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.

AP-42 Section 12.20
Reference
Report Sect. 4
Reference 93

Compliance Test Results

Babbitt Bearing
Test Date May 27, 1992

Chemical Data Management
11750 Dublin Blvd.
Suite 201
Dublin, California

Table of Contents

Executive Summary
Test Results
Source Test Plan Summary
Source Test Constituent and Methods
Stack Test Protocol
QAQC
Sample Train Drawing
Stack Drawing
Laboratory Analysis Values
Laboratory Analysis Calibrations
Gas Meter Calibration
Calculations
Field Data

EXECUTIVE SUMMARY

Babbitt Bearing of San Jose, California is required by permit conditions issued under Regulation 11, Rule 8 to conduct a source compliance test. The results are to be reported to the Bay Area Air Quality Management District located in San Francisco. The company has multiple chrome tanks with process gases which exhaust first through a series of scrubbers and then through a 34 foot high, 30 inch diameter stack. During plating operations, a surfactant is used in the tank.

The test was conducted by Chemical Data Management Systems of Dublin, California. The test methods being used were developed by the California Air Resources Board (CARB) and are referred to as CARB Method 425.

The test series was conducted on May 27 and May 28, 1992. The following results were obtained:

Test	Total Chrome mg/amp-hr	Hex Chrome mg/amp-hr	
Wednesday May 27 Start 4:05 PM	0.0616	0.0074	12%
Wednesday May 27 Start 6:45 PM	0.0331	0.0048	14%
Thursday May 28 Start 10:49 AM	0.0107	0.0173	162%
Average	0.0351	0.00983	

AVG

HEX SDCFM 10719 mg

SAY RUN B HEX $M_{mg/A\text{-}HR} = \frac{(60)(CATCH_{mg})(Q_o)}{V_o\ (AMPS)} = \frac{(60)(.0013)(\cancel{11353})}{(93.80)(1900)}$

RUN A = 0.00723 mg/A-HR ✓

RUB = 0.00469 mg/A-HR ✓

RUN C = 0.0169 mg/A-HR

AVG CV EX = 0.0096 mg/A-HR

DIFFERENCE APPEARS TO BE THAT Qs FT³ (WET) WAS USED AS Qo SDCFM IN CALCULATIONS.

COMPANY NAME Babbitt Bearing

STACK NAME Sample #3 NO #1

TEST DATE 5/27/92

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °F	AIR TEMP °C	ICE TEMP °F
initial		4:05			76.57							
1	1.23		.5	42.43	84.21	2.00	33.4	552.12	96	88	34.3	5.8
2	4.09		.5	42.43	91.8	2.00	33.3	551.94	105	89	34.8	10.7
3	8.23		.6	46.48	100.05	3.00	33.3	551.94	109	89	34.6	11.0
4	19.71		.6	46.48	108.2	3.00	33.3	551.94	111	90	34.5	11.2
5	23.91		.7	50.23	117.1	3.50	33.1	551.58	112	90	34.4	11.8
6	26.77		.7	50.22	126.1	4.00	33.2	551.76	115	90	34.6	11.9
7	26.77		.7	50.22	135.25	4.50	33.2	551.76	116	90	34.3	11.9
8	23.91		.7	50.23	144.2	4.50	33.1	551.58	116	90	34.2	12.0
9	19.71		.6	46.48	152.6	4.00	33.3	551.94	116	90	33.4	11.0
10	8.23		.6	46.48	160.4	3.00	33.3	551.94	111	89	32.5	10.6
11	4.09		.5	42.43	167.55	2.00	33.3	551.94	111	89	32.1	10.3
12	1.23		.5	42.43	175.71	2.00	33.4	552.12	109	88	32.1	10.1
final												

METER FINISH 175.71 AVG METER TEMP 100

AIR SAMPLE SIZE 99.14 AVG METER TEMP RANKIN 560

NOZZLE AREA SQ FT (An) 0.000309	STACK AREA SQ FT (As) 4.27	LENGTH OF TEST MINUTES ø 120	Standard Volume Vm 93.23	VOLUME RATIO STP 14,007	TOTAL CR mg .0167	AMPERAGE 1900	MG CR PER AMP HR 0.0616
NOZZLE DIA INCHES .238	STACK DIA INCHES 28	MINUTES PER POINT 10	Wt Dry Gas Md 29	STP VOL-STACK CU FT 652,941	HEX CR mg .002	AMP HOUR 3800	MG HEX CR PER AMP HR 0.0074
S TUBE Cp 0.840	Kp Pitot Tube Constant 85.49	NO OF POINTS 12	Bws Water Vapor 0.02	AVG STACK VOL CU FT 684,301	ISOKINETIC % 100.782	VOLUME LIQUID ml 0.76	LBS HEX CR PER AMP HR 0.00000002
BAR PRESSUR Pbar 29.84	Qstd Avg Stack Dry Vol Flow Rate 640197.17	STATIC PRESS Pg .2	Wt Wet Gas Ms 28.78	AVG VELOCITY FT/SEC (Vs) 44.48	STP VOL PER HR 46.62	EST ANNUAL AMP HR 15,000,000	LBS HEX CR ANNUAL-EST 0.24

10660 SCFM

Prepared by Chemical Data Management Systems

COMPANY NAME Babbitt Bearing STACK NAME Sample #2 TEST DATE 5/27/92

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °F	AIR TEMP °C	ICE TEMP °F
initial		6:45			176.67							
1	1.23		.5	42.63	184.2	2.00	30.5	546.90	87	82	30.5	9.5
2	4.09		.5	42.62	191.6	2.00	30.6	547.08	99	82	30.4	10.1
3	8.23		.6	46.68	199.8	3.00	30.7	547.26	104	82	30.6	10.0
4	19.71		.6	46.68	208.1	3.00	30.7	547.26	109	83	30.8	10.2
5	23.91		.7	50.43	217.2	3.50	30.6	547.08	110	83	31.4	10.8
6	26.77		.7	50.43	226.1	4.00	30.6	547.08	110	84	30.6	11.0
7	26.77		.7	50.45	234.8	4.00	30.4	546.72	110	83	31.3	11.2
8	23.91		.7	50.46	243.8	4.00	30.3	546.54	115	85	31.3	12.2
9	19.71		.6	46.69	252.20	3.00	30.6	547.08	115	84	31.5	11.4
10	8.23		.6	46.71	260.1	3.00	30.4	546.72	106	84	31.5	11.4
11	4.09		.5	42.64	267.7	2.50	30.4	546.72	106	84	30.3	11.6
12	1.23		.5	42.66	275.48	2.50	30.1	546.18	104	82	29.9	11.5
final												

METER FINISH 275.48 AVG METER TEMP 95

AIR SAMPLE SIZE 98.81 AVG METER TEMP RANKIN 555

NOZZLE AREA SQ FT (An) 0.000309	STACK AREA SQ FT (As) 4.27	LENGTH OF TEST MINUTES ø 120	Standard Volume Vm 93.80	VOLUME RATIO STP 13,985	TOTAL CR mg .009	AMPERAGE 1900	MG CR PER AMP HR 0.0331
NOZZLE DIA INCHES .238	STACK DIA INCHES 28	MINUTES PER POINT 10	Wt Dry Gas Md 29	STP VOL-STACK CU FT 655,924	HEX CR mg .0013	AMP HOUR 3800	MG HEX CR PER AMP HR 0.0048
S TUBE Cp 0.840	Kp Pitot Tube Constant 85.49	NO OF POINTS 12	Bws Water Vapor 0.02	AVG STACK VOL CU FT 681,206	ISOKINETIC % 100.936	VOLUME LIQUID ml 0.70	LBS HEX CR PER AMP HR 0.00000001
BAR PRESSUR Pbar 29.84	Qstd Avg Stack Dry Vol Flow Rate 643122.32	STATIC PRESS Pg .2	Wt Wet Gas Ms 28.78	AVG VELOCITY FT/SEC (Vs) 44.27	STP VOL PER HR 46.90	EST ANNUAL AMP HR 15,000,000	LBS HEX CR ANNUAL-EST 0.16

