\right]$

$V_{m(std)} =$ 343.467 dscf

2. Volume Water Vapor Collected, Standard Conditions

$V_{lc} =$ 899 condensate from impingers and Silica Gel

$V_{w(std)} = .04707\ V_{lc} =$ 4.23 scf

$V_{w(std)} =$ 4.23 scf

3. Percent Moisture, by volume

$B_{ws} = \frac{V_{w(std)}}{V_{w\ std} + V_{m\ (std)}} = \frac{(4.23)}{(4.23)+(343.467)} =$ 0.0122

$B_{ws} =$ 1.22 %

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

$M_s = M_d + B_{ws}(18 - M_d) = (29.0) + (0.0122)(18 - 29.0)$

$M_s =$ 28.87 lb/lb-mole

Plant: Chromal Plating Co.
Date: 2-2-89
Source/Sample Number: T-O-1 Outlet

5. Stack Gas Velocity Average

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

$$V_{s(avg)} = 85.49(0.84)(0.2852)\sqrt{\frac{(525.6)}{(30.56)(28.87)}}$$

$V_{s(avg)}$ = 15.81 ft/sec.

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

$$Q_s = 60\ V_s\ A = 60\ (15.81)(\pi\ 19^2/576)$$

Q_s = 1868 acfm

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

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

$$Q_{(std)} = 17.64(1867)(1-0.0122)\frac{(30.56)}{(525.6)}$$

Q_{std} = 1892 dscfm

8. Isokinetic Variation

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

$$= 0.0945\ \frac{(525.6)(343467)}{(30.56)(15.81)(00763)(480)(1-0.0122)}$$

%I = 97.6 %

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CHROME PLATING PROCESS DATA
METAL FINISHING ASSOCIATION OF SOUTHERN CALIFORNIA

PLATING SHOP Chromal
TEST DATE 2-7-89
TANK NUMBER 10
LENGTH _____ INCHES
WIDTH _____ INCHES 500 gallons
DEPTH _____ INCHES
ADDITIVE None
FREEBOARD 4.5 INCHES
POLYBALLS 3/4" INCH DIA, 100.0 PERCENT COVERAGE
HOOD TYPE SLotsalong Sides
MIX AIR NONE (during testing)

32oz acid/gallon
120-125°F

RECTIFIER #12
CAL DATE Sept 88

TIME	DC VOLTS	AMPS	DC VOLTS	AMPS	DC VOLTS	AMPS
0848	4.0	400				
0900	4.0	650				
1000	4.0	750				
11:22	4.0	750				
12:47	5.5	1000				
13:25	5.5	1000				
14:15	5.5	1025				
15:16	4.25	0575				
16:19	4.25	0600				

Test began 08:36, Polyballs added 0851
Added more Anodes at 8:58, 10:00,

From Amp hr meter in back room For Rectifier #12

Amp Hr Reading	Time of reading
73,400	0858
74,198	10:00
75,146	11:25
76,249	12:50
76,690	13:18
77,536	14:15
78,199	15:14
78,815	16:17
79,406	17:00

... 1 : ... 4' STACK, ... AND DUCT ... ∴ 8 TRAVERSE POINTS

44 FPS 2073 4f1"

-SCRUBBER INLET-

FIELD DATA

Plant TRI-MER SCRUBBER
Date 2-2-89
Sampling Location SCRUBBER INLET
Sample Type Cr / Cr+6
Run Number T-I-1
Operator SIMON / PURCELL
Ambient Temperature 48°F
Barometric Pressure 30.562
Static Pressure (P_s) -3.2
Filter Number(s) TFE
Pretest Leak Rate = 0.004 cfm @ 15 in. Hg
Pretest Pitot Leak Check OK
Pretest Orsat Leak Check N.A
Read and Record all Data Every 60 Minutes

Looking Upstream (Flow is out of paper)

Schematic of Traverse Point Layout

Probe Length and Type 4-FOOT GLASS
Pitot Tube I.D. No.
Nozzle I.D. 0.234, 0.236, 0.237 → 0.236
Assumed Moisture, % 2
Temp. Readout S/N OUTECH
Meter Box Number 304
Meter $\Delta H_@$ 1.735
C Factor 1.04
Meter Gamma 0.993
Heater Box Setting
Reference Δp
Post Test Leak Rate = cfm @ in. Hg
Post Test Pitot Leak Check OK
Post Test Orsat Leak Check N/A.