Prepared by Chemical Data Management Systems

COMPANY NAME Babbitt Bearing STACK NAME Sample #1 #3 TEST DATE 5/28/92

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °F	AIR TEMP °C	ICE TEMP °F
initial		10:49			276.8							
1	1.23		.5	42.73	284.1	2.00	29.1	544.38	84	76	29.7	10.9
2	4.09		.5	42.72	291.7	2.00	29.2	544.56	93	77	29.1	10.9
3	8.23		.6	46.79	299.8	3.00	29.3	544.74	100	78	29.5	10.6
4	19.71		.6	46.74	307.9	3.00	29.9	545.82	104	82	31.0	11.0
5	23.91		.7	50.47	316.8	3.50	30.1	546.18	108	82	31.2	11.0
6	26.77		.7	50.45	326.0	4.00	30.4	546.72	109	83	31.5	12.0
7	26.77		.7	50.41	335.1	4.00	30.9	547.62	112	84	31.7	11.6
8	23.91		.7	50.37	344.0	4.00	31.3	548.34	117	86	31.8	11.5
9	19.71		.6	46.64	352.5	3.00	31.2	548.16	117	86	32.1	11.1
10	8.23		.6	46.61	360.5	3.00	31.6	548.88	115	86	31.4	11.3
11	4.09		.5	42.54	367.9	2.00	31.8	549.24	115	85	32.4	11.5
12	1.23		.5	42.55	375.85	2.00	31.7	549.06	115	85	32.7	11.6
final												

METER FINISH 375.85 AVG METER TEMP 546.5 95 +460 =

AIR SAMPLE SIZE 99.05 AVG METER TEMP RANKIN 555

NOZZLE AREA SQ FT (An) 0.000309	STACK AREA SQ FT (As) 4.27	LENGTH OF TEST MINUTES ø 120	Standard Volume Vm 93.99	VOLUME RATIO STP 13,957	TOTAL CR mg .0029	AMPERAGE 1900	MG CR PER AMP HR 0.0107
NOZZLE DIA INCHES .238	STACK DIA INCHES 28	MINUTES PER POINT 10	Wt Dry Gas Md 29	STP VOL-STACK CU FT 655,874	HEX CR mg .0047	AMP HOUR 3800	MG HEX CR PER AMP HR 0.0173
S TUBE Cp 0.840	Kp Pitot Tube Constant 85.49	NO OF POINTS 12	Bws Water Vapor 0.02	AVG STACK VOL CU FT 681,266	ISOKINETIC % 101.143	VOLUME LIQUID ml 0.70	LBS HEX CR PER AMP HR 0.00000004
BAR PRESSUR Pbar 29.84	Qstd Avg Stack Dry Vol Flow Rate 643072.90	STATIC PRESS Pg .2	Wt Wet Gas Ms 28.78	AVG VELOCITY FT/SEC (Vs) 44.28	STP VOL PER HR 46.99	EST ANNUAL AMP HR 15,000,000	LBS HEX CR ANNUAL-EST 0.57

Prepared by Chemical Data Management Systems

10718 SDCFM

$P_s = 29.84 + \frac{.2}{13.6}$

ISO-OK!

SOURCE TEST PLAN SUMMARY

Company Information

Company Name	Babbitt Bearing
Contact	Jerry Mann
Address	1170 No. Fifth Street
City, State	San Jose, CA 95112
UTM coordinates	597200, 4135400
Phone	(408) 298-1101

Source Information

Type of Unit	Triple tank, S1 Single stack
Purpose	Chrome plating of industrial parts

Testing Firm Information

Company Name	Chemical Data Management Systems
Contact	Tim Lundell
Address	11750 Dublin Blvd.
City, State	Dublin, Ca 94568
Phone	(415) 551-7310

Testing Information

Procedure Used	Triplicate, simultaneous CARB Method 425 Total and Hexavalent Chromium Emissions at the scrubber outlet

Stack Description

Stack Height	34 feet
Stack Diameter	30 inches
Sampling Ports	2 sampling ports located 90 degrees apart which comply with the 2 and 8 rule, only one port was used on this test series
Sampling Platform	Inside of Stack Building

Traverse Points - Traverse 1

Point Number	% of Diameter	Inches From Edge
1	4.4	1.32
2	14.6	4.38
3	29.6	8.88
4	70.4	21.12
5	85.4	25.62
6	95.6	28.68

Traverse Points - Traverse 2

Point Number	% of Diameter	Inches From Edge
7	4.4	1.32
8	14.6	4.38
9	29.6	8.88
10	70.4	21.12
11	85.4	25.62
12	95.6	28.68

Stack Gas Conditions (estimates)

Stack Temperature	ambient
Expected Pitot Head	0.1 inches of H_2O
Gas Velocity	33.13 ft/sec
Stack Area	$(3.14)(30/2)^2(1/144) = 4.91\ ft^2$
Volume Flow Rate	585,605 cu ft/hour
Water Vapor	2%
Oxygen	20.9%
Carbon Dioxide	0.0%
Barometric Pressure	29.92
Molecular Weight Air	29.0
Nozzle Diameter/Area	0.375 inches = 0.000341 ft^2
Sample Volume	81.34 ft^3
Applied Amperage	1800
Time at Each Point	10 minutes
Total Sample Time	120 minutes = 2.0 hr
Total Charge per Run	3600
Process Cycle	100%

Source Test Constituent and Methods

Contaminant	Sampling Method	Analytical Method
Total chromium	CARB 425	AA Graphite Furnace
Hexavalent chromium	CARB 425	diphenylcarbazide colorimetric analysis

Detection Limit Calculation

Lab Detection Limit is 2 nanograms per each of two fractions

$(4\ ng)(1\ mg/10^6\ ng))/81.34\ ft^3 * (585{,}605\ ft^3/hr)(2\ hr) = 0.014\ mg$

$0.014\ mg/3600\ amp\text{-}hr = 0.00000389\ mg/amp\ hr$

Exceptions

Approved EPA or CARB sampling methods will be followed with the following exceptions:

A single transverse was used due to safety considerations. Only one stack port was accessible. Twelve points were tested, six in and six out. Each point was tested for ten minutes.

Stack Test Protocol

Following is the protocol that will be used for chrome stack testing at various facilities. The protocol is based on the California Air Resources Board Method 425.

The procedure is used to provide engineering data to the operators and to provide compliance data to the District. Consequently, three sample trains are run.

Tank Process Conditions

1. Parts in the tank are typical of what are run on a regular basis.

2. Tank temperature is to be consistent with normal plating practices.

3. Typical amperage will be applied to the tank(s) during the test period.

Test Protocol:

1. The purpose of this test is to determine the emissions of hexavalent and total chromium per amp-hour of plating based on specific plating tank process conditions.

2. The test method is based on the CARB Method 425.

3. CARB Methods 1 through 4 or the equivalent are used to determine stack gas velocity, dry molecular weight, and moisture content.

4. Isokinetic sampling is used. Air flow is calculated from pressure drops measured using a Dwyer Microtector Portable Electronic Point Gage and a 5/16" standard Pitot tube of appropriate length.

5. The sample train (see attached drawing) components are made of glass or Teflon and a glass fiber filter. Neither the probe or the filter are heated since duct temperatures are near ambient.

6. Three sets of three impingers are used. For each set the first two impingers contain 100 milliliters each of 0.1N sodium hydroxide (NaOH). The third impinger is empty, except for a thermocouple.

7. An 11 centimeter diameter Teflon coated glass-fiber filter in an appropriate filter holder follows the third impinger.

8. A drying column is used to dry the air after it leaves the filter.

9. Flow through the impingers is measured using a Dwyer Series RM Flowmeter. Flow is created using a Dayton Speedaire Oil-less Vacuum Pump. Volume is measured using a Rockwell Test Meter S-275. Temperature is measured using Ashcroft Bi-Metal Dial Thermometers. Barometric readings are obtained from the weather service of the local airport.

10. After collecting the samples, each sample train is capped and transported to the laboratory. No field cleaning of the train is done. The laboratory that is used is DataLab of San Jose (408-943-1889). They are approved by various Bay Area regulatory agencies and have received state certification under the new state certification plan. Their resume is available upon request.

11. Train rinse is performed using 0.1N NaOH. The filter is acid digested.

12. Determination of hexavalent chromium is done colorimetrically. Minimum detection level is 2 parts per billion (2 ppb).

13. Total chromium will be determined by digesting the sample in concentrated nitric acid followed by atomic absorption spectroscopy using a graphite furnace (GFAAS). Minimum detection level is 2 parts per billion (2 ppb).

QAQC

1. The sample train is rinsed at the laboratory with nitric acid, filled with the appropriate solutions, capped or sealed and transported to the test site.

2. Blanks and spike samples are prepared by the laboratory, transported to the site and returned to the laboratory for analysis.

3. Samples are analyzed within 48 hours of arrival at the laboratory.

4. The lab runs analyses on the probe rinse, the impinger solutions and the filter separately and then adds the results together.

5. Components of the sample train that require calibration are returned to the supplier/manufacturer:

   Yearly or,
   If they are inconsistent with other readings or
   If error is suspected

6. All test equipment is identifiable by serial number.

7. Chain of custody forms are initiated at the test site. The forms follow the sample train from the job site, to the lab, through the lab and are attached to the lab results.