#1 #5

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
1	0	0836	325.883	0.63	1.85	1.5	57	60		20		
1	15	0851	SHUT DOWN TRAIN TO CLEAN H_2O FROM PUMP (FROM FILTER FRIT SURFACE)									
1	15	0856	START TRAIN BACK UP									
1	30	0911	SHUT DOWN TRAIN TO DRY FRIT @ 344 .443							LEAK	CHECK	0.011 @ 15.5
1	30	0931	345.011	0.65	1.80	1.9	56					
2	60	1001	367.6	0.61	1.80	1.8	54	59		2.0		–
4	120	1101	414.7	0.45	1.30	1.30	58	62		2.0		–
3	180	1201	462.3	0.45	1.30	1.30	58	63		2.0		
3	240	1301	STOP TEST - SWITCH TRAVERSE 487.734									
5	240	1306	487.734	0.62	~~1.62~~ 1.45	1.80	60	63		2.5		–
6	300	1406	530.6 x	0.64	1.80	1.80	60	64		2.5		–
7	360	1506	575.0	~~0.48~~ 0.48	1.80	1.80	58	66		2.5		–
8	420	1606	614.9	0.57	1.65		53	62		2.0		–
8	480	1706	654.840	END	TEST							

STOP AT 0851 - 0856 ... (WATER IN PUMP)
START - 0856

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SAMPLE RECOVERY DATA

Plant: Chromal Plating Co.

Date: 2-2-89

Sampling Location: Scrubber Inlet

Sample Type: Chrome

Run Number: T-I-1 = Probe & Line Wash, T-I-2 = Imp Catch

Sample Box Number: —

Clean-up Man: Simon/Purcell

Job Number: 3625

Comments:

FRONT HALF

Filter Number:	T-FI-1	T-FI-2
Description of Filter:	Filter 1 looked new, Filter 2 was very light brown	

MOISTURE

Impingers			
Final Volume:	152 ml	71 ml	05 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	+52 ml	-29 ml	+5 ml
Total H_2O:	28 mL		

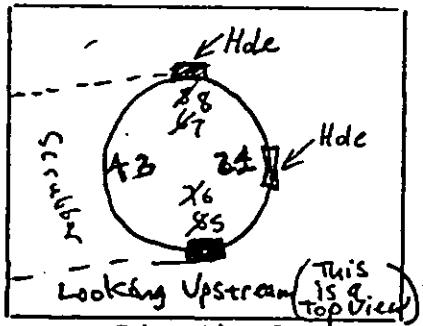
Silica Gel			
Final Volume:	305.5 g	g	g
Initial Volume	297.1 g	g	g
Net Volume	8.4g g	g	g
Total Moisture:	8.4g		36.4g/Train of 36.4 mL/train

Description of Impinger Catch: Very Slight yellow tint.

- SCRUBBER OUTLET -

FIELD DATA

Plant TRI-MER SCRUBBER
Date 2-2-89
Sampling Location SCRUBBER OUTLET
Sample Type Cr / Cr+6
Run Number T-0-1
Operator SIMON / PURCELL
Ambient Temperature 48°F
Barometric Pressure 30.562
Static Pressure (P_s) -0.04
Filter Number(s) TFE
Pretest Leak Rate =0.008 cfm @ 15.5 in. Hg
Pretest Pitot Leak Check OK
Pretest Orsat Leak Check N.A.
Read and Record all Data Every 60 Minutes



Schematic of Traverse Point Layout

Probe Length and Type 4-FOOT GLASS
Pitot Tube I.D. No.
Nozzle I.D. 0.372, 0.374, 0.375 → 0.374 AVG.
Assumed Moisture, % 2
Temp. Readout S/N NUTECH
Meter Box Number NUTECH
Meter $\Delta H_@$ 1.92
C Factor 1.1
Meter Gamma 1.004
Heater Box Setting
Reference Δp 0.095
Post Test Leak Rate =0.00% cfm @ 13 in. Hg
Post Test Pitot Leak Check O.K.
Post Test Orsat Leak Check N.A.

#2 #6 #7 #3

Traverse Point Number	Sampling / Clock Time, (min) / (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. (T_s) °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	Sample Box Temp. Filter Temp. °F	Impinger Temp. °F
1	0 / 10836	027.140	0.098	2.0	2.0	68	63	57	10		57
2	60 / 10936	040.32	0.095	2.0	2.0	65	62	58	8.5		59
3	120 / 10:38	121.1	0.095	2.0	2.0	64	63	58	9.0		58
4	180 / 11:38	114.7	0.090	1.95	1.95	62	63	59	8.5		58
4	240 / 12:38	197.368	STOP TEST - SWITCHED TRAVERSES								
5	240 / 12:43	197.368	0.095	1.80	1.78	63	62	61	7.5		54
6	300 / 13:43	236.3	0.087	1.80	1.80	66	60	64	8.0		56
7	330 / 14:43	280.3	0.077	1.65	1.65	66	59	57	7.0		56
8	390 / 15:43	325.0	0.050	1.08	1.10	71	60	58	7.0		61
8	480 / 16:43	356.362	END OF TEST								
	/						63	59			
	/										
	/										
	/										
	/										
	/										
	/										
	/										
	/										
	/										
	/										
	/	V_f = 329.222									

PACIFIC ENVIRONMENTAL SERVICES, INC.