Babbitt 5.27.92 Results

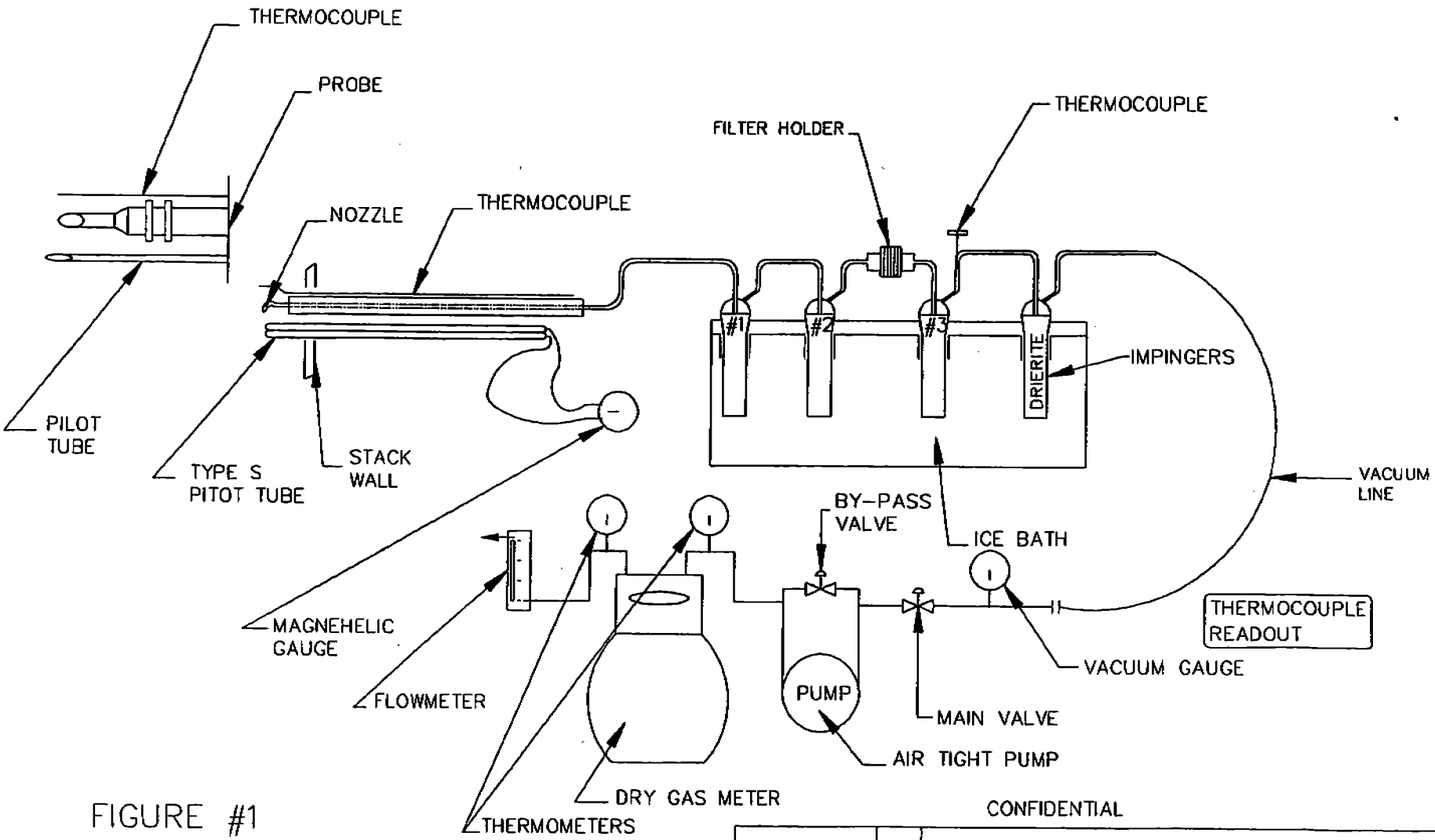


FIGURE #1

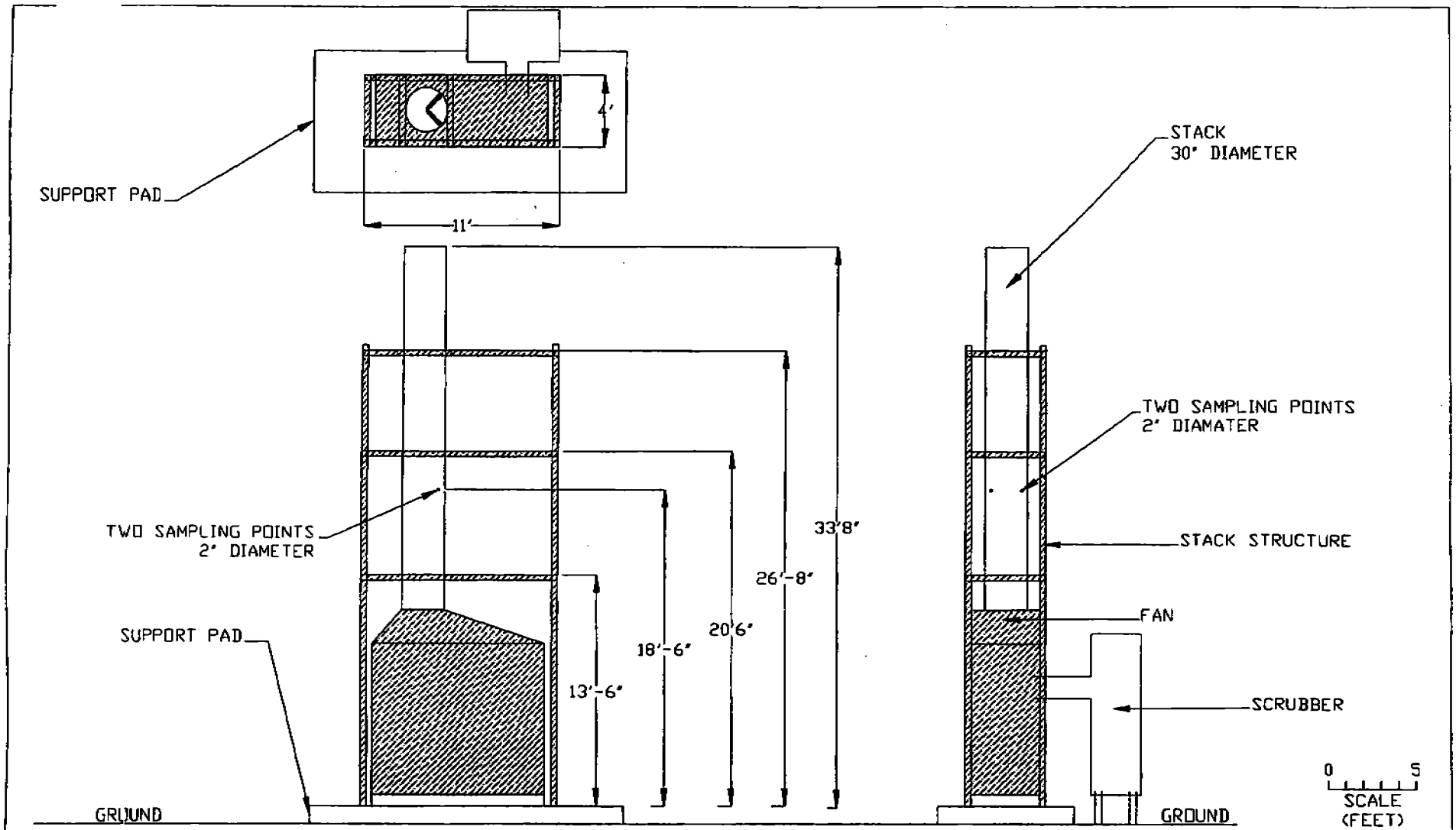
CONFIDENTIAL

SAMPLE TRAIN – #2

DATE	LTR	DESCRIPTION
08-12-91		

C.D.M.S. T & M PRODUCTS 11750 DUBLIN BLVD., STE 201 DUBLIN, CA 94568 (510) 551-7300

SAMPL2A1
G THOMSON



BABBITT BEARING,CO
SAN JOSE, CA

DR. BY: G.P.T.	REV. NO:	STAND
DATE: 03-05-91	DATE:	

Datalab, Inc.

Lab.Report: 5491
Date: June 1, 1992

Chemical Data Management Systems
Attn: Mr. Tim Lundell
11750 Dublin Blvd., Suite 201
Dublin, CA 94568

Subject: Chromium Conversion Stack Test
Samples Received: May 28, 1992

The following results were obtained from the glassware sample train

Sample #1	
Final Weight of Desiccant	461.832 g
Initial Weight of Desiccant	461.241 g
Change in Weight	0.591 g
Total Cr collected from sample Probe	0.0009 mg
Total Cr collected from sample Impinger	0.0020 mg
Hexavalent Cr collected from sample Probe	0.0006 mg
Hexavalent Cr collected from sample Impinger	0.0041 mg
Sample #2	
Final Weight of Desiccant	457.120 g
Initial Weight of Desiccant	456.423 g
Change in Weight	0.697 g
Total Cr collected from sample Probe	0.0047 mg
Total Cr collected from sample Impinger	0.0043 mg
Hexavalent Cr collected from sample Probe	0.0005 mg
Hexavalent Cr collected from sample Impinger	0.0008 mg
Sample #3	
Final Weight of Desiccant	453.497 g
Initial Weight of Desiccant	452.741 g
Change in Weight	0.756 g
Total Cr collected from sample Probe	0.0050 mg
Total Cr collected from sample Impinger	0.0117 mg
Hexavalent Cr collected from sample Probe	0.0003 mg
Hexavalent Cr collected from sample Impinger	0.0017 mg

.0013 mg

Datalab, Inc.

Holly Ham

HH:bb
1059A

2171 Del Franco Street, San Jose, CA 95131
[408] 943-1888 • [408] 943-0190 (Fax)

4	0.010	14.19	IMP. 1
5	0.001	2.819	IMP. 2
6	0.004	6.112	IMP 3

CDMS Cr^{6+}

LAB # 5491

1	6		
	0.0951		
	0.1770		
1	6		
	0.0936		
	0.1102		
MEAN	6	#1 PROBE	
SD	0		
RSD	0.0		
2	32	#2 PROBE	
	0.3479		
	0.1007		
2	33		
	0.3525		
	0.0970		
MEAN	33	#2 PROBE	
SD	1		
RSD	3.0		
3	35		
	0.3755		
	0.0964		
3	35		
	0.3761		
	0.0945		
MEAN	35	#3 PROBE	
SD	0		
RSD	0.0		
4	7		
	0.1049		
	0.0632		
4	7		
	0.1057		
	0.0645		
MEAN	7	#1 IMPINGER	
SD	0		
RSD	0.0		
5	15		
	0.1869		
	0.0547		
5	15		
	0.1851		
	0.0559		
MEAN	15	#2 IMPINGER	
SD	0		
RSD	0.0		
6	41		
	0.4280		
	0.0558		
6	41		
	0.4287		
	0.0551		
MEAN	41	#3 IMPINGER	
SD	0		
RSD	0.0		

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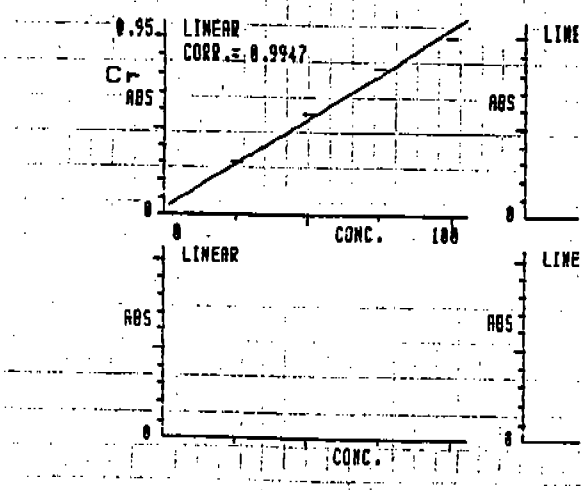
Lab #5491
TOTAL CR BY GRAPHITE FURNACE

** RESULT TABLE **

SAMPLE NO.	CONC.(ppb) - Cr - COR.ABS / REF.ABS / PEAK HEIGHT	CONC.(p COR. / REF. / PEAK H
STD 1	0	
	0.0066	
	0.0499	
STD 1	0	
	0.0044	
	0.0674	
STD 2	25	
	0.2853	
	0.1090	
STD 2	25	
	0.2881	
	0.1068	
STD 3	50	
	0.5529	
	0.1078	
STD 3	50	
	0.5519	
	0.1055	
STD 4	75	
	0.7897	
	0.1045	
STD 4	75	
	0.7914	
	0.1017	
STD 5	100	
	0.9462	
	0.1030	
STD 5	100	
	0.9445	
	0.1028	

** CALIBRATION CURVE ** FIRING



PHOTOMETRY/CYANIDE 05/31/92 21:27

ID	ABS	CONC

PHOTOMETRY/CYANIDE 05/31/92 21:39

ID	ABS	CONC

PHOTOMETRY/CR-HEX 05/31/92 22:02

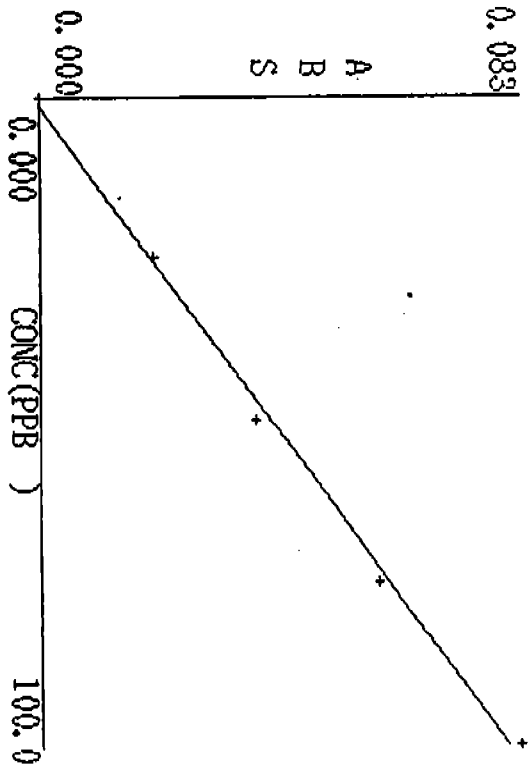
ID	ABS	CONC
STD 1	0.000	0.000
STD 2	0.020	25.00 25PPB
STD 3	0.037	50.00
STD 4	0.059	75.00
STD 5	0.083	100.0

K1= 1226 K0= 1.322

PHOTOMETRY/CR-HEX 05/31/92 22:10

ID	ABS	CONC	F

PHOTOMETRY/CR-HEX 05/31/92 22:11



PHOTOMETRY/CR-HEX 05/31/92 22:11

N= 8 MEAN= 209.6 SD= 245.0 CV= 116.9

1	0.002	4.017	PROBE 1
2	0.002	3.418	PROBE 2
3	0.001	2.220	PROBE 3
4	0.010	14.19	EMP. 1
5	0.001	2.819	EMP. 2
6	0.004	6.112	EMP 3

© HITACHI CHART NO. 258-1050

Meter Designation

S-275

Rated Capacity_____cfh
CVM and GT meters—max. index rate
Diaphragm meters— 2" H_2O Diff.rate

MINERS & PISANI, INC.

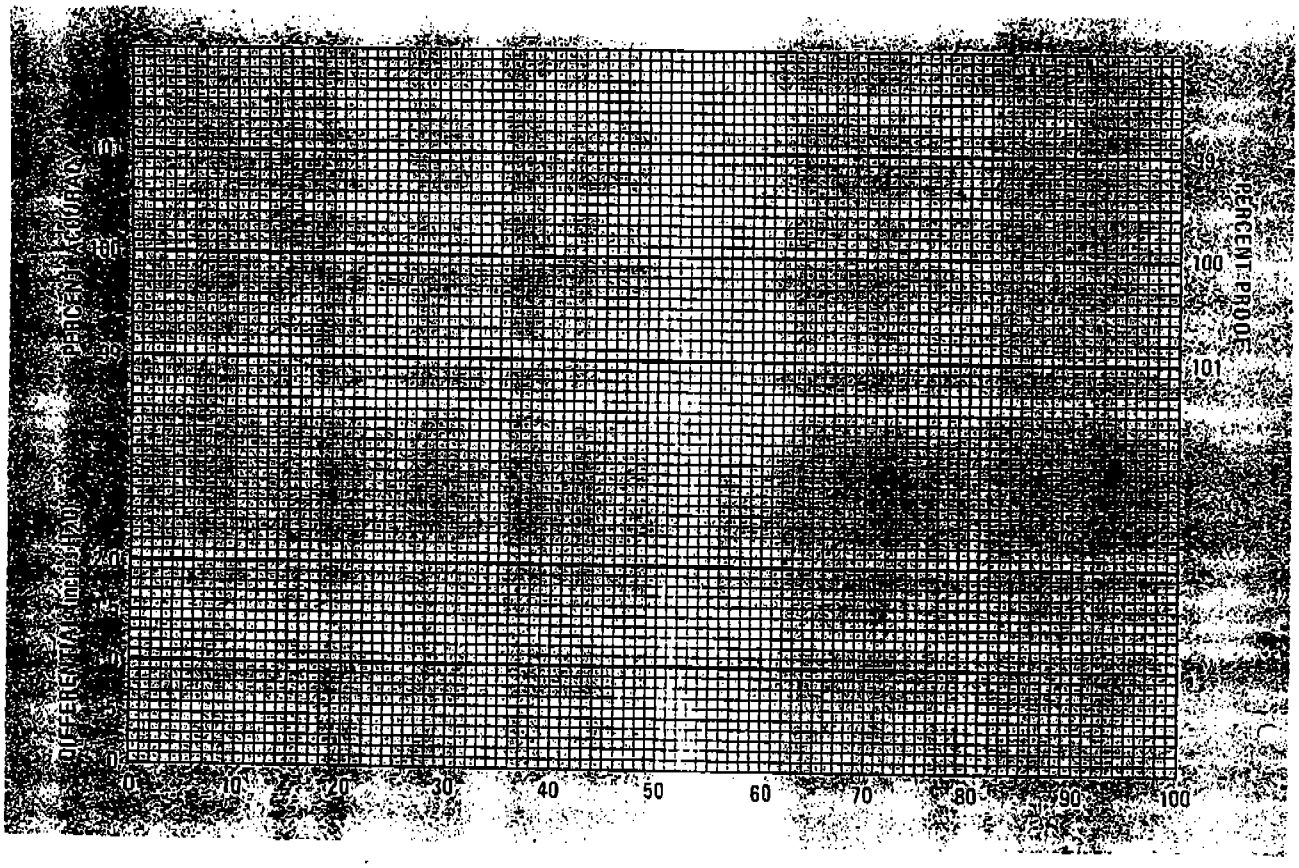
2010 Farallon Drive
SAN LEANDRO, CA 94577
(415) 352-9040

Manufacturer's Number

6848207

Cartridge Number

TEST MEDIUM – ATMOSPHERIC AIR



FLOW RATE – PERCENT OF RATED CAPACITY

FLOW RATE (AIR)	PERCENT RATED CAPACITY	PERCENT ACCURACY	PERCENT PROOF	DIFFERENTIAL (inches H_2O) Tested on air
.25 CFM			100.2	~~Add the % Proof~~ ↓
.5 CFM			100.2	divide by 4 to
.75 CFM			99.8	get factor
1.0 CFM			99.8	
				$\frac{400}{4} = 1$