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SAMPLE RECOVERY DATA

Plant: Chromal Plating Co

Date: 2-2-89

Sampling Location: Scrubber Outlet

Sample Type: Chrome

Run Number: T-O-1 = Probe & Like, T-O-2 = Impingers

Sample Box Number: —

Clean-up Man: Simon/Purcell

Job Number: 3625

Comments:

FRONT HALF

Filter Number: T-FO-1

Description of Filter: No Noticable Staining Whatsoever

MOISTURE

Impingers			
Final Volume:	143 ml	108 ml	10 ml
Initial Volume:	100 ml	100 ml	0 ml
Net Volume:	+43 ml	+8 ml	+10 ml
Total H_2O:	+61 ml		
Silica Gel			
Final Volume:	273.2 g	g	g
Initial Volume	244.3 g	g	g
Net Volume	28.9 g	g	g
Total Moisture:	28.9 g		89.9 ml

Description of Impinger Catch: Clear, No Yellow Coloring Whatsoever

TMA Inc. REPORT

Work Order # 89-02-013

Received: 02/03/89

02/08/89 13:45:06

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

ATTEN Mr. Dean High

CLIENT PACIFIC ENVI SAMPLES 8
COMPANY Pacific Environmental Service
FACILITY

WORK ID 3625 MFASC
TAKEN By Pacific Environ. Staff
TRANS By Pacific Environ. Staff
TYPE Filters & Liquids
P.O. # 3625
INVOICE under separate cover

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

ATTEN
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.

Information reported by telephone to Scott on 2//7/89.

SAMPLE IDENTIFICATION

01	T-FO-1
02	T-FI-1
03	T-FB-1
04	T-I-1
05	T-I-2
06	T-O-1
07	T-O-2
08	T-RB-1

TEST CODES and NAMES used on this report

CRHEXS	Hexavalent Chromium
CRHGAA	Chromium - Air
CRHGAW	Chromium - Liquids
CR HEX	Hexavalent Chromium
WC	General Chemical Testing

PACIFIC ENVIRONMENTAL SERVICE

Received: 02/03/89 Results by Sample

SAMPLE ID T-FO-1 SAMPLE # 01 FRACTIONS: A
Date & Time Collected 02/02/89 Category

CRHEXS < 1.0 mg/per Filter CRHGAA 16.5 Total ug

SAMPLE ID T-FI-1 SAMPLE # 02 FRACTIONS: A
Date & Time Collected 02/02/89 Category

CRHEXS <0.5 mg/per Filter CRHGAA 10.6 Total ug

SAMPLE ID T-FB-1 SAMPLE # 03 FRACTIONS: A
Date & Time Collected 02/02/89 Category

CRHEXS <1.0 mg/per Filter CRHGAA 16.4 Total ug

SAMPLE ID T-I-1 SAMPLE # 04 FRACTIONS: A
Date & Time Collected 02/02/89 Category

CRHGAW 6.06 mg/L (ppm) CR_HEX 5.0 mg/L WC 180 mL

Received: 02/03/89

Results by Sample

SAMPLE ID T-I-2 SAMPLE # 05 FRACTIONS: A

Date & Time Collected 02/02/89 Category

CRHGAW	CR_HEX	WC
0.90 mg/L (ppm)	1.04 mg/L	308 mL

SAMPLE ID T-O-1 SAMPLE # 06 FRACTIONS: A

Date & Time Collected 02/02/89 Category

CRHGAW	CR_HEX	WC
0.028 mg/L (ppm)	0.009 mg/L	255 mL

SAMPLE ID T-O-2 SAMPLE # 07 FRACTIONS: A

Date & Time Collected 02/02/89 Category

CRHGAW	CR_HEX	WC
0.036 mg/L (ppm)	0.006 mg/L	400 mL

SAMPLE ID T-RB-1 SAMPLE # 08 FRACTIONS: A

Date & Time Collected 02/02/89 Category

CRHGAW	CR_HEX	WC
0.002 mg/L (ppm)	<0.005 mg/L	104.5 mL

Pacific Environmental Service

Three filters and five liquids were analyzed for hexavalent chromium by spectroscopy using a long light path cell, and for total chromium by graphite furnace atomic absorption spectroscopy, according to EPA method 425. The total volume of the five liquids was measured. Please see the enclosed tables for the results.