Pump is slow

Pump is fast

Customer: CHEMICAL DATA

Customer P.O. No.: _____

Customer Meter No. _____

Date Tested: 5/05/92

Tested by: RAY HAIER

Test Location: _____

E-1982

Field Name	Field Type	Formula / Entry Option
ACTUAL METER	Number	Repeating field with 12 repetitions.
AIR SAMPLE SIZE	Calculation (Number)	= METER FINISH-METER START
AIR TEMP	Number	Repeating field with 15 repetitions.
AMP HR	Calculation (Number)	= AMPERAGE * LENGTH OF TEST / 60
AMPERAGE	Number	
An NOZZLE AREA	Calculation (Number)	= 3.14 * ((Nozzle Diameter / 2) ^ 2) / 144
ANNUAL HEX CR EMITTED IN POUNDS	Calculation (Number)	= ANNUAL PLATING HOURS * LBS HEX CR PER AMP HR
ANNUAL PLATING HOURS	Number	
As STACK AREA	Calculation (Number)	= (3.14 * (Stack Diameter / 2) ^ 2 / 144) + RECTANGLE AREA
AVG AIR TEMP	Calculation (Number)	= average (AIR TEMP)
AVG BATH TEMP	Calculation (Number)	= average (BATH TEMP)
AVG METER TEMP	Calculation (Number)	= (average (METER INLET TEMP) + average (METER OUTLET TEMP)) / 2
AVG METER TEMP RANKIN	Calculation (Number)	= AVG METER TEMP+460
AVG ORIFICE DELTA H	Calculation (Number)	= Average (ORIFICE DELTA H)
AVG STACK PRESSURE	Calculation (Number)	= average (ΔP PRESS BY POINT)
AVG STACK RANKIN	Calculation (Number)	= average (STACK TEMP RANKIN)
AVG STACK TEMP	Calculation (Number)	= average (Ts STACK TEMP)
AVG STACK VOLUME	Calculation (Number)	= Vs AVG * 3600 * As STACK AREA
BATH TEMP	Number	Repeating field with 15 repetitions.
Bws Water Vapor	Number	
CALCULATED METER	Number	Repeating field with 12 repetitions.
Cent to Far	Calculation (Number)	= 9/5
CHROME PER AMP HR	Calculation (Number)	= (TOTAL CR FOUND * 60/LENGTH OF TEST* VOLUME RATIO) / AMPERAGE
COMPANY NAME	Text	
Cp S TUBE VALUE	Number	
Cr PER HOUR	Calculation (Number)	= TOTAL CR FOUND * 60 / LENGTH OF TEST
Cr RATIO	Calculation (Number)	= Cr PER HOUR * VOLUME RATIO
DATE	Calculation (Date)	= today
Delta Pressure	Number	Repeating field with 12 repetitions.
Finish Time	Time	
HEX CR FOUND	Number	
HEX CR PER AMP HOUR	Calculation (Number)	= (HEX CR FOUND * 60 /LENGTH OF TEST* VOLUME RATIO) / AMPERAGE

$$\frac{(\chi_{mg})(60)}{(2\,\text{HRS}) \cdot \text{VOL RATIO}}$$

Field Name	Field Type	Formula / Entry Option
ICE TEMP	Number	Repeating field with 12 repetitions.
ISOKINETIC	Calculation (Number)	= ((Ts avg STACK TEMP R) * (Vm Corrected Volume Collected) * 29.92 *100) / ((Vs AVG) * LENGTH OF TEST * An NOZZLE AREA * Ps ABS STACK PRESS * 528 * 60 * (1 - Bws Water Vapor))
Kp Pitot Tube Constant	Number	
LBS HEX CR PER AMP HR	Calculation (Number)	= HEX CR PER AMP HOUR / 454000
Leak Rate at 15" Hg	Number	
LENGTH	Number	
LENGTH OF TEST	Number	
Md Molecular weight of Stack Gas	Number	
Md Wt of Stack Gas Dry Basis	Number	
METER AVG RANKIN	Calculation (Number)	= ((METER INLET TEMP + METER OUTLET TEMP) / 2)*(9 / 5) + 460
METER FINISH	Number	
METER INLET TEMP	Number	Repeating field with 15 repetitions.
METER OUTLET TEMP	Number	Repeating field with 15 repetitions.
METER START	Number	
MINUTES PER POINT	Number	
Ms Wt of Stack Gas Wet Basis	Calculation (Number)	= Md Molecular weight of Stack Gas * (1 - Bws Water Vapor) +18.0 * Bws Water Vapor
Nozzle Diameter	Number	
NUMBER OF POINTS	Number	
ORIFICE DELTA H	Number	Repeating field with 12 repetitions.
Pb BAROMETRIC PRESS	Number	
Points	Text	Repeating field with 15 repetitions.
POSITION	Number	Repeating field with 15 repetitions.
Ps ABS STACK PRESS	Calculation (Number)	= Pb BAROMETRIC PRESS + abs(STATIC PRESSURE/13.6)
Qm	Calculation (Number)	= 3600 * (1-extend(Bws Water Vapor))*extend(An NOZZLE AREA) * Vs STACK VELOCITY * (528 / Ts STACK TEMP R) * (extend(Ps ABS STACK PRESS) / extend(Pb BAROMETRIC PRESS))
Qm Avg	Calculation (Number)	= average(Qm)
Qm NOZZLE SCFH	Calculation (Number)	= 85.49*EXTEND(Cp S TUBE VALUE) * SQRT((ΔP PRESS BY POINT * Ts STACK TEMP R) / (EXTEND(Ps ABS STACK PRESS) * Ms Wt of Stack Gas Wet Basis)) * 3600 * EXTEND(An NOZZLE AREA)
Qstd Avg Stack Dry Volume Flow Rate	Calculation (Number)	= 3600 * (1 - Bws Water Vapor) * Vs AVG *As STACK AREA* (528 / Ts avg STACK TEMP R) * (Ps ABS STACK PRESS / 29.92)

Field Name	Field Type	Formula / Entry Option
RECTANGLE AREA	Calculation (Number)	= LENGTH * WIDTH / 144
Stack Diameter	Number	
STACK NAME	Text	
STACK TEMP RANKIN	Calculation (Number)	= Ts STACK TEMP * (9/5) + 32 + 460
Start Time	Time	
STATIC PRESSURE	Number	
STP STACK VOLUME PER HR	Calculation (Number)	= AVG STACK VOLUME * 528 / AVG STACK RANKIN * Pb BAROMETRIC PRESS / 29.92
Test Date	Date	
Time	Number	Repeating field with 12 repetitions.
TOTAL CR FOUND	Number	
Ts avg STACK TEMP R	Calculation (Number)	= (9/5) * Average (Ts STACK TEMP) + 460 +32
Ts STACK TEMP	Number	Repeating field with 15 repetitions.
Ts STACK TEMP R	Calculation (Number)	= (460) + 32+extend(Cent to Far) * (Ts STACK TEMP)
Q_M Vm Corrected Volume Collected	Calculation (Number)	= (AIR SAMPLE SIZE)*(Pb BAROMETRIC PRESS/29.92)*(528/AVG METER TEMP RANKIN)
Vo PER HOUR	Calculation (Number)	= Vm Corrected Volume Collected * 60 / LENGTH OF TEST
VOLUME LIQUID	Number	
VOLUME RATIO	Calculation (Number)	= STP STACK VOLUME PER HR /(Vo PER HOUR)
Vs AVG	Calculation (Number)	= Average (Vs STACK VELOCITY)
Vs STACK VELOCITY	Calculation (Number)	= Extend(Kp Pitot Tube Constant)*Extend(Cp S TUBE VALUE)*Sqrt ((ΔP PRESS BY POINT * Ts STACK TEMP R)/(Extend (Ps ABS STACK PRESS) * Extend (Ms Wt of Stack Gas Wet Basis)))
WIDTH	Number	
ΔP PRESS BY POINT	Number	Repeating field with 15 repetitions.

SURFACE WEATHER OBSERVATIONS

SJC SA 1445 10 SCT 10 60/56/1509/984
RHV SA 1445 10 SCT 100 -BKN 10 59/54/1607/983/F BNK SE-S
NUQ SA 1455 6 SCT 8 SCT E200 BKN 6FH 113/63/53/1105/986/ 302 1601=
PAO SA 1445 -X M10 BKN 6F 61/55/1205/986/F2
[illegible]L SA 1445 M11 BKN 100 OVC 10 61/53/3606/987
[illegible]K SA 1446 -X 10 SCT 150 -BKN 6H 2605/985/H3/F BNK SE-S
HWD SA 1446 8 SCT 9 SCT E100 OVC 3F 59/55/0000/985/CIG RGD

GMT

Labbitt Bearing
Barometric Pressure
29.84 San Jose
5/27/92

Lab # 5291

DATALAB, INC.
2171 Del Franco St.
SAN JOSE, CA 95131
(408) 943-1888

CHAIN OF CUSTODY RECORD

SAMPLERS (Signature) [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp.	SAMPLE TYPE Water Grab.	SAMPLE TYPE Air	SEQ. NO.	NO. OF CONTAINERS	ANALYSIS REQUIRED
	CDMS	5-28-92	9:08AM					3	Cr^{6+} + Cr^{TOT} IN EA

Relinquished by: (Signature) [illegible]	Received by: (Signature) [illegible]	Date/Time 5-28-92 9:08 AM
Relinquished by: (Signature)	Relinquished by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Received by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) Date/Time	Received for Laboratory by: [illegible]	Date/Time 5-28-92 9:10 AM
Method of Shipment: TIM LANDELL		

Distribution: Orig.–Accompany Shipment
1 Copy–Survey Coordinator Field Files

COMPANY NAME: Bagatt

STACK NAME: Bagatt

TEST DATE: 5/27/92

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	CALC METER CU FT	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °C	AIR TEMP °C	ICE TEMP °F
initial		405				076.57							
1	1.23	415	0.5	45.42	7.6/84.14	84.21	2	33.4		96	88	34.3	5.8
2	4.09	425	0.5	45.41	7.6/91.74	91.8	2	33.3		105	89	34.8	10.7
3	8.23	435	0.6	49.7	8.29/100.03	100.06	3	35.3		109	89	35.6	11.0
4	19.71	445	[illegible]	49.72	8.29/108.32	108.2	3	33.3		111.	90	34.5	11.2
5	23.91	455	7	53.7	9.95/117.27	117.1	3.5	33.1		112.	90	34.4	11.2
6	26.77	505	7	53.7	8.95/126.2	126.1	4.0	33.2		115.	90	34.6	11.8
AVERAGE													

Sample Train #3

Leak Rate at 15" Hg	Kp Pitot Tube Constant	Qstd Avg Stack Dry Vol Flow Rate	Standard Volume Vo	tested thermo in boiling + ice water			
NOZZLE AREA SQ FT (An)	STACK AREA SQ FT (As)	LENGTH OF TEST MINUTES θ	Wt Wet Gas Ms	VOLUME RATIO STP	TOTAL CR mg	AMPERAGE 1900	MG CR PER AMP HR
NOZZLE DIA INCHES	STACK DIA INCHES 28	MINUTES PER POINT	Wt Dry Gas Md	STP VOL-STACK CU FT	HEX CR mg	AMP HOUR	MG HEX CR PER AMP HR
S TUBE Cp	LENGTH INCHES	NO OF POINTS	Bws Water Vapor	AVG STACK VOL CU FT	ISOKINETIC % I	VOLUME LIQUID ml	LBS HEX CR PER AMP HR
BAR PRESSUR Pbar 2	WIDTH INCHES	STATIC PRESS Pg 0.2	AVG VELOCITY FT/SEC (Vs)		STP VOL PER HR	EST ANNUAL AMP HR	LBS HEX CR ANNUAL-EST

Prepared by Chemical Data Management Systems

COMPANY NAME | STACK NAME | TEST DATE

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	CALC METER CU FT	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °C	AIR TEMP °C	ICE TEMP °F
Initial		505				126.1							
7	26.77	515	.7	53.7	8.45/135.15	135.25	4.5	33.2		116	90	34.3	11.9
8	23.91	525	.7	53.7	8.55/144.10	144.2	4.5	33.2		116	86	34.2	12.0
9	19.71	535	.6	49.6	8.30/152.37	152.6	4.0	32.8		116	90	33.4	11.0
10	8.23	545	.6	49.6	8.27/160.64	160.4	3.0	31.7		111	89	32.5	10.6
11	4.09	555	.5	45.27	7.55/168.18	167.55	2.0	31.5		111	89	32.6	10.3
12	1.23	605	.5	45.27	7.54/175.7	175.71	2.0	31.5		109	88	32.1	10.1
AVERAGE													

Leak Rate at 15" Hg	Kp Pitot Tube Constant	Qstd Avg Stack Dry Vol Flow Rate	Standard Volume Vo				
NOZZLE AREA SQ FT (An)	STACK AREA SQ FT (As)	LENGTH OF TEST MINUTES ø	Wt Wet Gas Ms	VOLUME RATIO STP	TOTAL CR mg	AMPERAGE 1000	MG CR PER AMP HR
NOZZLE DIA INCHES	STACK DIA INCHES	MINUTES PER POINT	Wt Dry Gas Md	STP VOL-STACK CU FT	HEX CR mg	AMP HOUR	MG HEX CR PER AMP HR
S TUBE Cp	LENGTH INCHES	NO OF POINTS	Bws Water Vapor	AVG STACK VOL CU FT	ISOKINETIC % I	VOLUME LIQUID ml	LBS HEX CR PER AMP HR
BAR PRESSUR Pbar	WIDTH INCHES	STATIC PRESS Pg	AVG VELOCITY FT/SEC (Vs)		STP VOL PER HR	EST ANNUAL AMP HR	LBS HEX CR ANNUAL-EST

Prepared by Chemical Data Management Systems

COMPANY NAME | STACK NAME | TEST DATE

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	CALC METER CU FT	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °C	AIR TEMP °C	ICE TEMP °F
Initial		645				176.67	(176.67)						
1	1.23	655	.5	45.2	7.5/184.2	184.2	2	30.5		87	82	30.5	9.5
2	4.09	7.05	5	45.2	7.5/191.74	191.6	2	30.6		99	82	30.4	10.1
3	8.23	7.15	.6	49.53	8.3/200.0	199.8	3	30.7		104	82	30.6	10.0
4	19.71	7.25	.6	49.5	8.3/208.3	208.1	3	30.7		109	83	30.9	10.2
5	23.91	7:35	.7	53.52	8.9/217.2	217.2	4	30.6		110	83	31.4	10.8
6	26.77	7:45	.7	53.99	8.9/226.1	226.1	4	30.6		110	84	30.6	11.0
AVERAGE													

Sample train #2

Leak Rate at 15" Hg	Kp Pitot Tube Constant	Qstd Avg Stack Dry Vol Flow Rate	Standard Volume Vo				
NOZZLE AREA SQ FT (An)	STACK AREA SQ FT (As)	LENGTH OF TEST MINUTES ø	Wt Wet Gas Ms	VOLUME RATIO STP	TOTAL CR mg	AMPERAGE 1900	MG CR PER AMP HR
NOZZLE DIA INCHES	STACK DIA INCHES	MINUTES PER POINT	Wt Dry Gas Md	STP VOL-STACK CU FT	HEX CR mg	AMP HOUR	MG HEX CR PER AMP HR
S TUBE Cp	LENGTH INCHES	NO OF POINTS	Bws Water Vapor	AVG STACK VOL CU FT	ISOKINETIC % I	VOLUME LIQUID ml	LBS HEX CR PER AMP HR
BAR PRESSUR Pbar	WIDTH INCHES	STATIC PRESS Pg	AVG VELOCITY FT/SEC (Vs)		STP VOL PER HR	EST ANNUAL AMP HR	LBS HEX CR ANNUAL-EST

Prepared by Chemical Data Management Systems

COMPANY NAME | STACK NAME | TEST DATE

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	CALC METER CU FT	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °C	AIR TEMP °C	ICE TEMP °F
(6)		7:45			226.1	226.1							
7	26.77	7:55	.7	53.48	8.9/235.0	234.8	.4	30.4		110	83	31.3	11.2
8	23.91	8:05	.7	53.48	8.9/243.94	243.8	.4	30.3		115	83	31.3	12.2
9	19.71	8:15	.6	49.53	8.3/252.2	252.10	.3	30.6		115	84	31.5	11.4
10	8.23	8:25	.6	49.51	8.3/260.5	260.1	.3	30.4		106	84	31.5	11.4
11	4.09	8:35	.5	45.20	7.5/268.05	267.7	2.5	30.4		106	84	30.3	11.6
12	1.23	8:45	.5	45.17	7.53/275.58	275.48	2.5	30.1		104	82	29.9	11.5
AVERAGE													

275.49

Leak Rate at 15" Hg	Kp Pitot Tube Constant	Qstd Avg Stack Dry Vol Flow Rate	Standard Volume Vo				
NOZZLE AREA SQ FT (An)	STACK AREA SQ FT (As)	LENGTH OF TEST MINUTES ø	Wt Wet Gas Ms	VOLUME RATIO STP	TOTAL CR mg	AMPERAGE 1900	MG CR PER AMP HR
NOZZLE DIA INCHES	STACK DIA INCHES	MINUTES PER POINT	Wt Dry Gas Md	STP VOL-STACK CU FT	HEX CR mg	AMP HOUR	MG HEX CR PER AMP HR
S TUBE Cp	LENGTH INCHES	NO OF POINTS	Bws Water Vapor	AVG STACK VOL CU FT	ISOKINETIC % I	VOLUME LIQUID ml	LBS HEX CR PER AMP HR
BAR PRESSUR Pbar	WIDTH INCHES	STATIC PRESS Pg	AVG VELOCITY FT/SEC (Vs)		STP VOL PER HR	EST ANNUAL AMP HR	LBS HEX CR ANNUAL-EST

Prepared by Chemical Data Management Systems

COMPANY NAME | STACK NAME | TEST DATE 5/28/92

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	CALC METER CU FT	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °C	AIR TEMP °C	ICE TEMP °F
initial		10:49				276.8							
1	1.23	10:57	.5	45.10	7.5/284.3	284.1	2	29.1		84	76	29.7	10.9
2	4.09	11:07	.5	45.11	7.5/291.8	291.7	2	29.2		93	77	29.1	10.9
3	8.23	11:17	.6	49.42	8.2/300.1	299.8	3	29.3		100	78	29.5	10.6
4	19.71	11:27	.6	49.47	8.2/308.3	307.9	3	29.9		104	82	31.0	11.0
5	23.91	11:37	.7	53.45	8.9/317.2	316.8	4	30.1		108	82	31.2	11.0
6	26.77	11:47	.7	53.48	8.9/326.1	325.0	4	30.4		109	83	31.5	11.2
AVERAGE													

Sample Train #1 / Test #3

Leak Rate at 15" Hg	Kp Pitot Tube Constant	Qstd Avg Stack Dry Vol Flow Rate	Standard Volume Vo	No leak in 2 min			
NOZZLE AREA SQ FT (An)	STACK AREA SQ FT (As)	LENGTH OF TEST MINUTES ø	Wt Wet Gas Ms	VOLUME RATIO STP	TOTAL CR mg	AMPERAGE 1900	MG CR PER AMP HR
NOZZLE DIA INCHES	STACK DIA INCHES	MINUTES PER POINT	Wt Dry Gas Md	STP VOL-STACK CU FT	HEX CR mg	AMP HOUR	MG HEX CR PER AMP HR
S TUBE Cp	LENGTH INCHES	NO OF POINTS	Bws Water Vapor	AVG STACK VOL CU FT	ISOKINETIC % I	VOLUME LIQUID ml	LBS HEX CR PER AMP HR
BAR PRESSUR Pbar 29.84	WIDTH INCHES	STATIC PRESS Pg	AVG VELOCITY FT/SEC (Vs)		STP VOL PER HR	EST ANNUAL AMP HR	LBS HEX CR ANNUAL-EST

Prepared by Chemical Data Management Systems

COMPANY NAME | STACK NAME | TEST DATE 5/28/92

POINT	POSITION	TIME	POINT PRESS Pv	NOZZLE SCFH Qm	CALC METER CU FT	ACTUAL METER CU FT	VACUUM PRESS ΔH	STACK TEMP °C Ts	STACK TEMP °R Ts	METER INLET °F	METER OUTLET °C	AIR TEMP °C	ICE TEMP °F
(6)		11:47			326.13	326.0							
7	26.77	12:57	-.7	53.52	8.72/335.1	335.1	4	30.9		112	84	31.7	11.6
8	23.91	12:07	-.7	53.56	8.83/343.98	344.0	4	31.3		117	86	31.8	11.5
9	19.71	12:17	.6	49.57	8.43/352.2	352.5	3	31.2		117	86	32.1	11.1
10	8.23	12:27	.6	49.61	8.3/360.8	360.5	3	31.6		115	86	31.4	11.3
11	4.09	12:37	.5	45.30	7.5/368.3	367.9	2	31.8		115	85	32.4	11.5
12	1.23	12:47	.5	45.29	7.5/375.85	375.85	2	31.7		115	85	32.7	11.6
AVERAGE					375.48								

leak check after OK no leak

Leak Rate at 15" Hg	Kp Pitot Tube Constant	Qstd Avg Stack Dry Vol Flow Rate	Standard Volume Vo				
NOZZLE AREA SQ FT (An)	STACK AREA SQ FT (As)	LENGTH OF TEST MINUTES ø	Wt Wet Gas Ms	VOLUME RATIO STP	TOTAL CR mg	AMPERAGE 1900	MG CR PER AMP HR
NOZZLE DIA INCHES	STACK DIA INCHES	MINUTES PER POINT	Wt Dry Gas Md	STP VOL-STACK CU FT	HEX CR mg	AMP HOUR	MG HEX CR PER AMP HR
S TUBE Cp	LENGTH INCHES	NO OF POINTS	Bws Water Vapor	AVG STACK VOL CU FT	ISOKINETIC % I	VOLUME LIQUID ml	LBS HEX CR PER AMP HR
BAR PRESSUR Pbar	WIDTH INCHES	STATIC PRESS Pg	AVG VELOCITY FT/SEC (Vs)		STP VOL PER HR	EST ANNUAL AMP HR	LBS HEX CR ANNUAL-EST

Prepared by Chemical Data Management Systems

Source category: Electroplating
Plant name : Babbit Bearing
Process : Hard chromium electroplating

Filename: REF_4-93.WQ1
Location: San Jose, CA
Test date: May 27-28,1992

Date: 04/19/96
Ref. No.: 4-93
Process rate basis: production

Source	Type of control	Pollutant	Run No.	Test Method	Samp. time, min	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, ug	Concen., gr/DSCF	Emission rate, lb/hr	Process rate, A-hr	Emission factor mg/A-hr	Emission factor gr/A-hr	Rat.
Electroplating tank	PBS/FS	Total Cr	1	CARB 425	120	100.8	93.23	10,670	16.7	2.76E-06	0.00025	3,800	0.060	0.00093	
		Total Cr	2		120	100.9	93.80	10,719	9.0	1.48E-06	0.00014	3,800	0.032	0.00050	
		Total Cr	3		120	101.1	93.99	10,718	2.9	4.76E-07	4.4E-05	3,800	0.010	0.00016	
										1.57E-06		Average	0.034	0.00053	B
	PBS/FS	Cr+6	1	CARB 425	120	100.8	93.23	10,670	2.0	3.31E-07	3.0E-05	3,800	0.0072	0.00011	
		Cr+6	2		120	100.9	93.80	10,719	1.3	2.14E-07	2.0E-05	3,800	0.0047	7.2E-05	
		Cr+6	3		120	101.1	93.99	10,718	4.7	7.72E-07	7.1E-05	3,800	0.017	0.00026	
										4.39E-07		Average	0.0096	0.00015	NR

Basis for rating: Outlet Cr+6 data below quantification limit.
Problems noted:
Other notes: