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 67

AIR TOXICS SAMPLING REPORT
DEUTSCH ENGINEERED CONNECTING DEVICES
OCEANSIDE, CALIFORNIA 92054

Prepared for

DEUTSCH ENGINEERED CONNECTING DEVICES
MUNICIPAL AIRPORT ROAD
OCEANSIDE, CALIFORNIA 92054

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June 28, 1991

THIS DOCUMENT WAS PREPARED FOR USE ONLY BY THE CLIENT, ONLY FOR THE PURPOSES STATED, AND WITHIN A REASONABLE TIME FROM ITS ISSUANCE. PLEASE READ THE "LIMITATIONS" SECTION OF THIS REPORT.

DEUTSCH ENGINEERED CONNECTING DEVICES

Oceanside Manufacturing Plant • Municipal Airport • Oceanside, California 92054 • Telephone (619) 757-7500

July 18, 1991

Mr. Thomas R. Weeks
Associate Air Pollution Control Engineer
County of San Diego
Air Pollution Control District
9150 Chesapeake Drive
San Diego, Ca. 92123-1095

Subject: Source Test Data and Emissions Report

Dear Mr. Weeks:

Air Sampling and testing at our plating shop scrubbers has been completed to satisfy the requirements of the Air Toxic Hot Spots Information and Assessment Act. All sampling and testing was performed by Kleinfelder, Inc. of San Diego on January 7 thru January 17, 1991 in accordance to the approved source test protocol.

Enclosed is a copy of all sampling/ test data and an emissions report of Cadmium, Chromium VI, Copper, Lead, Nickel & Zinc. Emission rates of these substances were calculated using the LB/HR emissions factors established from the sampling/ test data. These emissions factors can be found on page 4-5 and 4-6 of the report.

Please call me at (619) 757-7500 if you have any questions.

Sincerely,

Greg Brady

Greg Brady
Health & Safety Engineer

Deutsch Company E.C.D.
Municipal Airport
Oceanside, Ca. 92054

AB2588 EMISSIONS INVENTORY REPORT- PLATING SHOP

METAL	SOURCE	LBS/ HOUR [1]	LBS/ DAY [2]	LBS/ YEAR [3]
Cadmium	Scrubber # 6	0.000183	0.002928	0.732
Chromium VI	Scrubber # 2	0.000153	0.002448	0.612
"	Scrubber # 3	0.000153	0.002448	0.612
Copper	Scrubber # 1	0.02756	0.44096	110.24
"	Scrubber # 2	0.02756	0.44096	110.24
Lead	Scrubber # 1	0.00386	0.06176	15.44
"	Scrubber # 2	0.00386	0.06176	15.44
Nickel	Scrubber # 2	0.004006	0.06410	16.026
"	Scrubber # 5	0.004006	0.06410	16.026
Zinc	Scrubber # 6	0.287	4.592	1148.0

TOTALS:

Cadmium	0.000183	0.002928	0.732
Chromium VI	0.000306	0.004896	1.224
Copper	0.05512	0.88192	220.48
Lead	0.00772	0.12352	30.88
Nickel	0.008012	0.128192	32.048
Zinc	0.287	4.592	1148.0

Footnotes:

1 Based on the avg. of three source test results.
2 Based on working time of 16 hours/ day.
3 Based on working days of 250 days/ year.

AIR TOXICS SAMPLING REPORT
DEUTSCH ENGINEERED CONNECTING DEVICES
MUNICIPAL AIRPORT ROAD
OCEANSIDE, CALIFORNIA 92054

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B	LABORATORY DATA
C	DETAILED RESULTS
D	SAMPLE CALCULATIONS
E	EQUIPMENT CALIBRATION

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AIR TOXICS SAMPLING REPORT
DEUTSCH ENGINEERED CONNECTING DEVICES
MUNICIPAL AIRPORT ROAD
OCEANSIDE, CALIFORNIA 92054

1 EXECUTIVE SUMMARY

Deutsch Engineered Connecting Devices retained Kleinfelder, Inc. to perform the AB 2588 Air Toxics Hot Spots evaluation on two emission control scrubbers serving the plating lines located at their facility on Municipal Airport Road, Oceanside, California 92054. The tests were conducted from January 7 through 17, 1991 and consisted of multiple metals emission measurements. Multiple metal tests consisted of the sampling of copper, lead and zinc for Scrubber #2 and the evaluation of cadmium and zinc for Scrubber #6. The multiple metal tests were verified by individual sampling of nickel and cadmium. All procedures conformed to the specifications of the California Air Resources Board (CARB).

The purpose of the tests was to determine if the source emitted any of the above air toxics in reportable quantities and to develop accurate emission estimating factors. Scrubber efficiencies were evaluated by simultaneous testing of inlet and outlet emissions. The tests were requested by the San Diego Air Pollution Control District (APCD), as part of compliance with AB 2588.

All tests provided valid data and the results are contained herein. The plating line tanks were operated under normal operating conditions at or near full load for the duration of the test; process requirements determined the actual load rate.

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2 INTRODUCTION

Deutsch Engineered Connecting Devices is a manufacturer of electrical connectors for the aerospace industry. Deutsch retained **Kleinfelder, Inc.** (KA) to perform the AB 2588 air toxics sampling on two scrubber systems, located at Municipal Airport Road, Oceanside, California 92054. These tests were performed from January 7 through 17, 1991.

2.1 Purpose and Objectives

The purpose of the test program was to determine air toxics emissions, if any, as delineated in AB 2588, the Air Toxics "Hot Spots" Information and Assessment Act of 1987. The two sources, Scrubber #2 and Scrubber #6, were tested by an EPA draft method for multiple metals: specifically copper, lead, and nickel for Scrubber #2 and cadmium and zinc for Scrubber #6. Heavy metal tests were verified by individual evaluations of nickel for Scrubber #2 and cadmium for Scrubber #6. Simultaneous testing of inlet and outlet emissions of scrubbers determined removal efficiencies. Process parameters recorded during testing were used to estimate emission factors.

WHAT ABOUT Cr+6?

2.2 Process Description

Source testing was conducted on the inlets and outlets of two scrubbers on the plating lines at the Deutsch Engineered Connecting Devices facility. The sources are identified as Plating Line Scrubber #2 and Plating Line Scrubber #6. Scrubber #2 is intended to remove acid emissions from the exhausts of several baths; Scrubber #6 is intended to remove cyanide emissions from several baths.

The entire plating shop is located in an enclosed building; all tanks containing chemicals are connected to wet scrubbers. Pre-installation studies ensured proper design and collection efficiency of the control systems. Parameters that were evaluated included surface area of the tanks, heated and unheated tanks, and vapor density of chemicals within each tank. Packing material was installed in the scrubber housing to control fumes and provide adequate vapor-liquid contact to assure reasonable control. Scrubber liquids are discharged through the existing wastewater treatment process.

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Particular details of individual plating lines and operations are considered to be proprietary information by Deutsch. This information will not be disclosed without the consent of Deutsch.

Parts to be plated are loaded into plastic barrels or onto metal racks. They are immersed in an acid or caustic solution to clean and prepare the surface for plating. The parts are transferred to a plating bath, and if required, an electrical current is applied, if required. The amount of current and time that current is applied for plating depends on the total surface area of the parts and other historical factors common to the particular type of part. After the plating is complete, the parts are transferred to a clear rinse water tank to remove residues. The parts are then oven dried or air dried and shipped to stock.

Scrubber #2 is approximately 9 feet wide, 18 feet long, and 9 feet high. Liquid spray flows at a rate of 360 gallons per minute. The exhaust blower is rated at 41,700 cubic feet per minute through an exhaust duct that is about 4 feet by 6 feet. This duct required the installation of a temporary extension to facilitate testing. The inlet sample location was in an approximately 5 foot diameter duct near the inlet of the scrubber.

Scrubber #6 is approximately 6 feet wide, 7 feet long, and 9 feet high. Liquid spray flows at a rate of 60 gallons per minute. The exhaust blower is rated at 15,000 cubic feet per minute through an exhaust duct that is about 2 feet by 3 feet. This duct required the installation of a temporary extension to facilitate testing. The inlet location was in an approximately 2 foot diameter duct near the inlet of the scrubber.

2.3 Procedures

The testing program was coordinated by Mr. Greg Brady of Deutsch Engineered Connecting Devices and Mr. Jon Kawaguchi of KA. The following field testing methods were employed in the test program.

- Sample traverse points were determined according to CARB Method 1.

- Gas stream velocity, gas temperature, gas pressure measurements, and the verification of the absence of cyclonic flow were made by CARB Method 2.

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- Molecular weights of stack gases (carbon dioxide, oxygen, and carbon monoxide) were determined to be that of ambient air.

- Stack gas moisture content was measured by using CARB Method 4 in conjunction with other wet chemistry sampling trains.

- The emissions for heavy metals were measured using the EPA draft method for multiple-metals entitled "Methodology for the Determination of Metals Emissions in Exhaust Gases from Waste Incineration and Similar Combustion Processes" (drafted 8/28/89). Along with each of these multiple metal test trains, nickel and cadmium test trains (CARB Methods 433 and 424, respectively) were run as required for verification of the multi-metal test method.

- Total and hexavalent chromium emissions were sampled according to CARB Method 425, using standard sized impingers. Analyses for total and hexavalent chromium were conducted by a qualified laboratory.

- Nickel emissions were sampled according to CARB Method 433, using standard sized impingers. Analysis for nickel was conducted by a qualified laboratory.

- Cadmium emissions were sampled according to CARB Method 424, using standard sized impingers. Analysis for cadmium was conducted by a qualified laboratory.

Procedures and field data sheets for the above are presented in Section 5 and Appendix A, respectively. Table 2-1 summarizes field sampling activities.

Analyses of the above samples were conducted by Thermo Analytical, Inc. at their Monrovia, California facility. Please refer to Section 6 for procedural discussions and to Appendix B for data.

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All raw data generated from the field sampling program were combined with the analytical results into the appropriate equations from the applicable methods to determine the final results in Appendix C. Sample calculations are included in Appendix D of the report. Calculations were performed using computer programs that have undergone rigorous quality control inspections before use.

Equipment used during the field testing program were appropriately calibrated to ensure accurate measurements. These included meter boxes, nozzles, pitot tubes and thermocouples. Calibration data are included as Appendix E of this report.

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verification tests not run concurrently with multiple metals train!

TABLE 2-1
FIELD SAMPLING ACTIVITIES
AIR TOXICS TEST
Deutsch Engineered Connecting Devices

Parameter	Run No.	Date	Time	Method
SCRUBBER #2				
Multiple Metals	1	1/07/91	0925-1038	EPA
Multiple Metals	2	1/08/91	0830-1000	EPA
Multiple Metals	3	1/14/91	0910-1030	EPA
Chromium	1	1/10/91	1315-1450	425
Chromium	2	1/11/91	0915-1040	425
Chromium	3	1/11/91	1230-1350	425
Nickel VERIFICATION METHOD	1	1/07/91	1420-1525	433
Nickel "	2	1/10/91	0925-1125	433
Nickel "	3	1/14/91	1230-1400	433
SCRUBBER #6				
Multiple Metals	1	1/16/91	0810-0930	EPA
Multiple Metals	2	1/16/91	1355-1510	EPA
Multiple Metals	3	1/18/91	0820-0945	EPA
Cadmium VERIFICATION METHOD	1	1/15/91	1135-1250	424
Cadmium "	2	1/17/91	0958-1110	424
Cadmium "	3	1/17/91	1330-1438	424

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3 SUMMARY OF RESULTS

The results of the air toxics tests are summarized in Tables 3.1 to 3.10. These tables include data pertaining to the source and its parameters (diameter, flow rates, temperatures, loads, etc.) and the analytical results. Following describes the contents of each table.

Scrubber No. 2

Multiple Metals (Copper, Nickel and Lead) Inlet and Outlet: Tables 3.1 and 3.2

Total and Hexavalent Chromium Inlet and Outlet: Tables 3.3 and 3.4

Nickel Verification Inlet and Outlet: Tables 3.5 and 3.6

Scrubber No. 6

Multiple Metals (Cadmium, Zinc) Inlet and Outlet: Tables 3.7 and 3.8

Cadmium Verification Inlet and Outlet: Tables 3.9 and 3.10

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TABLE 3-1
SCRUBBER #2
RESULTS - MULTI-METAL TESTS
AT SCRUBBER INLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3	
Date		1/07/91	1/08/91	1/14/91	
Start Time		0925	0830	0910	
End Time		1038	1000	1030	
Stack Diameter	inches	53.5	53.5	53.5	
Stack Temperature	°F	67	70	76	
Moisture	% vol	1.3280	1.404	1.664	
Gas Meter Volume	DSCF	64.073	67.819	48.716	
Gas Velocity	ft/sec	32.14	34.50	37.55	
Gas Volume	ACFM	30,100.1	32,314.1	35,171.5	
Gas Volume	DSCFM	29,628.4	31,592.5	33,922.8	
Isokinetics	%	94.26	93.57	91.34	
Oxygen	% vol	20.90	20.90	20.90	
Carbon Dioxide	% vol	0.0	0.0	0.0	
Copper	lb/hour	.00184	<.000592	<.000884	0.000859
Lead	lb/hour	.00135	.000986	.00120	0.001179
Nickel	lb/hour	.00171	.0117	.00286	0.005425

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TABLE 3-2
SCRUBBER #2
RESULTS - MULTI-METAL TESTS
AT SCRUBBER OUTLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3	
Date		1/07/91	1/08/91	1/14/91	
Start Time		0925	0830	0910	
End Time		1038	1000	1030	
Stack Diameter	inches	58	58	58	
Stack Temperature	°F	73	64	76	
Moisture	% vol	1.642	1.813	2.722	
Gas Meter Volume	DSCF	45.438	46.703	48.326	
Gas Velocity	ft/sec	36.76	36.47	37.51	
Gas Volume	ACFM	40,466.2	40,142.8	41,288.6	
Gas Volume	DSCFM	39,508.2	39,783.1	39,645.3	39645
Isokinetics	%	96.72	98.73	102.52	
Oxygen	% vol	20.90	20.90	20.90	
Carbon Dioxide	% vol	0.0	0.0	0.0	
Copper	lb/hour	.06560	.0135	.00358	0.02756
Lead	lb/hour	.00759	.00214	.00185	0.00386
Nickel	lb/hour	.00690	.00304	.00208	0.004007

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TABLE 3-3
SCRUBBER #2
RESULTS - CHROMIUM TESTS (TOTAL & HEXAVALENT)
AT SCRUBBER INLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3	
Date		1/10/91	1/11/91	1/11/91	
Start Time		1315	0915	1230	
End Time		1450	1040	1350	
Stack Diameter	inches	53.5	53.5	53.5	
Stack Temperature	°F	75	73	71	
Moisture	% vol	1.672	0.828	1.650	
Gas Meter Volume	DSCF	54.326	50.239	49.997	
Isokinetics	%	90.83	93.29	91.87	
Gas Velocity	ft/sec	42.09	37.39	37.94	
Gas Volume	ACFM	39,424.9	35,017.6	35,536.5	
Gas Volume	DSCFM	38,042.4	34,253.5	34,602.6	
Oxygen	% vol	20.9	20.9	20.9	
Carbon Dioxide	% vol	0.0	0.0	0.0	
Total Chromium	lb/hour	.000523	.000246	.00000824	0.000259
Hexavalent Chromium	lb/hour	<.000130	<.000126	<.000128	6.4 E-5

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TABLE 3-4
SCRUBBER #2
RESULTS - CHROMIUM TESTS (TOTAL & HEXAVALENT)
AT SCRUBBER OUTLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3	
Date		1/10/91	1/11/91	1/11/91	
Start Time		1315	0915	1230	
End Time		1450	1040	1350	
Stack Diameter	inches	58	58	58	
Stack Temperature	°F	77	75	77	
Moisture	% vol	0.936	1.484	1.695	
Gas Meter Volume	DSCF	47.884	48.791	48.098	
Isokinetics	%	100.24	103.92	101.26	
Gas Velocity	ft/sec	37.44	36.82	37.47	
Gas Volume	ACFM	41,215.3	40,530.0	35,094.7	
Gas Volume	DSCFM	40,172.9	39,485.8	33,990.4	
Oxygen	% vol	20.9	20.9	20.9	
Carbon Dioxide	% vol	0.0	0.0	0.0	
Total Chromium	lb/hour	.000411	.0000385	.000252	2.34E-4
Hexavalent Chromium	lb/hour	<.000155	<.000150	<.000154	7.65E-5

They found Total Chromium, therefore we will assume that hex. chrome was emitted at 1/2 DL.

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TABLE 3-5
SCRUBBER #2
RESULTS - NICKEL TESTS
AT SCRUBBER INLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3	
Date		1/07/91	1/10/91	1/14/91	
Start Time		1420	0925	1230	
End Time		1525	1125	1400	
Stack Diameter	inches	53.5	53.5	53.5	
Stack Temperature	°F	71	75	78	
Moisture	% vol	1.841	1.072	1.388	
Gas Meter Volume	DSCF	54.275	45.643	48.872	
Isokinetics	%	89.96	92.12	91.60	
Gas Velocity	ft/sec	28.89	34.66	37.60	
Gas Volume	ACFM	27,059.9	32,462.2	35,218.7	
Gas Volume	DSCFM	26,297.8	31,514.7	33,937.2	
Oxygen	% vol	20.9	20.9	20.9	
Carbon Dioxide	% vol	0.0	0.0	0.0	
Nickel	lb/hour	.00753	.00685	.00253	5.6E-3

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TABLE 3-6
SCRUBBER #2
RESULTS - NICKEL TESTS
AT SCRUBBER OUTLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3
Date		1/07/91	1/10/91	1/14/91
Start Time		1420	0925	1230
End Time		1525	1125	1400
Stack Diameter	inches	58	58	58
Stack Temperature	°F	66	77	78
Moisture	% vol	1.628	1.510	1.093
Gas Meter Volume	DSCF	47.267	47.638	46.492
Isokinetics	%	98.43	100.20	98.98
Gas Velocity	ft/sec	37.07	37.48	36.89
Gas Volume	ACFM	40,817.0	41,259.9	40,613.5
Gas Volume	DSCFM	40,386.9	39,983.4	39,502.9
Oxygen	% vol	20.9	20.9	20.9
Carbon Dioxide	% vol	0.0	0.0	0.0
Nickel	lb/hour	.00367	.00278	.00141

7.9E-3 ÷ 3
0.00262

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TABLE 3-7
SCRUBBER #6
RESULTS - MULTI-METAL TESTS
AT SCRUBBER INLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3	
Date		1/16/91	1/16/91	1/18/91	
Start Time		0810	1355	0820	
End Time		0930	1510	0945	
Stack Diameter	inches	26.5	26.5	26.5	
Stack Temperature	°F	72	76	76	
Moisture	% vol	2.331	1.620	1.770	
Gas Meter Volume	DSCF	44.215	40.919	42.111	
Gas Velocity	ft/sec	38.52	36.34	36.29	
Gas Volume	ACFM	8,851.2	8,350.3	8,338.9	
Gas Volume	DSCFM	8,576.7	8,089.7	8,093.2	
Isokinetics	%	96.54	94.72	97.44	
Oxygen	% vol	20.90	20.90	20.90	
Carbon Dioxide	% vol	0.0	0.0	0.0	
Cadmium	lb/hour	.00253	.000165	.000193	9.68E-4
Zinc	lb/hour	.254	.314	.305	0.291

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TABLE 3-8
SCRUBBER #6
RESULTS - MULTI-METAL TESTS
AT SCRUBBER OUTLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3	
Date		1/16/91	1/16/91	1/18/91	
Start Time		0810	1355	0820	
End Time		0930	1510	0945	
Stack Diameter	inches	19.5	19.5	19.5	
Stack Temperature	°F	72	78	75	
Moisture	% vol	0.985	1.301	1.621	
Gas Meter Volume	DSCF	47.823	48.250	48.055	
Gas Velocity	ft/sec	73.37	73.83	72.98	
Gas Volume	ACFM	9,129.6	9,186.5	9,080.7	Average
Gas Volume	DSCFM	8,987.2	8,913.8	8,861.4	8921
Isokinetics	%	95.92	97.58	97.76	
Oxygen	% vol	20.90	20.90	20.90	
Carbon Dioxide	% vol	0.0	0.0	0.0	
Cadmium	lb/hour	.000199	.000208	.000142	1.83E-4
Zinc	lb/hour	.274	.294	.293	0.287

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TABLE 3-9
SCRUBBER #6
RESULTS - CADMIUM TESTS
AT SCRUBBER INLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3
Date		1/15/91	1/17/91	1/17/91
Start Time		1135	0958	1330
End Time		1250	1110	1438
Stack Diameter	inches	26.5	26.5	26.5
Stack Temperature	°F	75	76	75
Moisture	% vol	1.124	0.937	0.591
Gas Meter Volume	DSCF	40.191	39.374	41.180
Gas Velocity	ft/sec	35.76	34.57	36.21
Gas Volume	ACFM	8,218.4	7,943.5	8,321.0
Gas Volume	DSCFM	7,990.0	7,759.3	8,171.5
Isokinetics	%	94.20	95.03	94.37
Oxygen	% vol	20.90	20.90	20.90
Carbon Dioxide	% vol	0.0	0.0	0.0
Cadmium	lb/hour	.000145	.000359	.000256

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TABLE 3-10
SCRUBBER #6
RESULTS - CADMIUM TESTS
AT SCRUBBER OUTLET
Deutsch Engineered Connecting Devices

Parameter	Units	Run 1	Run 2	Run 3	
Date		1/15/91	1/17/91	1/17/91	
Start Time		1135	0958	1330	
End Time		1250	1110	1438	
Stack Diameter	inches	19.5	19.5	19.5	
Stack Temperature	°F	77	71	77	
Moisture	% vol	2.011	1.404	1.586	
Gas Meter Volume	DSCF	49.593	48.981	45.305	
Gas Velocity	ft/sec	76.26	75.57	73.75	
Gas Volume	ACFM	9,488.9	9,402.9	9,176.7	
Gas Volume	DSCFM	9,127.5	9,246.8	8,907.0	
Isokinetics	%	97.95	95.49	91.69	
Oxygen	% vol	20.90	20.90	20.90	
Carbon Dioxide	% vol	0.0	0.0	0.0	
Cadmium	lb/hour	.000219	.000262	.00120	5.6×10^{-4}

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4 DISCUSSION OF RESULTS

The heavy metals tests were performed using the EPA proposed multiple-metal method (drafted 8/28/89) with nickel verification for Scrubber #2 and cadmium verification for Scrubber #6. Nickel tests were performed using CARB Method 433; cadmium tests were performed using CARB Method 424.

All calculated isokinetic percentages were within the acceptable range of 90 to 110 percent. The isokinetic percentage is the best single criterion in assessing the validity of an individual test run. It can be simply defined as maintaining a sampling nozzle inlet velocity identical to the undisturbed mainstream velocity.

Some test runs had sample system leakage rates in excess of the maximum allowable within the CARB procedures. However, in accordance with the methods, a correction was applied to the gas meter volume measurement to obtain a realistic value of the sample gas metered, as if no leakage had occurred. Adjustment of the isokinetic sample rate was accomplished by direct measurement of the pre-test leakage rate. Percentage of leakage was calculated based on anticipated sample rate. The actual rate was adjusted by multiplying the square of the leakage percentage with the anticipated sample rate. (Flow rate is proportional to the square root of the pressure drop.) For example, if the leakage rate was estimated to be 10 percent of the true sample rate, this rate was adjusted by a factor of 1.21 (1.1^2). This correction was used for applicable sample test runs.

4.1 Removal Efficiencies

Tables 3-1 through 3-10 contain the inlet and outlet mass flow rates of the different metals for Scrubbers #2 and 6. With the exception of zinc and one high copper reading, all flow rates are 0.01 lb/hr or less (in some instances as low as 0.0001 lb/hr). Consequently, calculating removal efficiencies involves differences between very small quantities. Small inaccuracies in these measurements can have large effects on the removal efficiency values. Results among the three runs for individual metals vary, indicating possible changes in process conditions (for example, amperes).

Some outlet readings are higher than inlet readings. Differences may be attributed to the design of the scrubbers, which is such that droplet carryover to the outlet sampling system

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was possible; this could account for larger outlet numbers. At the reported levels of mass flow rates, even a small amount of carryover could affect results and produce anomalous numbers that would appear to indicate negative removal efficiencies.

Both Scrubbers #2 and 6 were designed for removal of emitted species other than metals - acid or cyanide. Any reduction in metal emissions is not the result of design or operation but is caused by the nature of the scrubber as a liquid-gaseous contact device. So removal efficiencies close to zero are not unexpected.

Because of the very small inlet and outlet numbers involved, removal efficiencies for metals other than zinc are meaningless and are not presented in this report. Mass flow rates for zinc are on the order of 0.2 to 0.3 lb/hr, considerably higher than other metals. There is also much better agreement of results among runs, consistent with higher numbers. Removal efficiencies are all positive but show only small reductions (maximum 6 percent) across Scrubber #6.

4.2 Multiple-Metal Verification

For Scrubber #2, nickel was the metal selected for independent verification of the multiple metal method. Comparison of results in Table 4-1 shows an order of magnitude correlation between the two methods. Again, quantities are so small that detailed comparison is not meaningful. Cadmium values for Scrubber #6 also show an order of magnitude correlation.

4.3 Emission Factors

Average emission factors for the different metals are show in Tables 4-2 and 4-3. Table 4-2 contains emission factors for metals emitted to the two scrubbers from electroplating processes. Table 4-3 contains emission factors for non-electroplating processes. Calculations were performed using the process data collected at the time of testing.

In tables 4-2 and 4-3, with a few exceptions, there is good agreement among emissions factors of the three test runs for each metal. The emission factors show smaller differences than mass flow rates (lb/hr). The factors normalize flow rates and reduces differences introduced by process variations. In general, the emission factor averages in the two tables appear to represent emissions and to be useful for determination of emissions based on

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future process conditions.

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TABLE 4-1
MULTIPLE-METAL VERIFICATION
Deutsch Engineered Connecting Devices

Parameter	Run 1 (lb/hr) Inlet/Outlet	Run 2 (lb/hr) Inlet/Outlet	Run 3 (lb/hr) Inlet/Outlet
Scrubber No. 2 - Nickel			
Multiple-Metal Test	.00171/.00690	.0117/.00304	.00286/.00208
Verification	.00753/.00367	.00685/.00278	.00253/.00141
Scrubber No. 6 - Cadmium			
Multiple-Metal Test	.00253/.00199	.00165/.000208	.000193/.000142
Verification	.00145/.00219	.000359/.000262	.000256/.00120

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TABLE 4-2
EMISSION FACTORS - ELECTROPLATING
Deutsch Engineered Connecting Devices

Scrubber	Metal	lb/hr*	amp-min	Test Time(min) *	Emission Factor (lb/amp-hr)
2	Copper	0.0656	2605	98	0.00247
		0.0135	494	78	0.00213
		0.00358	806	81	0.00360
				Average	0.00273
2	Nickel	0.00690	5103	98	0.000133
		0.00304	9708	78	0.000024?
		0.00208	9520	81	0.00018
				Average	0.000058
2	Lead	0.00759	2605	98	0.000286
		0.000214	494	78	0.000338
		0.00185	806	81	0.000186
				Average	0.000270
6	Cadmium	0.000199	20,250	45	0.000000442
		0.000208	32,850	73	0.000000462
		0.000142	39,150	87	0.000000316
				Average	0.00000407 ← averaged incorrect
					0.000000407

*Results of Multiple-Metal Tests

* This is total test duration not test time

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TABLE 4-3
EMISSION FACTORS - NON-ELECTROPLATING
Deutsch Engineered Connecting Devices

Scrubber	Metal	lb/hr*	amp-min	Test Time(min)	Emission Factor (lb/amp-hr)
2	Hex. Chromium	<0.000155	29.40	64	<0.00000562
		<0.000150	29.40	64	<0.00000544
		<0.000154	29.40	64	<0.00000559
				Average	<0.00000555
2	Zinc	0.274	30.07	60	0.00911
		0.294	30.07	60	0.00978
		0.293	30.07	60	0.00974
				Average	0.00954

*Results of Multiple-metal Tests

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5 FIELD SAMPLING PROCEDURES

5.1 Introduction

This section describes field sampling procedures that were used during the conduct of this project. Deviations from standard procedure are described, including the reason for the deviation, and the effect of the deviation on the final results.

5.2 General Factors Involved in Sampling

The production of valid data required that the sampling program be performed by qualified personnel using proper test equipment. The sampling team leader was trained in source sampling and experienced in test procedures.

Valid tests required the use of appropriate test equipment properly calibrated and maintained. This equipment included nozzles, pitot tubes, manometers, thermocouples, flow meters and dry gas meters at a minimum. Because calibration and maintenance of this equipment was important to valid data collection, written records were essential.

The use of the standard procedures described herein was important as a means of ensuring test validity. Deviations were kept to a minimum and used only when absolutely necessary. They were well documented and were based upon sound engineering practices. Of particular importance were the following:

1. Location of the sample site and determination of the number of sample points.
2. Using acceptable equipment that had been properly calibrated.
3. Determining gas velocities.
4. Maintaining isokinetic sampling conditions when appropriate.
5. Sample handling, labeling, and chain of custody procedures.
6. Sample analysis.
7. Recordkeeping.

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5.3 Chain of Custody Procedures

A specific Chain of Custody procedure was used for this project. The elements of this plan included:

- Train component identification
- Sample identification
- Sample labels
- Documentation
- Chain of custody forms

The sequence of activities concerned with sample custody together with identification and tracking procedures are described below:

1. Sample train preparation on site including filter holders, impingers, and other sampling equipment identified by tags and codes.

2. Sample train issued to test team and master log filled out. Sample identification labels issued according to test identification code.

3. Train returned to recovery area when a valid sample was obtained. Sample train accompanied by all field data sheets.

4. Recovery team recovered samples using appropriate containers, affixed sample identification labels to sample containers, to master log, to field data sheet, and to train recovery sheet.

5. All samples returned to Kleinfelder with Chain of Custody form.

6. Samples transferred to appropriate laboratory personnel with Chain of Custody form.

7. Samples examined at each transfer point for integrity (broken containers, loss of liquid, or seal integrity).

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Upon completing the required analyses, the analyst returned the Chain of Custody form along with results. All samples were accounted for by the Project Manager. The laboratory identified samples in its own laboratory notebooks by the field identification number as well as any internal identification. Notebooks are retained by the laboratory according to usual laboratory practices.

5.4 Location and Number of Traverse Points

The location of sample ports and the number of traverse points used was critical to successful completion of the project. The specifications of CARB Method 1 were utilized in the selection of sample points. Essentially, an ideal test location is one that is a minimum distance of eight times the diameter (called eight equivalent diameters) from any upstream disturbance (bend, constriction, tee, etc.) and at least two equivalent diameters from any downstream disturbance. The minimum requirement is a location two equivalent diameters downstream and one half equivalent diameter upstream from any flow disturbances. Additionally, stream flow characteristics should be free from any eddy currents, helical or cyclonic flow. These requirements were met for the subject tests. There were 12 traverse points, six along each of two ports, which were located in the same horizontal plane and 90° apart.

5.5 Gas Flow and Temperature Measurements

The gas volumetric flow rate and temperature profiles were measured by conducting simultaneous velocity and temperature traverses following the procedures of CARB Method 2. Gas velocity heads were measured with a calibrated "S" type pitot tube connected to an inclined manometer. A Chromel-Alumel (K type) thermocouple, attached to a digital indicator, was used to measure the gas temperature at each of the traverse points.

The static pressure of the gas stream was measured using the same pitot tube and manometer. The tips of the pitot were turned perpendicular to the gas stream, one leg of the manometer was vented to atmosphere, and the resultant pressure was the static pressure. The vented leg (impact or static) determined if the static pressure was positive or negative.

During the initial traverse at each sample location, the absence of cyclonic flow was

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verified. This was accomplished by turning the pitot tube perpendicular to the gas flow. If a null reading was obtained on the manometer, an acceptable flow condition existed at that traverse point. If not, the pitot was rotated until a null manometer reading was obtained and the rotation angle measured and recorded. After all traverse points were examined, the average rotation angle was determined. Since this average was less than 10 degrees, the sample location was acceptable and testing was conducted.

5.6 Multiple Metals Sampling

The multiple metals sampling system collected a sample to determine gas moisture content and heavy metal content at the same time. The basis of this system is described in EPA draft method "Methodology for the Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes" (draft 8/28/89).

Sampling systems of this type must be operated at a rate within 10 percent of true isokinetic rates. The isokinetic rate is the best single criteria in assessing the validity of an individual run. It is defined as maintaining the sample velocity at the sampling system inlet identical to the undisturbed mainstream velocity adjacent to the system inlet, as measured by an S type pitot tube.

The sampling train design was based on the EPA multiple metal draft methodology and designed to collect emissions of heavy metals. It was isokinetically operated according to the method with stringent clean-up and recovery procedures. The multiple metal trains were accompanied by a nickel sampling train for Scrubber #2 and a cadmium sampling train for Scrubber #6, for verification of the draft method.

The sample train consisted of a quartz nozzle, heated glass lined probe, heated glass fiber filter, heated Teflon sample line, and impinger train. Heated components were maintained at 225±25°F. The impinger train consisted of four impingers in series, the first two each contained 100 milliliters of 5% nitric acid/10% hydrogen peroxide, the third impinger was dry, and the fourth contained about 400 grams of indicating silica gel. The impinger train was maintained at ice water conditions to ensure gas exit temperatures of no more then 68°F.

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The buttonhook quartz nozzle tip diameter that was necessary to maintain the isokinetic rate was calculated from the results of the preliminary velocity and temperature traverse data, which are contained in the appendix. The nozzle was securely attached to the upstream end of a heated probe maintained at 225±25°F to avoid moisture condensation. The filter holder was constructed of glass and was also heated to the same temperature range.

The sample gas passed through the nozzle and probe to the filter for removal of suspended particulate. From the filter, the gas passed directly to the impinger train. From the impinger train, the sample gas was conducted through an umbilical to the control console which contained the following pieces of equipment (listed in order): a coarse on-off valve, a needle valve on the pump bypass for flow control, an air tight vacuum pump, a calibrated dry gas meter, and a calibrated orifice tube connected to an inclined manometer that ensured the maintenance of isokinetic sampling rates

The impinger set consisted of a Greensburg-Smith design impinger in the second position, while the other three were modified by replacing the tip and plate with a 1/2 inch glass tube. The entire impinger train was immersed in an ice water bath that aided in moisture condensation and protected the gas meter from excessive temperatures.

The entire sampling system was subjected to a leak check prior to each run. The nozzle inlet was plugged, and a minimum 15 inch Hg vacuum was held for one minute. The leakage rate for the first two multiple-metal outlet test runs on Scrubber #2 exceeded the maximum 0.02 cfm or 4% of the anticipated rate. Adjustments of the isokinetic sample rate were accomplished by direct measurement of the pre-test leakage rate.

Upon completion of each test, the system was leak checked at a vacuum greater than the highest recorded during the test. The leakage rate was above the acceptable level for two runs on Scrubber #2. The final sample train volume for these two runs was adjusted to compensate for the leak rate by using the methodology prescribed in CARB Method 5. The isokinetic variations in the appendix are calculated from these adjusted sample volumes.

The used filter was removed from the holder and sealed in its container. The nozzle, probe, Teflon sample line, and front half of the filter holder were washed three times using a total volume of 100 milliliters of acetone and then three times with 0.1 N nitric acid (100

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milliliters total volume), while brushing all exposed surfaces with a nonmetallic brush. All acetone and nitric acid washings were placed in separate sealed sample bottles for subsequent analysis.

The contents of the first three impingers were measured gravimetrically and, along with their associated washings of a total of 100 milliliters of 0.1 N nitric acid, were stored in a sealed sample bottle. The fourth impinger was reweighed in the field to the nearest 0.1 milligram, and the impinger was resealed for subsequent recovery or reuse. Samples of unexposed filters and unused reagents were carried through the entire process as analytical blanks.

Field preparation and sample recovery were critical. All impinger and recovery solutions, (acetone, 0.1 N nitric acid, 8 N hydrochloric acid, 4% potassium permanganate/10% sulfuric acid 5% nitric acid/10% hydrogen peroxide) were made from ACS reagent grade certified or equivalent quality reagents and stored in acid cleaned glass containers. Reagent water was distilled and deionized and stored in glass containers with Teflon-lined screw caps.

The sample bottles were properly labeled and stored until they were transported to the laboratory. Each sample collected was labeled per laboratory specifications and the same nomenclature assigned to the corresponding data sheet.

5.7 Total and Hexavalent Chromium Sampling

Total and hexavalent chromium emissions were collected and analyzed according to CARB Method 425 for Scrubber #2. The sample apparatus consisted of a button hook quartz nozzle, heated glass lined probe, and heated Teflon sample line connected to four impingers of Greensburg-Smith (impinger 2) and modified Greensburg-Smith design (impingers 1,3,4).

The first two of these impingers contained distilled and deionized water. The third was empty, and the fourth contained approximately 400 grams of indicating silica gel. The system was leaked tested before each test and was found to be within the criteria stated by the method. During the test the system was operated at a rate to maintain 10% of true isokinetic rates, as prescribed by the methodology.

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Before and after each test, the system was leak tested and was found to be within limits. The system was then disassembled and removed for recovery. The filter was placed in a sealed and labeled container. The front half (nozzle, probe, sample line, front half of filter holder) was rinsed three times with a total of 100 milliliters of distilled and deionized water. The back half of the filter holder and the first three impingers along with its connectors (back half) were also rinsed three times with a total of 100 milliliters of distilled and deionized water. The chromium samples from the impingers and the rinses from the front and back half of the sampling system were then placed in a sealed labeled container with a Teflon-lined cap and stored until transported to the lab.

All filters, including blanks, were extracted to determine the metal content. All liquid samples were treated according to the particular analytical technique that was used.

5.8 Nickel Sampling

The nickel emissions were collected and analyzed according to CARB Method 433 and were also sampled with the multiple-metal train (Section 5.6) for the verification of the EPA methodology for Scrubber #2. The impinger set consisted of a Greensburg-Smith design impinger in the second position while the other three were modified by replacing the tip and plate with a 1/2 inch glass tube. The entire impinger train was immersed in an ice water bath that aided in moisture condensation and protected the gas meter from excessive temperatures.

The first two impingers in the system each contained 100 milliliters of 0.1 N nitric acid (HNO_3). The third was empty and the fourth contained about 400 grams of indicating silica gel.

The system was leaked tested before and after each test and was found to be in excess of allowable rates for the first two nickel test runs. Adjustments of the isokinetic sample rate were accomplished by direct measurement of the pre-test leakage rate.

The recovered sample filter was placed in a container and sealed. The nozzle, probe, and glass connectors were brushed (nonmetallic) and rinsed three times with a total of 100 milliliters of 0.1 N HNO_3 solution, and the combined washes were placed in a glass bottle with a Teflon-lined cap. All impinger solutions and their subsequent washes with 0.1 N HNO_3 were added to the same sample bottle as the front half and stored until transported

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to the lab.

5.9 Cadmium Sampling

The cadmium emissions were collected and analyzed according to CARB Method 425 and were also sampled with the multiple-metal train for the verification of the EPA methodology for Scrubber #6. The sample train consisted of a heated glass lined probe, heated filter, and four impingers in series.

The impinger set consisted of a Greensburg-Smith design impinger in the second position, while the other three were modified by replacing the tip and plate with a 1/2-inch glass tube. The entire impinger train was immersed in an ice water bath that aided in moisture condensation and protected the gas meter from excessive temperatures.

The first two impingers in the system contained 100 milliliters of 0.1 N nitric acid (HNO_3) each. The third was empty and the fourth contained about 400 grams of indicating silica gel.

The train was leaked checked before and after each test run. In all cases, leakage rates were within acceptable limits. The system was then operated isokinetically as prescribed by this methodology.

The recovered sample filter was placed in a container and sealed. The nozzle, probe, and glass connectors were scrubbed with a nonmetallic brush and rinsed three times with a total of 100 milliliters of 0.1 N HNO_3 solution, and the combined washes were placed in a glass bottle with a Teflon-lined cap. All impinger solutions and their subsequent washes with 0.1 N HNO_3 were added to the same sample bottle as the front half and stored until transported to the lab.

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6 ANALYTICAL PROCEDURES

6.1 Introduction

The procedures described in this section were used for the analysis of the samples generated during the AB 2588 tests on plating line scrubber exhausts at the Deutsch Engineered Connecting Devices facility.

Samples were collected at the stack exhaust. The samples were submitted to Thermo Analytical Inc. of Monrovia, California for the analysis of multiple metals, including individual verification samples for nickel and cadmium. The following procedures were used.

6.2 Moisture Content

The principles of CARB Method 4 were used to determine the moisture content of the samples. The difference between the final impinger solution volume before washing and the initial volume, measured gravimetrically to the nearest 0.1 milligram, plus the weight gain of the silica gel determined the total moisture gain for each test run.

6.3 Multiple Metals Analysis

The samples containing the metals (copper, lead, nickel, cadmium, zinc) were extracted with 50% Nitric Acid (HNO_3), oxidized with 3% hydrogen peroxide (H_2O_2), and filtered through a membrane or equivalent filter. Each metal in question was individually analyzed using atomic absorption (AA) spectrophotometry. One of three methods was used to determine the actual concentration of the metal: direct flame aspiration, cold vapor, or graphite furnace. The operating conditions for the AA were determined by the equipment manufacturer for optimum sensitivity.

6.4 Total and Hexavalent Chromium Analysis

For total chromium content, samples were subjected to an acid digestion procedure and analyzed by atomic absorption spectroscopy.

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Hexavalent chromium content in samples was analyzed by the diphenylcarbazide colorimetric method following extraction in an alkaline solution.

6.5 Nickel Analysis

The nickel samples were analyzed by atomic absorption spectroscopy after combining filter extract and impinger solution.

6.6 Cadmium Analysis

Each cadmium sample filter extract and impinger solution was combined and analyzed by atomic absorption spectroscopy (direct aspiration method).

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7 LIMITATIONS

This report was prepared in general accordance with the accepted standard of care that existed in Southern California at the time the report was written. It should be recognized that estimating possible emission scenarios and chemicals is difficult. Judgements leading to conclusions and recommendations are generally made with an incomplete knowledge of the facility. Kleinfelder should be notified for additional consultation of the client wishes to reduce the uncertainties beyond the level associated with this report. No warranty, expressed or implied, is made.

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Appendix A

Field Data

FIELD DATA

Plant
Date 1/7/91
Test Site 1N #2
Run Number 1452I1
Operator JC

Ambient Temp
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # 0801C
Nozzle Diameter ~~0.25~~ 0.302
Probe Length 7'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.008cfm
POST LEAK 0.02 cfm

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1		0923	49.825	0.05	0.44	.44	41	68	64	46	180	250	2
2	3	26	50.830	.08	0.70	.70	50	68	64	47	185	250	2
3		* 29	51.990	.08	0.70	.70	52	69	64	47	187	250	3
4		0943	52.470 53.370	.15	1.30	1.30	56	74	64	47	190	250	5
~~4~~ 5		46	55.610	.15	1.30	1.30	58	75	65	50	200	250	5
6		49	57.350	.40	3.50	3.50	67	76	66	56	200	250	15
7		52	58.350	.40	3.50	3.50	66	80	67	60	200	250	15
8		55	60.540	.38	3.31	3.30	67	81	69	63	200	250	15
9		58	63.495	.40	3.50	3.50	68	83	72	64	200	250	15
10		10:01	65.430	.39	3.40	3.40	69	84	74	66	200	250	15
11		04	69.650	.38	3.31	3.30	69	84	75	69	200	250	15
12		07	72.250	.39	3.40	3.40	70	84	75	60	200	250	15
	36	10	75.390										
AVERAGE /SUM													

Stop 0929 problem w/filter

FIELD DATA

Plant Deutsch
Date 1/7/90
Test Site IN #2
Run Number M52 E1
Operator JK

Ambient Temp 70
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box # D8016
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1		10:32	75.390	0.32	2.78	2.80	71	82	81	55	200	250	9
2		35	78.00	.34	2.96	3.00	71	83	79	54	200	250	10
3		38	80.750	.42	3.65	~~3.45~~ 3.65	71	86	79	53	200	250	12
4		41	83.300	.32	2.78	2.80	73	87	82	52	200	250	9
5		44	86.550	.35	3.04	3.00	73	87	83	51	200	250	9
6		47	89.320	.30	2.61	2.60	74	93	83	51	200	250	8
7		50	91.980	.31	2.70	2.70	73	93	84	51	200	250	8
8		53	94.630	.33	2.87	2.90	74	97	85	52	200	250	8
9		56	97.370	.47	4.10	4.10	74	95	86	52	200	250	14
10		59	100.60	.47	4.09	4.10	74	96	87	53	200	250	13
11		11:02	103.860	.47	4.09	4.10	73	96	88	53	200	250	13
12		05	107.120	.46	4.00	4.00	75	96	89	53	200	250	13
	36	08	~~109~~ 114.435	~~.47~~	~~4.09~~	~~4.10~~							
AVERAGE /SUM			64.610	0.33		2.84	67	79		54	198	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.7.91 ~~1.2.91~~

RUN# MS2I1 METHOD multiple Metals

FACILITY Deutsch

TYPE Std. Imp.

TECHNICIAN A. Petraneay

IMP. SOLUTION 5% HNO_3/10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp. Sol'n	579.0	583.3	-4.3
IMPINGER # 2	100 ml Imp Sol'n	569.6	567.0	2.6
IMPINGER # 3	Empty	439.4	438.0	1.4
IMPINGER # 4	Silica Gel	676.1	657.5	18.6
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 18.3

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 07 JAN 1991
Test Site Scrubber #2
Run Number M3201
Operator ARE

Ambient Temp
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.065cfm
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 1	0	0925	787.463	0.65		2.76	66	59	56	46	171	250	3.0
2	4	0929	791.118	0.57		2.42	68	70	56	46	159	250	2.5
3	8 *	0943	794.029	0.44		1.87	67	68	60	54	176	250	2.0
4	12	0947	797.134	0.32		1.35	66	74	60	56	166	250	2.0
5	16	0951	799.982	0.30		1.27	61	84	60	60	163	250	1.0
6	20	0955	802.750	0.19		0.80	63	87	64	62	167	250	1.0
7	24	0959	805.118	0.22		0.94	66	87	66	63	165	250	1.0
8	28	1003	807.616	0.25		1.07	70	93	69	63	159	250	1.0
	32	1007	810.131										
B 1	32	1030	810.131	0.50		2.13	77	80	71	53	189	250	2.5
2	36	1034	813.472	0.47		2.03	81	87	73	48	184	250	2.5
3	40	1038 1039	817.090	0.47		2.03	78	94	73	47	172	250	2.0
4	44	47 1043	820.398	0.41		1.76	82	96	74	45	174	250	2.0
AVERAGE /SUM													

*stop

FIELD DATA

Plant DEUTSCH
Date 07 JAN 1991
Test Site
Run Number MS201
Operator ARE

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.039 cfm @ 5"Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
5	48	46 1047	823.546	0.42		1.78	80	98	75	45	167	250	2.0
6	52	50 1051	826.714	0.49		2.08	80	100	76	47	174	250	2.0
7	56	54 1055	830.022	0.50		2.13	81	103	78	48	158	250	2.0
8	58	48 1059	833.400	0.52		2.21	83	104	78	48	165	250	2.0
	62	62 1100	836.310										
AVERAGE /SUM	62		48.847	0.42		1.79	73	77		52	169	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE ~~1.2.91~~ 1.7.91

FACILITY Deubsch

TECHNICIAN A. Peterancy

RUN# MS201 METHOD multiple metals

TYPE Std. Imp

IMP. SOLUTION 5% HNO_3/10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml Imp. Soln	539.3	539.5	-0.2
IMPINGER # 2	100ml Imp. Soln	567.3	565.9	1.4
IMPINGER # 3	Empty	461.1	461.1	0
IMPINGER # 4	Silica Gel	622.6	610.7	11.9
DESCRIPTION				
IMPINGER RINSE				

SILICA GEL	CONDITION	FINAL (g)	INITIAL(g)	NET (g)

FILTER	NUMBER	DESCRIPTION

TOTAL MOISTURE (g) 16.1

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 08 JAN 1991
Test Site Scrubber #2 INLET
Run Number MS2I2
Operator JK

Ambient Temp
Barometer 29.95
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # 0801C
Nozzle Diameter 0.302"
Probe Length 8'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.02 cfm @ 12"
POST LEAK 0.02 cfm @ 15"

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	0830	174.150	0.14	1.57	1.60	72	56	53	40	200	250	6
2		33	176.285	0.16	1.39	1.40	72	59	54	40	200	250	5
3		36	178.245	0.08	0.70	0.70	70	65	55	42	200	250	4
4		39	179.635	0.10	0.87	0.87	71	68	56	42	200	250	3
5		42	181.170	0.12	1.04	1.00	74	71	57	43	200	250	4
6		45	182.810	0.45	3.92	3.90	74	74	59	44	200	250	14
7		48	185.810	0.50	4.35	4.00	76	73	61	44	200	250	14
8		51	189.000	0.45	3.92	3.90	77	74	63	45	200	250	14
9		54	192.560	0.50	4.35	4.00	77	75	62	46	200	250	14
10		57	195.255	0.52	4.52	4.00	77	76	63	46	200	250	14
11		0900	198.350	0.45	3.92	3.90	78	74	66	47	200	250	14
12	-	03	201.550	.46	4.00	4.00	78	77	66	48	200	250	14
	36	06	205.000										
AVERAGE /SUM													

FIELD DATA

Plant Deutsch
Date 1/8/91
Test Site Scrub #2 IN
Run Number MS2 T2
Operator JK

Ambient Temp
Barometer
Stack Pressure
Stack H2O % 2
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter .302"
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O)		TEMPERATURES						PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	
1	36	0924	205.000	0.34	2.96	3.00	55	69	66	45	200	250	9
2		27	207.625	.34	2.96	3.00	56	71	66	45	200	250	9
3		30	210.366	.44	3.83	3.80	68	73	66	46	201	250	10
4		33	213.455	.45	3.92	3.90	68	76	69	46	200	250	13
5		36	216.600	.44	3.83	3.80	68	76	68	46	200	250	13
6		39	219.730	.31	2.70	2.70	68	78	69	47	202	250	13
7		42	222.425	.33	2.87	2.90	68	80	70	47	201	250	13
8		45	225.155	.50	4.35	4.10	68	82	71	46	200	250	13
9		48	228.370	.48	4.18	4.10	68	81	72	47	200	250	14
10		51	231.595	.45	3.92	3.90	68	81	72	47	200	250	13
11		54	234.755	.45	3.92	3.90	67	81	73	48	200	250	13
12		57	237.945	.46	4.00	4.00	67	81	73	47	200	250	13
	72	10:00	241.235										
AVERAGE /SUM	72		67.095	0.37		3.18	70	69		45	200	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE [illegible]

FACILITY [illegible]

TECHNICIAN [illegible]

RUN# [illegible] METHOD [illegible]

TYPE [illegible]

IMP. SOLUTION [illegible]

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL (g)	NET (g)
IMPINGER # 1	[illegible]	502.4	503.8	-1.4
IMPINGER # 2	[illegible]	571.2	567.7	3.5
IMPINGER # 3	[illegible]	460.8	460.2	0.6
IMPINGER # 4	[illegible]	675.9	658.1	17.8
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL (g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 20.5

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 08 JAN 1991
Test Site Scrubber #2 outlet
Run Number MS202
Operator ARE

Ambient Temp 54°F
Barometer 29.95
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 6.07 cfm @ 7"Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 1	0	0832	891.789	0.63		2.58	63	59	54	52	54	250	4.0
2	4	0836	895.372	0.53		2.18	63	66	54	52	55	250	4.0
3	8	0840	898.813	0.42		1.73	65	73	55	55	56	250	3.0
4	12	0844	902.004	0.31		1.27	65	77	56	57	57	250	2.0
5	16	0848	904.855	0.28		1.15	66	79	58	57	65	250	2.0
6	20	0852	907.606	0.20		0.82	66	81	60	57	67	250	1.5
7	24	0856	910.067	0.23		0.95	66	82	61	57	67	250	2.0
8	28	0900	912.638	0.30		1.22	66	84	62	57	67	250	2.0
	32	0904	915.355										
B 1	32	0922	915.355	0.50	1	2.06	65	66	62	52	58	250	3.0
2	36	0926	918.650	0.46		1.89	64	75	62	52	60	250	3.0
3	40	0930	921.931	0.43		1.77	63	82	63	53	60	250	3.0
4	44	0934	925.132	0.39		1.60	64	84	64	54	60	250	2.5
AVERAGE /SUM													

FIELD DATA

Plant
Date 08 JAN 1991
Test Site Scrubber #2
Run Number M5202
Operator

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.07 cfm @ 7"Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 5	48	0938	928.223	0.39		1.60	63	86	65	54	60	250	2.5
6	52	0942	931.334	0.52		2.14	63	89	67	54	61	250	2.5
7	56	0946	934.725	0.55		2.26	63	91	68	54	60	250	4.0
8	60	0950	938.266	0.57		2.34	63	~~80~~ 90	68	54	63	250	4.0
AVERAGE /SUM	64		49.854	0.42		1.73	64	70		54	61	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1/9/91

RUN# MS7cc METHOD Multi Metal

FACILITY Deutsch

TYPE Sed. Imp.

TECHNICIAN Jon C.

IMP. SOLUTION 5% HNO_3/10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml	544.7	539.6	5.1
IMPINGER # 2	100 ml	567.6	567.2	0.4
IMPINGER # 3	Empty	439.7	439.5	0.2
IMPINGER # 4	Silica	639.5	626.9	12.6
DESCRIPTION				
IMPINGER RINSE				

SILICA GEL	CONDITION	FINAL (g)	INITIAL(g)	NET (g)

FILTER	NUMBER	DESCRIPTION

TOTAL MOISTURE (g) 18.3

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant Dunlap
Date 1/14/91
Test Site
Run Number MS2I3
Operator JK

Ambient Temp 70
Barometer 29.96
Stack Pressure
Stack H2O % 2
Stack Dia

Meter ^H@ 1.00 d
Meter Gamma 1.80
Meter Box # D3C1C
Nozzle Diameter 1.75"
Probe Length 4'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.015 @ 15"
POST LEAK 0.009 @ 15"

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1		0903	477.500	0.1 ~~477.500~~	0.41	.41	71	71	66	42	200	250	1
2		06	478.610	.07	.29	.29	71	73	68	44	200	250	1
3		09	479.550	.05	.20	.20	71	75	68	45	200	250	1
4		12	480.440	.08	.33	.33	72	78	71	46	200	250	1
5		15	481.490	.08	.33	.33	75	80	71	50	200	250	1
6		18	482.535	0.1	.41	.41	75	83	73	51	200	250	1
7		21	483.670	.56	2.30	2.30	75	89	75	52	200	250	4
8		24	486.130	.59	2.42	2.40	75	92	77	55	200	250	4
9		27	488.645	.66	2.71	2.70	76	93	78	59	200	250	4
10		30	491.295	.70	2.87	2.90	76	96	81	58	200	250	5
11		33	494.050	.69	2.83	2.80	78	97	81	56	200	250	5
12		36	496.770	.72	2.95	3.00	77	98	83	55	200	250	5
	36	39	499.680										
AVERAGE /SUM			~~499.685~~										

FIELD DATA

Plant Dartbrook
Date 11/14/91
Test Site Scrub #2
Run Number MS2I3
Operator JK

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1		0953	496.680	0.40	1.64	1.60	77	86	84	55	210	250	3
2		56	501.800	.41	1.68	1.70	76	88	84	57	212	250	3
3		59	503.935	.47	1.93	1.90	76	92	85	57	215	250	3
4		1002	506.150	.43	1.76	1.80	77	95	86	58	215	250	3
5		05	508.400	.32	1.31	1.30	77	95	86	59	215	250	2
6		08	510.355	.32	1.31	1.30	78	100	89	58	215	250	2
7		11	512.220	.47	1.93	1.90	78	100	89	58	215	250	3
8		14	514.485	.65	2.66	2.70	76	103	91	57	217	250	4
9		17	517.125	.63	2.58	2.60	77	104	91	58	217	250	4
10		20	519.765	.59	2.42	2.40	77	105	92	59	215	250	4
11		23	522.295	.60	2.46	2.50	78	106	93	60	215	250	4
12		26	524.585	.58	2.38	2.40	78	106	95	60	215	250	4
	36	29	527.485										
AVERAGE /SUM	72		49.985	0.43		1.74	76	87		55	207	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1/14/91

RUN# MS2I3 METHOD Multi Metal

FACILITY Deutsch

TYPE Sed. Imp

TECHNICIAN Jon R

IMP. SOLUTION 5% HNO_3/10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml	542.5	539.9	2.6
IMPINGER # 2	100ml	557.1	555.9	1.2
IMPINGER # 3	Empty	453.9	452.3	1.6
IMPINGER # 4	Silica	666.1	654.0	12.1
DESCRIPTION				
IMPINGER RINSE				

SILICA GEL	CONDITION	FINAL (g)	INITIAL(g)	NET (g)

FILTER	NUMBER	DESCRIPTION

TOTAL MOISTURE (g) 17.5

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 14 JUN 1991
Test Site Scrubber #2
Run Number M503
Operator ARE

Ambient Temp
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.011 cfm @ 11" Hg
POST LEAK 0.007 cfm @ 11" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	TEMPERATURES METER INLET	TEMPERATURES METER OUT	TEMPERATURES IMP	TEMPERATURES FILTER	TEMPERATURES PROBE	PUMP VAC. "Hg
A 1	0	0909	144.150	0.65		2.64	73	66	61	48	202	247	10.0
2	4	0913	147.722	0.54		2.13	75	73	62	46	203	247	8.5
3	8	0917	151.104	0.39		1.51	72	78	64	49	204	247	6.0
4	12	0921	154.136	0.30		1.21	72	82	65	49	201	247	4.5
5	16	0925	156.918	0.30		1.21	73	87	67	51	210	247	4.0
6	20	0929	159.660	0.19		0.77	74	89	69	51	206	247	2.5
7	24	0933	162.082	0.21		0.84	75	90	71	52	208	247	3.0
8	28	0937	164.504	0.30		1.21	72	92	72	53	212	247	4.0
	32	0941	167.186										
B 1	32	0958	167.186	0.54		2.13	76	80	75	48	221	247	8.0
2	36	1002	170.488	0.54		2.13	78	87	75	45	227	247	8.0
3	40	1006	173.830	0.49		2.01	77	91	77	46	220	247	7.5
4	44	1010	177.162	0.43		1.76	78	94	76	46	221	247	6.5
5	48	1014	180.324	0.41		1.63	79	97	78	48	218	247	6.0
AVERAGE /SUM													

FIELD DATA

Plant DEUTSCH
Date 14 JAN 1991
Test Site Scrubber #2 out
Run Number MS203
Operator GRE

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.007 cfm @ 11"Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	TEMPERATURES METER INLET	TEMPERATURES METER OUT	TEMPERATURES IMP	TEMPERATURES FILTER	TEMPERATURES PROBE	PUMP VAC. "Hg
B 6	52	1018	183.406	0.49		2.01	80	100	80	54	217	247	7.5
7	56	1022	185.986	0.51		2.01	78	101	81	54	222	247	7.0
8	60	1026	191.258	0.57		2.26	78	102	81	~~54~~ 51	224	247	8.0
	64	1030	193.321										
AVERAGE /SUM	64		49.171	0.43		1.72	76	80		49	214	247	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET 203

DATE 1/14/91

RUN# MS ~~601~~ METHOD mult. metals

FACILITY Dentsch

TYPE Std. Imp.

TECHNICIAN A.P.

IMP. SOLUTION 5% HNO_3/10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp	558.6	543.9	14.7
IMPINGER # 2	100 ml Imp	553.3	~~555.6~~ 549.2	4.1
IMPINGER # 3	Empty	461.1	460.3	0.8
IMPINGER # 4	Silica Gel	659.1	650.0	9.1
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 28.7

FIELD BLANKS

DISPOSITION/COMMENTS

KLEINFELDER

SHEET ____ OF ____

PROJECT ____ PROJECT NO. ____

SUBJECT ____ BY ____ DATE ____

REVIEWED BY ____ DATE ____

SCRUBBER 2

MULTI-METALS

	1-IN	1-OUT	2-IN	2-OUT	3-IN	3-OUT
~~Cu~~	~~0.0096~~	~~0.0096~~	~~0.0096~~			
~~Pb~~	~~0.00048~~	~~0.00013~~	~~0.00048~~			
~~Ni~~	~~0.0192~~	~~0.0192~~	~~0.0192~~			
Cu	0.030	0.570	<0.0096	0.120	<0.0096	0.033
Pb	0.022	0.066	0.016	0.019	0.013	0.017
Ni	0.280	0.060	0.190	0.027	0.031	0.0192

FIELD DATA

Plant Deutsch
Date 1/10/91
Test Site Scrub. #2 IN
Run Number CS2I1
Operator JK

Ambient Temp
Barometer 29.92
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # 0801C
Nozzle Diameter .25"
Probe Length 7'

Pitot check pre and post

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.020CFM 16" Hg
POST LEAK 0.015 cfm 15" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	1313	317.040	0.12	0.49	.49	75	78	77	42	200	250	1
2		16	318.245	0.12	0.49	.49	76	78	77	43	200	250	1
3		19	319.445	0.08	0.32	0.32	75	80	77	52	200	250	1
4		22	320.350	.09	.37	.37	72	82	77	55	202	250	1
5		25	321.335	.21	.86	.86	72	83	79	57	202	252	3
6		28	322.955	.69	2.79	2.80	70	88	78	58	202	250	7
7		31	325.480	.65	2.66	2.70	73	90	80	57	202	250	7
8		34	328.120	.99	4.06	4.10	74	91	81	57	210	250	10
9		37	331.300	.95	3.90	3.90	74	92	82	57	210	250	10
10		40	334.495	.96	3.94	3.90	75	92	82	57	210	250	10
11		43	337.640	.80	3.28	3.30	74	93	83	57	210	250	10
12		46	340.660	.92	3.36	3.40	75	93	83	57	210	250	9
	36	49	343.665										
AVERAGE /SUM													

FIELD DATA

Plant Deutsch
Date 1/10/91
Test Site Scrub #2 IN
Run Number CS2I1
Operator JK

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	36	14	343.980	.52	2.13	2.10	76	78	77	52	210	250	6
2		17	346.260	.50	2.05	2.00	70	81	78	56	210	250	6
3		21	349.300	.52	2.13	2.10	71	84	79	56	210	250	6
4		24	351.630	.49	2.01	2.00	70	88	79	58	210	250	6
5		27	253.955	.38	1.56	1.60	70	90	80	58	210	250	5
6		30	356.060	.35	1.44	1.40	70	91	81	60	210	250	4
7		33	358.035	.48	1.97	2.00	70	93	82	59	210	250	6
8		36	360.350	.50	2.05	2.00	71	94	83	59	210	250	6
9		39	362.625	.63	2.58	2.60	71	94	83	58	210	250	7
10		42	365.235	.59	2.42	2.40	69	95	84	59	210	250	7
11		45	367.830	.60	2.46	2.50	70	95	84	58	210	250	7
12		48	370.370	.58	2.38	2.40	70	96	84	57	210	250	7
	72	51	372.910	.55	2.26	2.30	70	96	85	57	210	250	6
AVERAGE /SUM	72 ~~60~~		55.95	0.55 ~~0.66~~		2.25 ~~2.60~~	75	88		58	207	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET CRSDI1

RUN# ~~[illegible]~~ METHOD None

DATE 1.16.91

FACILITY Dutch

TYPE Old. Imp.

TECHNICIAN [illegible]

IMP. SOLUTION H2O DI

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml DI H2O	536.0	539.0	-3.0
IMPINGER # 2	100 ml DI H2O	567.9	561.0	6.90
IMPINGER # 3	Empty	454.8	~~460.0~~ 452.9	1.9
IMPINGER # 4	Silica	667.4	654.1	13.3
DESCRIPTION				
IMPINGER RINSE				~~19.1~~

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 19.6

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 10 JAN 1991
Test Site Scrubber #2
Run Number CRS201
Operator CRE

Ambient Temp 76°
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia 58"

Meter ^H@
Meter Gamma
Meter Box # D317C
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.005 cfm @ 2" Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 1	0	1315	991.125	0.66	2.63		79	72	71	45	213	247	4.0
2	4	1319	994.650	0.56	2.24		77	81	71	42	209	247	3.5
3	8	1323	998.098	0.44	1.76		78	84	73	44	207	247	3.0
4	12	1327	001.226	0.34	1.38		78	88	72	45	208	247	2.0
5	16	1331	004.054	0.32	1.25		77	90	72	46	209	247	2.0
6	20	1335	006.822	0.21	0.84		77	91	74	47	209	247	1.5
7	24	1339	009.590	0.21	0.84		76	91	75	48	205	247	1.5
8	28	1343	011.968	0.26	1.04		76	92	76	49	211	247	2.0
	32	1347	014.425										
B 1	32	1414	014.425	0.56	2.24		74	73	72	43	213	247	3.5
2	36	1418	017.794	0.56	2.24		75	84	72	42	215	247	3.5
3	40	1422	021.212	0.51	2.04		78	89	73	44	214	247	3.0
4	44	1426	024.520	0.46	1.88		77	91	73	46	205	247	3.0
AVERAGE /SUM													

FIELD DATA

Plant DEUTSCH
Date 10 JAN 1991
Test Site Scrubber #2
Run Number CRS201
Operator ARE

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box # DS17C
Nozzle Diameter 0.25
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.018 cfm @ 12"Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 5	48	1430	027.718	0.42	1.67	1.67	76	94	78	46	208	247	2.5
6	52	1434	030.776	0.46	1.84	1.84	76	96	76	47	206	247	3.0
7	56	1438	033.924	0.50	2.01	2.01	76	97	78	49	201	247	3.0
8	60	1442	037.182	0.50	2.01	2.01	75	98	77	46	203	247	3.0
	64	1446	039.999										
AVERAGE /SUM	64		48.874	0.44		1.74	77	81		46	208	247	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.10.91

FACILITY Deutsch

TECHNICIAN A Pettaway

RUN# CR3201 METHOD CR6+

TYPE Std. Imp

IMP. SOLUTION H_2O DI

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml DIW	537.1	534.8	2.3
IMPINGER # 2	100 ml DIW	582.7	578.5	4.2
IMPINGER # 3	Empty	461.5	460.6	0.9
IMPINGER # 4	Silica Gel	670.0	667.8	2.2
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 9.6

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant Deutsch
Date 1/11/96
Test Site Scrub #2 IN
Run Number CS2I2
Operator JK

Ambient Temp 60
Barometer 29.96
Stack Pressure
Stack H2O % 2
Stack Dia

Meter ^H@ 1.50
Meter Gamma 1.004
Meter Box # U3016
Nozzle Diameter .25"
Probe Length 7'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.017cfm @ 14"Hg
POST LEAK 0.0056cfm 15"Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	0912	373.543	.69	2.33	.33	68	57	55	42	210	250	2
2		15	374.535	.69	.37	.37	69	61	56	42	215	250	4
3		18	375.270	.67	.30	.30	70	62	56	43	215	250	2
4		20	376.170	.65	.20	.20	70	64	57	43	215	250	1
5		23	377.000	.11	.45	.45	72	69	58	45	215	250	4
6		26	378.630	.55	2.26	2.30	72	73	59	46	215	250	12
7		29	380.295	.65	2.66	2.70	73	73	61	48	215	250	15
8		32	382.801	.59	2.42	2.46	73	73	63	49	215	250	15
9		35	385.300	.59	2.42	2.46	73	74	64	52	215	250	15
10		38	387.795	.56	2.30	2.30	74	72	64	52	215	250	14
11		41	391.070	.63	2.60 ~~2.44~~	2.60 ~~2.50~~	74	76	66	52	215	250	15
12		45	393.630	.65	2.66	2.65	74	77	68	53	215	250	15
	36	48	396.295										
AVERAGE /SUM													

FIELD DATA

Plant Deutsch
Date 1/11/91
Test Site Scrub #2
Run Number CSLI 2
Operator JK

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	36	1007	396.295	.48	1.97	2.00	73	67	67	52	215	250	11
2		10	398.576	.45	1.84	1.80	70	71	67	52	215	250	11
3		13	400.752	.40	1.64	1.60	71	73	68	53	215	250	10
4		16	402.835	.35	1.44	1.40	72	76	68	54	215	250	8
5		19	404.775	.35	1.44	1.40	74	78	69	55	215	250	8
6		22	406.710	.30	1.23	1.20	74	81	70	55	215	250	8
7		25	408.525	.50	2.05	2.00	74	85	73	56	215	250	12
8		28	410.775	.60	2.46	2.50	76	85	75	56	215	250	15
9		31	413.300	.60	2.46	2.50	77	85	75	58	215	250	15
10		34	415.835	.61	2.50	2.50	74	84	76	59	215	250	15
11		37	418.460	.60	2.40	2.50	74	84	77	57	215	250	15
12		40	420.922	.60	2.46	2.50	73	85	78	57	215	250	15
	72	43	423.485										
AVERAGE /SUM	72		49.942	0.44		1.79	73	70		51	215	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1/11/91

RUN# CRSDI2 METHOD Chrome

FACILITY Dow Corn

TYPE Std. Imp.

TECHNICIAN D. Pitchaney

IMP. SOLUTION DDI water

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml DIW	517.3	536.4	-19.1
IMPINGER # 2	100 ml DIW	579.2	572.9	6.3
IMPINGER # 3	Empty	454.6	452.6	2.0
IMPINGER # 4	Silica Gel	650.4	630.7	19.7
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 8.9

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 11 JAN 1991
Test Site Scrub. #2 outlet
Run Number CRS202
Operator ARE

Ambient Temp 54 °F
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box # D817C
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.009 cfm @ 11" Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 1	0	0914	041.212	0.65		2.60	73	57	53	47	200	248	7.0
2	4	0918	044.792	0.57		2.30	74	62	53	45	203	247	6.0
3	8	0922	048.274	0.42		1.60	73	70	54	42	202	247	4.0
4	12	0926	051.360	0.33		1.40	74	74	58	41	204	247	3.5
5	16	0930	055.286	0.32		1.30	75	77	57	42	207	247	3.0
6	20	0934	057.102	0.18		0.71	76	79	58	43	205	247	2.0
7	24	0938	059.448	0.19		0.76	75	79	60	45	204	247	2.0
8	28	0942	061.824	0.26		1.04	73	80	62	47	203	247	2.5
	32	0946	064.326										
B 1	32	1006	064.326	0.56	1	2.3	76	64	61	44	213	247	6.5
2	36	1010	067.746	0.53		2.13	77	73	62	41	213	247	5.5
3	40	1014	071.152	0.48		1.88	74	79	63	40	212	247	5.0
4	44	1018	074.458	0.42		1.60	75	83	63	43	209	247	4.0
AVERAGE /SUM													

FIELD DATA

Plant DEUTSCH
Date 11 JAN 1991
Test Site Scrub. #2 outlet
Run Number ERD CRS202
Operator ARE

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.017 cfm@11" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 5	48	1022	077.614	0.37		1.50	75	85	64	44	208	247	4.0
6	52	1026	080.780	0.50		2.01	77	88	66	48	208	247	5.0
7	56	1030	083.946	0.49		2.01	76	90	68	52	206	247	5.0
8	60	1034	087.252	0.49		2.01	75	91	69	56	208	247	5.0
	64	1038	089.848										
AVERAGE /SUM	64		49.636	0.42		1.69	75	69		45	207	247	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1/11/91

RUN# CRS202 METHOD Chromium

FACILITY Deutsch

TYPE Std. Imp.

TECHNICIAN A. Petrunez

IMP. SOLUTION DDI H_2O

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml DDI H2O	538.1	537.2	0.9
IMPINGER # 2	100 ml DDI H2O	554.4	550.6	3.8
IMPINGER # 3	Empty	461.5	460.4 ~~461.5~~	1.1
IMPINGER # 4	Silica Gel	649.7	639.9	9.8
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 15.6

FIELD BLANKS

DISPOSITION/COMMENTS

ALTINWILLER, I.C. - DIAMOND BAR, CAL.

CLIENT: DEJTSON
SOURCE: SCRUBBER NO. 2 INLET
TEST DATE: 17 JAN 91
RUN NO.: 7 TOTAL CHROMIUM

STANDARD TEMP.: 68 DEG F STANDARD PRESS.: 29.92 in HG

PLANT GAS FLOW DATA

STACK DIAMETER (inches)	33.50
STACK CROSS-SECTIONAL AREA (sq. feet)	3.611
BAROMETRIC PRESSURE (inches Hg)	29.92
OXYGEN CONTENT (%)	20.40
CARBON DIOXIDE CONTENT (%)	0.70
MOISTURE CONTENT (%)	1.487
STACK TEMPERATURE (deg F)	71.00
STACK STATIC PRESSURE (inches water)	-2.30
STACK GAS DRY MOLECULAR WEIGHT	28.64
VELOCITY PRESSURE (sq rt inches water)	0.67
PITOT TUBE CORRECTION FACTOR	0.840
VELOCITY (ft per sec)	37.94
EXHAUST GAS FLOW RATE (ACFM)	35,836.5
EXHAUST GAS FLOW RATE (DSCFM)	34,602.6

FIELD SAMPLING DATA

DRY GAS VOLUME METERED (DCF)	51.360
DRY GAS VOLUME SAMPLED (DSCF)	49.977
DRY GAS METER TEMPERATURE (deg F)	88.00
DRY GAS METER GAMMA	1.00
AVERAGE ORIFICE PRESSURE (inches water)	1.66
TOTAL RUN TIME (min)	72.00
NOZZLE DIAMETER (inches)	0.250
ISOKINETIC (%)	91.87

ANALYTICAL DATA

MOISTURE RECOVERED (mls)	17.80
NOZZLE, PROBE & WASHES (mg)	0.0001
FILTER (mg)	0.0000
IMPINGERS (mg)	0.0000

EMISSIONS DATA

FRONT HALF	(gr/DSCF)	2.779E-08
	(lb/hr)	8.244E-06
BACK HALF	(gr/DSCF)	0.000E+00
	(lb/hr)	0.000E+00
TOTAL	(gr/DSCF)	2.779E-08
	(lb/hr)	8.244E-06

CONFIDER, INC., DIAMOND BAR, CAL.

CLIENT: [illegible]
SOURCE: SCRUBBER NO. 3 INLET
TEST DATE: 11 JAN 91
RUN NO.: 7 HEXAVALENT CHROMIUM

STANDARD TEMP.: 68 DEG F STANDARD PRESS.: 29.92 in HG

PLANT GAS FLOW DATA

STACK DIAMETER (inches)	55.50
STACK CROSS-SECTIONAL AREA (sq feet)	15.611
BAROMETRIC PRESSURE (inches Hg)	29.96
OXYGEN CONTENT (%)	20.90
CARBON DIOXIDE CONTENT (%)	0.00
MOISTURE CONTENT (%)	1.450
STACK TEMPERATURE (deg F)	71.00
STACK STATIC PRESSURE (inches water)	-2.30
STACK GAS DRY MOLECULAR WEIGHT	28.94
VELOCITY PRESSURE (sq rt inches water)	0.67
PITOT TUBE CORRECTION FACTOR	0.840
VELOCITY (ft per sec)	37.94
EXHAUST GAS FLOW RATE (ACFM)	35,534.5
EXHAUST GAS FLOW RATE (DSCFM)	34,602.6

FIELD SAMPLING DATA

DRY GAS VOLUME METERED (DCF)	51.360
DRY GAS VOLUME SAMPLED (DSCF)	49.977
DRY GAS METER TEMPERATURE (deg F)	88.00
DRY GAS METER GAMMA	1.00
AVERAGE ORIFICE PRESSURE (inches water)	1.36
TOTAL RUN TIME (min)	72.00
NOZZLE DIAMETER (inches)	0.250
ISOKINETIC (%)	91.87

ANALYTICAL DATA

MOISTURE RECOVERED (ml)	17.80
NOZZLE, PROBE & WASHES (mg)	< 0.0001
FILTER (mg)	< 0.0005
IMPINGERS (mg)	< 0.0008

EMISSIONS DATA

FRONT HALF	(gr/DSCF)	< 1.852E-07
	(lb/hr)	< 5.496E-05
BACK HALF	(gr/DSCF)	< 2.470E-07
	(lb/hr)	< 7.329E-05
TOTAL	(gr/DSCF)	< 4.322E-07
	(lb/hr)	< 1.282E-04

FIELD DATA

Plant Deutsch
Date 1/11/91
Test Site Scrub. #2
Run Number CS2E5
Operator JC

Ambient Temp 80
Barometer 29.94
Stack Pressure
Stack H2O % 2
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # DSCC
Nozzle Diameter .25"
Probe Length 7

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.015 @ 10"
POST LEAK 0.008 @ 15"

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	12:28	424.465	0.07	0.29	.29	74	77	77	45	215	250	2
2		31	425.400	0.04	0.37	.37	72	79	77	50	215	250	2
3		34	426.455	.06	0.25	0.25	71	81	78	49	215	250	2
4		37	427.300	.08	0.33	.33	71	83	78	52	215	250	2
5		40	428.250	0.64	0.57	0.57	71	84	79	53	215	250	4
6		43	429.560	.57	2.33	2.30	70	89	80	55	215	250	7
7		46	432.400	.70	2.87	2.90	70	94	83	57	215	250	10
8		49	435.620	.75	3.07	3.10	71	96	84	58	215	250	10
9		52	437.455	.72	2.95	3.00	71	96	86	57	215	250	10
10		55	440.250 ~~438.991~~	.71	2.91	2.90	70	96	86	59	215	250	10
11		58	443.015 ~~441.650~~	.65	2.67	2.70	70	96	86	59	215	250	10
12	36	1307	445.750	.66	2.71	2.70	70	97	81	58	215	250	9
		13.04	448.545										
AVERAGE /SUM													

FIELD DATA

Plant Deutsch
Date 1/11/91
Test Site Scrub. #2 IN
Run Number C5L43
Operator JC

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	36	13:20	448.545	0.33	1.35	1.40	70	86	83	49	215	250	5
2		23	450.035	.30	1.23	1.20	71	88	86	50	215	250	5
3		26	452.330	.51	2.09	2.10	71	90	86	52	215	252	7
4		29	454.640	.45	1.84	1.80	73	93	88	54	215	250	6
5		32	456.965	.35	1.44	1.40	74	95	87	55	215	252	5
6		35	458.255	.30	1.23	1.20	72	96	87	57	215	250	4
7		38	460.675	.49	2.01	2.00	71	97	87	57	215	250	7
8		41	462.980	.60	2.46	2.50	72	98	88	56	215	250	8
9		44	465.565	.62	2.54	2.50	72	98	89	57	215	250	8
10		47	468.140	.60	2.46	2.50	72	99	90	58	215	250	8
11		50	470.750	.57	2.34	2.30	72	99	90	58	215	250	8
12	72	53	473.250	.55	2.26	2.30	71	99	91	59	215	250	8
		56	475.925										
AVERAGE /SUM	72		51.360	0.45		1.86	71	88		55	215	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 11 JAN 1991

RUN# CRS2I METHOD CR

FACILITY DEUTSCH

TYPE Std Impingers

TECHNICIAN A. SRBES

IMP. SOLUTION H_2O DI

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml DIW	576.1	518.0	-1.9
IMPINGER # 2	100ml DIW	538.6	533.3	5.3
IMPINGER # 3	Empty	454.6	453.0	1.6
IMPINGER # 4	Silica Gel	688.8	676.0	12.8
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 17.8

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 11 JAN 1991
Test Site Scrub. #2 outlet
Run Number CRS203
Operator ARG

Ambient Temp 77° F
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box # D817C
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.015 cfm@11"Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 1	0	1231	091.148	0.65		2.64	77	72	71	59	221	247	4.0
2	4	1235	094.783	0.56		2.26	77	80	72	48	214	247	3.0
3	8	1239	098.278	0.42		1.63	77	87	73	60	217	247	2.5
4	12	1243	101.363	0.32		1.26	75	90	75	~~50~~ 53	210	247	2.0
5	16	1247	104.228	0.30		1.21	77	93	75	54	216	247	2.0
6	20	1251	107.013	0.21		0.84	77	94	76	56	215	247	1.0
7	24	1255	109.458	0.22		0.88	77	96	77	57	216	247	1.5
8	28	1259	111.953	0.30		1.21	76	96	79	59	219	247	2.0
	32	1303	114.529										
									7				
B 1	32	1320	114.529	0.56		2.26	75	84	77	60	216	247	3.5
2	36	1324	118.063	0.55		2.20	77	90	78	48	216	247	3.0
3	40	1328	121.568	0.51		2.01	77	90	78	48	209	247	3.0
4	44	1332	124.893	0.45		1.76	78	95	77	49	212	247	2.5
AVERAGE /SUM													

FIELD DATA

Plant DEUTSCH
Date 11 JAN 1991
Test Site Scrubber #2 outlet
Run Number CRS203
Operator ARE

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O)		TEMPERATURES						PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	
B 5	48	1336	128.078	0.44		1.76	78	98	81	50	209	247	2.5
6	52	1340	131.243	0.50		2.01	77	98	81	50	210	247	3.0
7	56	1344	134.538	0.51		2.01	76	100	83	53	212	247	3.0
8	60	1348	137.853	0.53		2.14	78	101	81	51	212	247	3.0
	64	1352	140.444										
AVERAGE /SUM	64		49.296	0.44		1.76	77	84		52	214	247	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE [illegible] RUN# [illegible] METHOD Chrome

FACILITY [illegible] TYPE Std. Imp.

TECHNICIAN [illegible] IMP. SOLUTION [illegible]

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml DI	541.7	539.5	2.2
IMPINGER # 2	100 ml DI	568.2	563.2	5.0
IMPINGER # 3	Empty	462.2	460.5	1.7
IMPINGER # 4	Silica Gel	676.0	667.3	8.7
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g)	17.6

FIELD BLANKS

DISPOSITION/COMMENTS

KLEINFELDER

SHEET ____ OF ____

PROJECT ____ PROJECT NO. ____

SUBJECT ____ BY ____ DATE ____

REVIEWED BY ____ DATE ____

SCRUBBER #2

CHROMIUM

HEX	1-IN	1-OUT	2-IN	2-OUT	3-IN	3-OUT
FRONT (30)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
FILTER	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
BACK (270)	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

TOTAL						
FRONT (30)	0.0003	0.003	0.00273	0.0003	0.00009	0.0023
FILTER	0.00535	0.0007	<0.00005	0.00006	<0.00005	0.0005
BACK (270)	<0.00027	<0.00027	<0.00027	<0.00027	<0.00027	0.00189

FIELD DATA

Plant DEUTSCH
Date 07 JAN 1991
Test Site Scrubber #2 Inlet
Run Number NS2 I 1
Operator JR

Ambient Temp 73
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # D801C
Nozzle Diameter 0.302"
Probe Length 7'

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.035 cfm
POST LEAK .055 cfm

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	1421	115.930	.08	.71	.71	71	73	73	52	200	250	3
2	3	24	117.205	.09	.80	.80	71	76	72	52	200	250	4
3	6	27	118.650	.08	.71	.71	71	79	72	53	200	250	4
4	9	30	120.055	.09	.80	.80	72	80	73	53	200	250	4
5	12	33	121.465	.120	1.07	1.10	72	84	74	54	199	250	6
6	15	36	123.100	.17	1.51	1.50	72	85	75	54	199	250	11
7	18	39	125.130	.21	1.90	1.90	71	83	76	54	199	250	15
8	21	42	127.350	.20	1.78	1.80	71	82	76	55	200	250	15
9	24	45	129.600	.22	1.96	2.00 ~~2.00~~	71	83	77	55	200	250	15
10	~~27~~	* 48	132.950	~~.24~~	~~2.10~~	~~2.100~~	~~71~~	~~86~~	~~78~~	~~55~~	~~200~~	~~250~~	~~15~~
11		51	132.950	.25	2.24	2.20	71	86	78	54	200	250	15
12	30	54	134.800	.28	2.50	2.50	71	86	79	56	190	250	15
	33	57	137.150	.29	2.58	2.60	71	86	79	56	195	250	15
	~~36~~ 45	60	139.715										
AVERAGE /SUM													

Stop 1448 restart 1451

FIELD DATA

Plant Deutch
Date 1/7/90
Test Site
Run Number NS2IV
Operator JK

Ambient Temp
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter .302"
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	36 ~~45~~	1511	139.715	0.33	2.96	2.96	71	76	75	55	202	250	14
2	39	14	142.440	.30	2.67	2.70	71	77	76	55	200	250	13
3	42	17	145.170	.32	2.85	2.85	71	79	75	56	200	250	13
4	45	20	147.920	.34 ~~.42~~	3.20	3.20	71	80	75	54	200	250	15
5	48	23	150.810	.35	3.12	3.10	71	81	76	55	202	250	15
6	51	26	153.680	.37	3.29	3.30	71	81	75	55	200	250	15
7	54	29	156.580	.35	3.12	3.10	71	82	75	55	201	250	15
8	57	32	159.465	.37	3.29	3.30	71	83	76	56	201	250	15
9	60	35	162.370	.37	3.29	3.30	71	83	76	56	200	250	15
10	63	38	165.830	.40	3.56	3.30 ~~3.40~~	71	83	77	56	200	250	15
11	66	41~~44~~*	167.260 ~~167.830~~	~~.37~~	3.29	~~3.30~~	~~71~~	~~84~~	~~77~~	~~56~~	~~200~~	~~250~~	~~15~~
12	66	44~~44~~	167.260	.37	3.29	3.30	71	84	77	56	200	250	15
	69	47~~50~~	170.070	.39	3.47	3.30	71	85	78	57	200	250	15
	72	50	173.015										
AVERAGE /SUM	72		57.085	0.26 ~~0.29~~		2.34 ~~2.57~~	71	~~78~~ ~~85~~	79	55	199	250	

* stop at 1541 restart 1544

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE ~~04 JAN 1991~~ 1.7.91

RUN# NSZ1 METHOD Nickel CARB12

FACILITY DEUTSCH

TYPE std imp

TECHNICIAN A.P.

IMP. SOLUTION 0.1N HNO_3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml 0.1N	538.5	536.1	2.4
IMPINGER # 2	100ml 0.1N	543.1	550.5	-7.4
IMPINGER # 3	Empty	466.6	466.3	0.3
IMPINGER # 4	Silica Gel	669.7	643.4	26.3
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 21.6

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 07 JAN 1991
Test Site Scrubber #2
Run Number NS201
Operator QRE

Ambient Temp 62°F
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.89
Meter Gamma 0.9996
Meter Box # DB17C
Nozzle Diameter 0.25"
Probe Length 6'

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.025 cfm @ 7" Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 1	0	1422	840.024	0.64		2.62	65	71	69	51	118	247	3.0
2	4	1426	841.813	0.52		2.13	65	80	70	51	124	247	2.0
3	8	1430	845.194	0.40		1.64	66	86	70	52	130	247	1.5
4	12	1434	848.036	0.33		1.35	66	89	70	55	135	247	1.0
5	16	1438	850.890	0.34		1.39	66	91	70	55	140	247	1.0
6	20	1442	853.691	0.23		0.94	66	93	72	55	145	247	1.0
7	24	1446	856.202	0.24		0.99	66	93	73	57	149	247	1.0
8	28	1450	858.753	0.30		1.23	65	95	74	58	154	247	1.0
	32	1454	861.349										
B 1	32	1514	861.349	0.51		2.09	64	76	70	53	160	247	2.0
2	36	1518	864.655	0.53		2.18	65	84	70	51	166	247	2.0
3	40	1522	868.036	0.50		2.05	66	90	70	52	170	247	2.0
4	44	1526	871.337	0.43		1.77	66	92	71	65	174	247	2.0
AVERAGE /SUM													

FIELD DATA

Plant DEUTSCH
Date 07 JAN 1991
Test Site Scrubber #2
Run Number NS201
Operator ARE

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.043@7"Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O)		TEMPERATURES						PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	
B 5	48	1530	874.458	0.40		1.64	66	95	71	54	180	247	1.5
6	52	1534	877.489	0.50		2.06	65	95	73	55	186	247	2.0
7	56	1538	880.750	0.49		2.01	66	97	72	65	192	247	2.0
8	60	1542	885.162	0.48		1.97	66	96	73	56	194	247	2.0
	64	1546	889.139								~~194~~		
AVERAGE /SUM	64		49.115	0.43		1.76	66	75		54	157	247	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE ~~04 JAN 1990~~ 1.7.91

RUN# N5203 METHOD Nickel CARB 12

FACILITY DEUTSCH

TYPE Std. Impingers

TECHNICIAN A. P.

IMP. SOLUTION 0.1N HNO_3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml 0.1N	538.4	~~511.7~~ 537.2	1.7
IMPINGER # 2	100ml 0.1N	573.1	571.7	1.4
IMPINGER # 3	Empty	437.4	437.3	0.1
IMPINGER # 4	Silica Gel	654.3	645.9	8.4
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 16.6

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 16 JAN 1991
Test Site Scrubber #2 (K)
Run Number N5-12
Operator JK

Ambient Temp
Barometer 29.92
Stack Pressure
Stack H2O % 2
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # 0801C
Nozzle Diameter 0.25"
Probe Length 7'

Pitot Check

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.015 cfm 15" Hg
POST LEAK 0.015 cfm 16" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	0955	269.750	0.07	0.29	.29	65	65	63	58	200	250	3
2		58	270.710	0.08	0.33	.33	68	67	63	58	200	250	3
3		10:01	271.670	0.10	0.41	0.41	73	70	65	59	200	250	3
4		04	272.665	.06	0.25	0.25	74	72	66	58	200	250	3
5		07	273.500	.08	0.33	0.33	75	74	66	56	210	250	3
6		10	274.495	0.13	0.53	.53	74	78	68	56	210	250	4
7		13	275.735	.50	2.05	2.00	74	82	72	57	210	250	15
8		16	277.880	0.51	2.09	2.10	75	82	71	56	210	250	16
9		19	280.145	0.51	2.09	2.10	77	82	73	56	210	250	16
10		22	282.470	0.49	2.01	2.00	78	82	75	57	210	250	16
11		25	284.765	.50	2.05	2.00	78	83	77	58	210	250	16
12		28	286.055	.52	2.13	2.10	78	83	77	59	210	250	16
	36	31	289.420										
AVERAGE /SUM													

FIELD DATA

Plant Dartsch
Date 1/10/90
Test Site #2 IN
Run Number N52I2
Operator JK

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	36	1050	289.420	0.38	1.56	1.60	79	77	77	60	210	250	11
2		53	291.610	.32	1.31	1.30	80	80	77	59	210	250	10
3		56	293.480	.38	1.60	1.60	79	83	77	59	210	250	11
4		59	295.475	.30	1.23	1.20	79	85	78	58	210	250	9
5		11.02	297.370	.44	1.80	1.80	80	86	78	58	210	250	12
6		05	299.550	.42	1.72	1.70	80	88	80	57	210	250	12
7		08	302.00	.51	2.09	2.10	79	89	82	58	210	250	15
8		11	304.020	0.53	2.17	2.20	80	90	84	56	210	250	15
9		14	306.50	.54	2.27	2.20	75	90	84	57	210	250	16
10		17	308.76	0.54	2.21	2.20	75	90	84	58	210	250	16
11		20	311.120	.52	2.131	2.10	73	90	86	59	210	250	14
12		23	313.500	.50	2.05	2.00	73	90	86	60	210	250	14
	72	26	315.900										
AVERAGE /SUM	72		46.150	0.37		1.52	75	75	78	58	208	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 10 JAN 1991 RUN# N5212 METHOD 12

FACILITY [illegible] TYPE Std impingers

TECHNICIAN [illegible] IMP. SOLUTION [illegible]

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml 0.1N	533.0	538.4	-5.40
IMPINGER # 2	100ml 0.1N	553.5	549.6	3.90
IMPINGER # 3	Empty	452.9	452.7	0.2
IMPINGER # 4	Silica Gel	635.4	623.6	11.8
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 10.5

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 10 JAN 1991
Test Site Scrubber #2
Run Number NS202
Operator ARE

Ambient Temp 61 °F
Barometer 29.92
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box # D817C
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.008 cfm @ 11"Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 1	0	0955	941.651	0.66			72	61	59	41	208	247	8.0
2	4	0959	945.202	0.55			73	71	60	41	219	247	6.5
3	8	1003	948.810	0.43			74	76	61	43	207	247	5.0
4	12	1007	951.888	0.32			74	80	62	45	208	247	4.0
5	16	1011	954.666	0.29			74	83	63	46	209	247	3.5
6	20	1015	957.354	0.20			72	84	65	48	209	247	2.5
7	24	1019	959.732	0.21			74	84	65	48	211	247	2.5
8	28	1023	962.120	0.28			74	86	67	48	216	247	3.5
	32	1027	964.558									247	
B 1	32	1050	964.558	0.55			79	72	69	42	236	247	6.5
2	36	1054	967.876	0.51			80	78	69	38	238	247	6.0
3	40	1059	971.184	0.50			~~80~~ 82	85	71	39	235	247	6.0
4	44	1103	974.422	0.42			80	88	70	39	237	247	5.0
AVERAGE /SUM													

FIELD DATA

PAGE ____ OF ____

Plant DEUTSCH
Date 10 JAN 1991
Test Site Scrubber #2
Run Number NS202
Operator GRE

Ambient Temp ____
Barometer ____
Stack Pressure ____
Stack H2O % ____
Stack Dia ____

Meter ^H@ ____
Meter Gamma ____
Meter Box # ____
Nozzle Diameter ____
Probe Length ____

Probe Mat'l ____
Filter Number ____
Samp Box # ____
PRE LEAK ____
POST LEAK 0.004 cfm @ 11" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 5	48	1107	977.500	0.38			81	91	71	40	234	247	4.5
6	52	1111	980.479	0.49			80	93	75	44	232	247	5.5
7	56	1115	983.620	0.49			79	94	73	45	233	247	5.5
8	60	1119	986.810	0.53			82	95	75	47	225	247	6.0
	64	1123	989.738										
AVERAGE /SUM	64		48.087	0.43		1.71	77	75		43	222	247	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 10 JAN 1991 RUN# N5220 METHOD 12

FACILITY DELTECH TYPE Std Impingers

TECHNICIAN A. ERBES IMP. SOLUTION 0.1N HNO3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml 0.1N HNO3	535.6	534.4	1.2
IMPINGER # 2	100 ml 0.1N	578.1	572.7	5.4
IMPINGER # 3	Empty	461.8	460.5	1.3
IMPINGER # 4	Silica Gel	630.8	623.2	7.6
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 15.5

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant Diesel
Date 1/14/91
Test Site Scrub. #2
Run Number NS2E3
Operator SK

Ambient Temp 8
Barometer 29.96
Stack Pressure
Stack H2O % 2
Stack Dia

Meter ^H@ 1.81
Meter Gamma 1.004
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK .01 [illegible]
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	12:33	533.010	.15	0.33	.33	76	96	92	52	200	250	2
2		37	534.420	.09	.37	.37	77	96	92	53	200	250	2
3		40	535.470	.09	.37	.37	76	97	92	53	200	250	2
4		43	536.520	.09	0.33	0.33	78	95	93	53	205	250	2
5		46	537.525	.17	.29	.29	75	100	93	54	210	250	2
6		49	538.652	.13 ~~.24~~	.33 ~~.31~~	.33 ~~.37~~	78	102	95	55	210	250	3
7		52	539.675	.69 ~~.46~~	2.69 ~~2.46~~	2.70 ~~2.50~~	78	106	93	56	210	250	9
8		55	541.930	.65	2.66	2.70	77	107	96	58	210	250	9
9		58	544.485	.68	2.79	2.80	77	107	97	59	215	250	9
10		13:01	547.200	.77	3.16	3.20	76	107	98	60	215	250	11
11		04	550.140	.83	3.40	3.40	76	107	98	59	215	250	11
12		07	553.120	.72	2.95	3.00	77	107	99	60	215	250	10
	36	10	556.050										
AVERAGE /SUM													

FIELD DATA

Plant Pearlach
Date 1/14/98
Test Site Scrub. #2 IN
Run Number Test 3
Operator JK

Ambient Temp 30
Barometer
Stack Pressure
Stack H20 %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # DGCC
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK .02 cfm @ 15" Hg
POST LEAK .02 cfm @ 15" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H20) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	36	1330	556.240	.45	1.84	1.80	77	95	94	52	215	250	7
2		33	558.575	.45	1.84	1.80	78	99	97	54	215	250	7
3		36	560.765	.46	1.89	1.90	78	100	98	55	215	250	7
4		39	563.040	.47	1.93	1.90	79	104	97	56	215	250	7
5		42	565.295	.45	1.84	1.80	79	106	98	57	215	250	7
6		45	567.530	.36	1.78	1.50	79	107	98	57	215	250	6
7		48	569.605	.35	1.44	1.40	80	108	99	58	215	250	5
8		~~49~~ 51	571.620	.47	1.89	1.90	80	108	100	59	215	250	7
9		* 54	573.580	~~.40~~ .50	~~2.15~~ 2.15	~~2.00~~ 2.20	81	111	101	60	215	250	8
10		57	576.365	.61	2.62	2.60	80	111	102	60	215	250	9
11		1400	579.615	.60	2.58	2.60	80	110	104	59	215	250	9
12	~~72~~	1403	581.725	.60	2.58	2.60	80	116	103	59	215	250	9
	72	06	582.430										
AVERAGE /SUM	72		51.420	0.44		1.83	78	101		57	212	250	

Nozzle Break on changing ports
change

* change Tm from 50 to 80

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1/14/91

RUN# N5273 METHOD Ni 433

FACILITY Deutsch

TYPE Scal Imp

TECHNICIAN Jon K

IMP. SOLUTION 0.1 N HNO3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml	542.5	539.4	3.1
IMPINGER # 2	100ml	532.6	534.4	3.2
IMPINGER # 3	Empty	454.4	452.6	1.8
IMPINGER # 4	Silica	641.5	635.0	6.5
DESCRIPTION				
IMPINGER RINSE				14.6

SILICA GEL	CONDITION	FINAL (g)	INITIAL(g)	NET (g)

FILTER	NUMBER	DESCRIPTION

TOTAL MOISTURE (g) 14.6

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 14 JAN 1991
Test Site Scrubber # 2 Out
Run Number NS203
Operator ARE

Ambient Temp 74°F
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box # D817C
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.005 cfm @ 11" Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 1	0	1231	194.130	0.65		~~1.80~~ 2.6	79	84	84	51	230	247	9.5
2	4	1235	197.791	0.54		2.0	80	87	84	48	231	247	7.5
3	8	1238	201.222	0.42		1.8	80	95	84	51	229	247	6.0
4	12	1243	204.273	0.33		1.4	81	99	84	52	227	247	5.0
5	16	1247	207.164	0.32		1.25	80	102	85	53	231	247	4.5
6	20	1251	209.925	0.20		0.80	78	103	86	55	217	247	3.0
7	24	1255	212.286	0.21		0.84	79	103	88	57	218	247	3.0
8	28	1259	214.677	0.29		1.17	77	105	88	56	219	247	4.0
	32	1303	217.239										
B 1	32	1328	217.239	0.54		2.1	77	88	89	60	223	247	7.5
2	36	1332	220.559	0.51		2.0	77	95	89	52	222	247	7.0
3	40	1336	223.870	0.49		2.0	76	101	89	53	220	247	7.0
4	44	1340	227.171	0.41		1.6	79	104	91	54	223	247	6.0
AVERAGE /SUM													

FIELD DATA

Plant DEUTSCH
Date 14 JAN 1991
Test Site Scrubber #2 out
Run Number NS203
Operator ARR

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter 0.25"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.007 cfm@11"Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 5	48	1344	230.242	0.43		1.80	77	105	91	55	219	247	6.0
6	52	1348	233.343	0.49		2.0	75	110	91	57	220	247	6.5
7	56	1352	236.564	0.48		1.9	79	111	93	57	226	247	6.5
8	60	1356	239.765	0.47		1.9	78	111	94	58	224	247	7.0
	64	1400	242.664										
AVERAGE /SUM	64		48.534	0.42		1.69	78	94		54	224	247	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1/14/90 RUN# N5203 METHOD N.

FACILITY Dairdsel TYPE Seal Imp

TECHNICIAN Jim K IMP. SOLUTION 0.1 N HNO3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml	576.6	572.3	4.3
IMPINGER # 2	100ml	565.1	561.9	3.2
IMPINGER # 3	Empty	460.7	460.1	0.6
IMPINGER # 4	Silica	647.4	644.6	2.8
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 10.9

FIELD BLANKS

DISPOSITION/COMMENTS

KLEINFELDER

SHEET____ OF____

PROJECT_____ PROJECT NO._____

SUBJECT_____ BY_____ DATE_____

_____ REVIEWED BY_____ DATE_____

SCRUBBER #2

NICKEL

TOTAL	1-IN	1-OUT	2-IN	2-OUT	3-IN	3-OUT
	0.1175	0.0325	0.075	0.025	0.0275	0.0125

FIELD DATA

Plant Dautsch
Date 1/16/91
Test Site Scrub #6
Run Number MS6I1
Operator JK

Ambient Temp 65
Barometer 30.06
Stack Pressure
Stack H2O % 2
Stack Dia 26.5

Meter ^H@ 1.80
Meter Gamma 1.000
Meter Box # 0310C
Nozzle Diameter .15'
Probe Length 4'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK .20 cfm 15"Hg
POST LEAK 0.015 cfm 18"Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	0809	631.120	.35	1.44	1.40	68	62	59	42	200	250	6
2		12	633.130	.35	1.44	1.40	68	68	59	42	200	252	6
3		15	635.025	.36	1.48	1.50	68	70	60	43	202	252	6
4		18	637.060	.40	1.64	1.60	68	76	63	44	200	252	7
5		21	639.045	.41	1.68	1.70	69	78	64	45	200	250	7
6		24	641.165	.45	1.85	1.80	70	82	66	45	200	250	7
7		27	643.650	.46	1.89	1.90	72	84	69	46	200	250	8
8		30	645.500	.48	1.97	2.00	71	85	70	47	200	250	8
9		33	647.785	.50	2.05	2.00	71	87	72	49	200	250	8
10		36	650.100	.50	2.05	2.00	72	87	73	50	200	250	8
	30	39	652.440										
AVERAGE /SUM			~~44.240~~										

FIELD DATA

Plant Deutsch
Date 11/6/91
Test Site Scrub #6
Run Number MSGI 1
Operator JK

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	30	0903	652.446	.72	2.95	3.00	73	74	73	49	200	250	8
2		06	655.020	.67	2.75	2.80	74	75	72	50	200	250	10
3		09	657.760	.67	2.75	2.80	73	78	73	50	200	250	11
4		12	660.350	.40	1.64	1.60	72	81	74	51	200	250	7
5		15	662.585	.38	1.56	1.60	73	83	75	52	200	250	7
6		18	664.670	.40	1.64	1.60	74	85	75	54	200	250	7
7		21	666.602	.41	1.68	1.70	74	87	76	55	200	250	7
8		24	668.740	.43	1.76	1.80	74	88	77	56	200	250	7
9		27	670.900	.45	1.84	1.80	74	90	78	56	200	250	7
10		30	673.120	.45	1.84	1.80	74	90	78	52	200	250	7
	60	33	675.350										
AVERAGE /SUM	60		44.210	0.46		1.59	72	75		49	200	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1/16/91

RUN# 456 I METHOD Multi Metals

FACILITY

TYPE Sed Imp

TECHNICIAN

IMP. SOLUTION 5% HNO_3/10

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml	549.2	545.0	4.2
IMPINGER # 2	100ml	544.0	539.2	4.8
IMPINGER # 3	Empty	453.2	452.1	1.1
IMPINGER # 4	Silica	662.2	649.9	12.3
DESCRIPTION				
IMPINGER RINSE				

SILICA GEL	CONDITION	FINAL (g)	INITIAL(g)	NET (g)

FILTER	NUMBER	DESCRIPTION

TOTAL MOISTURE (g) 22.4

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 16 JAN 1991
Test Site Scrubber Inlet
Run Number HS6A1
Operator [illegible]

Ambient Temp 65°
Barometer 30.06
Stack Pressure
Stack H2O %
Stack Dia 19.5"

Meter ^H@
Meter Gamma
Meter Box # D817C
Nozzle Diameter 0.1875
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK [illegible]
POST LEAK 0.004 cfm @ 18.5 "Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 2	0	0809	220.358	2.0	2.8	2.4	73	62	57	43	234	247	18.5
2	3	0812	222.79	2.0	2.8	2.4	73	63	59	43	215	247	18.5
3	6	0815	225.21	1.9	2.7	2.4	72	64	58	44	215	247	18.5
4	9	0818	227.63	1.8	2.5	2.4	70	68	59	47	220	247	18.5
5	12	0821	230.05	1.6	2.2	2.2	68	71	61	49	217	247	17.0
6	15	0824	232.42	1.7	2.3	2.3	69	75	63	51	220	247	17.0
7	18	0827	234.80	1.9	2.7	2.4	70	77	64	54	218	247	18.0
8	21	0830	237.22	1.9	2.7	2.4	72	77	64	54	218	247	18.0
9	24	0833	239.66	1.7	2.3	2.3	71	78	67	55	215	247	18.0
9	27	0836	242.06	1.7	2.3	2.3	72	80	69	56	223	247	18.0
	30	0839	244.395										
AVERAGE /SUM													

FIELD DATA

Plant DEUTSCH
Date 16 JAN 1991
Test Site Scrubber #6 outlet
Run Number MS601
Operator QPS

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.004 cfm @ 18.5"

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 2	30	0902	244.315	1.7	2.4	2.3	77	~~68~~ 70	68	48	251	247	18.5
2	33	0905	246.76	1.7	2.4	2.3	74	70	69	51	243	247	18.5
3	36	0908	249.15	1.6	2.2	2.2	74	75	69	53	246	247	18.5
4	39	0911	251.56	1.6	2.2	2.2	76	76	69	54	243	247	18.5
5	42	0914	253.90	1.6	2.2	2.2	75	77	70	55	241	247	18.5
6	45	0917	256.28	1.6	2.2	2.2	74	78	71	56	245	247	18.5
7	48	0920	258.67	1.7	2.4	2.3	76	81	70	55	248	247	18.5
8	51	0923	261.04	1.7	2.4	2.3	75	82	72	57	249	247	18.5
9	54	0926	263.43	1.6	2.2	2.2	69	81	74	56	249	247	18.5
9	57	0929	265.86	1.6	2.2	2.2	64	82	74	60	239	247	18.5
	60	0932	267.890										
AVERAGE /SUM	60		47.532	1.7		2.30	72	70		52	232	247	

~~59.595~~

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.16.91

RUN# MS601 METHOD mult. metals

FACILITY Deutsch

TYPE Std. Imp.

TECHNICIAN A. Petraneny

IMP. SOLUTION 5% HNO_3 / 10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp Soln	575.6	584.9	-9.30
IMPINGER # 2	100 ml Imp Soln	569.1	567.2	1.9
IMPINGER # 3	Empty	459.9	459.9	0
IMPINGER # 4	Silica Gel	682.4	664.9	17.5
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 10.1

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant Deutsch
Date 1/16/91
Test Site Scrubber #6
Run Number M5G-I 2
Operator JK

Ambient Temp 80
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.000
Meter Box # D3C1C
Nozzle Diameter 0.25"
Probe Length 4'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.015 cfm 14" Hg
POST LEAK 0.017 cfm 15" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B1	0	13:54	681.865	.67	2.75	2.70	73	83	82	~~56~~ 53	190	250	16.5
2		57	684.720	.65	2.67	2.20 ~~2.70~~	74	84	82	54	195	250	16.5
3		14:00	687.00	0.29	1.19	1.20	75	87	84	53	195	250	9
4		03	689.080	.36	1.48	1.50	75	91	83	54	195	250	9
5		06	690.825	.32	1.31	1.30	76	93	85	55	200	250	10
6		09	692.750	.32	1.31	1.30	76	94	84	56	200	250	10
7		12	694.695	.32	1.31	1.30	76	95	85	57	200	250	10
8		15	696.625	.38	1.56	1.60	77	97	86	55	200	250	11
9		18	698.675	.41	1.68	1.70	77	98	88	57	200	250	11
10		21	700.800	.42	1.72	1.70	77	98	89	56	200	250	12
	30	24	703.000										
AVERAGE /SUM	~~40~~		~~42.090~~										

FIELD DATA

Plant Dewatch
Date 1/16/91
Test Site Scrub #4
Run Number M5G-I2
Operator JK

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	30	1437	703.000	.35	1.44	1.46	77	87	87	56	200	250	16
2		40	704.885	.35	1.44	1.40	77	90	86	57	200	250	16
3		43	706.825	.32	1.31	1.30	76	92	87	57	200	250	9
4		46	708.725	.34	1.46	1.46	77	93	87	58	200	250	10
5		49	710.650	.42	1.72	1.70	77	95	87	56	200	250	1
6		52	712.760	.42	1.72	1.70	77	96	88	57	200	250	12
7		55	714.895	.43	1.76	1.90	77	96	89	58	200	250	13
8		58	717.120	.49	2.01	2.00	77	96	89	58	200	250	15
9		1501	719.395	.46	1.39	1.90	76	96	91	59	200	250	15
10		04	721.676	.46	1.39	1.90	76	96	93	60	200	252	15
	60	07	723.955										
AVERAGE /SUM	1860		42.090	0.41		1.62	76	90		56	199	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.16.91 RUN# MSCI2 METHOD mult. metals

FACILITY Deutsch TYPE Std. Imp.

TECHNICIAN A. Petrancosky IMP. SOLUTION 5% HNO_3/10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp. Soln	538.4	~~543.5~~ 542.5	-4.1
IMPINGER # 2	100 ml Imp. Soln	588.6	584.3	+4.3
IMPINGER # 3	Empty	455.7	452.1	3.6
IMPINGER # 4	Silica Gel	680.8	670.3	10.5
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 14.3

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD A

Plant DEUTSCH
Date 16 JAN 1991
Test Site Scrubber #2 out
Run Number MS602
Operator ARG

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK 0.020 @ 18" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 2	30	1437	295.436	1.6	2.2	2.2	77	89	85	50	230	247	13.0
2	33	1440	297.98	1.6	2.2	2.2	79	91	83	50	229	247	13.0
3	36	1443	300.16	1.6	2.2	2.2	79	93	85	51	214	247	13.0
4	39	1446	302.52	1.6	2.2	2.2	77	96	85	50	237	247	13.0
5	42	1449	304.89	1.7	2.4	2.4	78	98	86	51	227	247	14.5
6	45	1452	307.43	1.9	2.7	2.7	80	99	85	53	227	247	17.0
7	48	1455	309.91	1.8	2.5	2.5	79	97	87	55	220	247	16.5
8	51	1459	312.45	1.7	2.4	2.4	80	98	86	55	215	247	15.5
9	54	1502	314.95	1.5	2.1	2.1	82	98	88	56	210	247	13.0
9	57	1505	317.33	1.5	2.1	2.1	82	99	88	57	221	247	13.0
	60	1508	319.74										
AVERAGE /SUM	60		49.576	1.70		2.38	78		~~79~~ 88	52	221	247	

62.156 2.11

FIELD DATA

Plant DEUTSCH
Date 16 JAN 1991
Test Site SCRUBBER #2 OUT
Run Number MS602
Operator QRS

Ambient Temp 86°F
Barometer 30.06
Stack Pressure
Stack H2O %
Stack Dia 19.5"

Meter ^H@ 0.9996
Meter Gamma 1.94
Meter Box # D817C
Nozzle Diameter 0.1875"
Probe Length

pitot pre ok post

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.013 cfm @ 15 "Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 2	0	1355	270.164	1.9	2.7	2.7	75	79	79	49	220	247	16.0
2	3	1358	272.69	1.9	2.7	2.7	75	82	80	48	218	247	16.5
3	6	1401	275.39	1.8	2.5	2.5	75	84	80	47	224	247	15.5
4	9	1404	277.83	1.7	2.4	2.4	75	88	78	50	220	247	14.0
5	12	1407	280.32	1.6	2.2	2.2	76	92	80	51	221	247	13.0
6	15	1410	282.74	1.9	2.7	2.7	74	94	83	52	216	247	16.0
7	18	1413	285.30	2.0	2.8	2.8	75	94	83	52	217	247	17.0
8	21	1416	287.95	1.8	2.5	2.5	77	94	84	52	216	247	16.0
9	24	1419	290.55	1.5	2.1	2.1	81	96	85	53	217	247	13.0
9	27	1422	292.97	1.5	2.1	2.1	79	99	86	53	224	247	12.0
	30	1425	295.436										
AVERAGE /SUM			~~49.476~~										

KLEINFELDER, INC.

TRAIN RECOVERY SHEET MS6C02

DATE 1.16.91 RUN# ~~[illegible]~~ METHOD CARB 424 Cadmium

FACILITY Deadlock TYPE Std. Imp

TECHNICIAN G. Petersonoy IMP. SOLUTION ~~[illegible]~~ 5% HNO_3/10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp. Soln	564.0	565.1	-1.1
IMPINGER # 2	100 ml Imp. Soln	565.1	563.0	2.1
IMPINGER # 3	Empty	478.2	478.1	0.1
IMPINGER # 4	Silica Gel	667.5	655.1	12.4
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 13.5

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant Lautech
Date 11/8/91
Test Site Scrub PC
Run Number MSGT 3
Operator JK

Ambient Temp 50
Barometer 30.16
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.000
Meter Box # D3010
Nozzle Diameter 0.25"
Probe Length 4'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.01 cfm @ 15" Hg
POST LEAK 0.015 cfm @ 17" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	0319	808.640	0.66	2.70	2.70	52	49	46	50	200	250	16
2		22	811.150	0.66	2.70	2.70	63	55	52	47	200	250	16
3		0037 ~~40~~	811.150 813.875	0.56	2.30	2.30	72	58	53	48	200	250	13
4		43 ~~25~~	816.135	.33	1.35	1.40	73	63	55	48	200	250	8
5		46 ~~31~~	818.640	.35	1.44	1.40	80	67	57	49	200	250	7
6		49 ~~34~~	819.950	.31	1.27	1.30	80	72	58	52	200	250	7
7		52 ~~37~~	821.860	.32	1.31	1.30	81	73	60	55	200	250	7
8		55 ~~40~~	823.665	.38	1.56	1.60	78	74	62	57	200	250	9
9		58 ~~43~~	825.690	.41	1.64	1.60	81	78	66	57	200	250	9
10		0701 ~~46~~	827.050	.43	1.74	1.80	76	80	67	56	200	250	10
	30	04 ~~49~~	829.000	.24									
AVERAGE /SUM													

0822 stop outlet pump break

FIELD DATA

Plant Deutsch
Date 1/18/91
Test Site Scrub #6
Run Number MS6I3
Operator JC

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O)		TEMPERATURES						PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	
1	30	0915	829.000	.27	1.11	1.10	80	72	69	56	200	250	6
2		18	831.545	.25	1.02	1.00	77	76	70	56	200	250	6
3		21	833.215	.23	1.07	1.00	76	81	71	57	200	250	6
4		24	834.860	.38	1.52	1.60	81	82	72	56	200	250	9
5		27	836.900	.41	1.68	1.70	78	84	73	55	200	250	10
6		30	838.995	.41	1.63	1.70	82	84	74	56	200	250	10
7		33	841.120	.44	1.81	1.80	79	87	76	57	200	250	12
8		36	843.380	.45	1.85	1.80	77	89	77	58	200	250	11
9		39	845.480	.48	1.97	2.00	77	90	79	59	200	250	12
10		42	847.785	.48	1.97	2.00	78	92	81	60	200	250	12
	60	45	850.000										
AVERAGE /SUM	60		41.360	0.41		1.69	76	87		54	200	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1/18/91

RUN# MS6I3 METHOD Multi. Metal

FACILITY Deutsch

TYPE Sed. Imp.

TECHNICIAN Jon R

IMP. SOLUTION 5% HNO_3 / 10% H_2O_2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml	543.2	544.5	-1.3
IMPINGER # 2	100 ml	545.7	538.8	6.9
IMPINGER # 3	Empty	455.1	452.2	2.9
IMPINGER # 4	Silica	700.6	693.0	7.6
DESCRIPTION				
IMPINGER RINSE				

SILICA GEL	CONDITION	FINAL (g)	INITIAL(g)	NET (g)

FILTER	NUMBER	DESCRIPTION

TOTAL MOISTURE (g) 16.1

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant DEUTSCH
Date 18 JAN 1991
Test Site Scrubber #6 out
Run Number MS6-03
Operator ARE

Ambient Temp 50°F
Barometer 30.16
Stack Pressure
Stack H2O % 2%
Stack Dia 19.5"

Meter ^H@
Meter Gamma
Meter Box # D817C
Nozzle Diameter 0.1875"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.01 cfm @ 17" Hg
POST LEAK 0.01 cfm @ 18"

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	ORIFICE PRESSURE (delta H, "H2O) Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 2	0	0838	422.58	1.9	2.7	2.5	76	66	51	34	278	247	18.0
2	3	0841	425.03	1.9	2.7	2.5	72	67	53	33	229	247	18.0
3	6	0844	427.50	1.7	2.4	2.4	76	68	54	32	264	247	17.5
4	9	0847	429.93	1.6	2.2	2.2	76	69	55	34	257	247	16.0
5	12	0850	432.28	1.5	2.1	2.1	74	73	57	35	252	247	14.5
6	15	0853	434.66	1.8	2.5	2.5	75	76	59	35	251	247	17.5
7	18	0856	437.04	1.9	2.7	2.5	76	75	60	35	245	247	18.0
8	21	0859	439.53	1.7	2.4	2.4	73	76	62	36	245	247	17.5
9	24	0902	442.99	1.6	2.2	2.2	74	78	64	37	246	247	16.0
9	27	0905	444.37	1.6	2.2	2.2	77	79	64	38	244	247	15.0
	30	0908	446.488										
AVERAGE /SUM			47.785										

FIELD DATA

Plant DEUTSCH
Date 18 JAN 1991
Test Site Scrubber exit
Run Number MS6003
Operator ARZ

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.010 @ 18"Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O)		TEMPERATURES						PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	
B 2	30	0916	446.488	1.6	2.2	2.2	75	68	67	40	251	247	14.0
2	33	0919	448.82	1.6	2.2	2.2	77	88	70	38	250	247	14.0
3	36	0922	451.15	1.6	2.2	2.2	77	89	70	37	252	247	14.0
4	39	0925	453.52	1.6	2.2	2.2	76	87	71	39	247	247	14.0
5	42	0928	455.88	1.6	2.2	2.2	75	88	71	41	250	247	14.0
6	45	0931	458.24	1.8	2.5	2.5	78	88	73	42	252	247	17.0
7	48	0934	460.74	1.8	2.5	2.5	75	87	73	42	248	247	17.0
8	51	0937	463.24	1.6	2.2	2.2	73	86	74	44	252	247	15.0
9	54	0940	465.63	1.5	2.1	2.1	73	90	76	45	250	247	14.0
9	57	0943	468.0	1.5	2.1	2.1	70	90	76	46	288	247	14.0
	60	0946	470.368										
AVERAGE /SUM	60		47.785	1.67		2.30	75	72		38	250	247	

59.5[illegible] 1.9[illegible]

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.18.91

RUN# MS603 METHOD Mult. Metals

FACILITY Deutsch

TYPE Std. Imp.

TECHNICIAN R. Peterson

IMP. SOLUTION 5% HNO3 / 10% H2O2

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 mL Imp. Soln	585.1	583.5	~~0.4~~ 1.6
IMPINGER # 2	100 mL Imp. Soln	545.3	540.7	4.6
IMPINGER # 3	Empty	461.2	460.3	0.9
IMPINGER # 4	Silica Gel	658.3	648.6	9.7
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 16.8

FIELD BLANKS

DISPOSITION/COMMENTS

KLEINFELDER

SHEET ____ OF ____

PROJECT _____ PROJECT NO. _____

SUBJECT _____ BY _____ DATE _____

REVIEWED BY _____ DATE _____

SCRUBBER #6

MULTI-METALS

	1-IN	1-OUT	2-IN	2-OUT	3-IN	3-OUT
Cd	0.098	0.008	0.0063	0.0085	0.0076	0.0058
Zn	9.90	11.00	12.00	12.00	12.00	12.00

FIELD DATA

Plant Deutsch
Date 11/15/91
Test Site EdRUB #6
Run Number C/S6I1
Operator JK

Ambient Temp 70
Barometer 29.56
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # D8C1C
Nozzle Diameter 0.25"
Probe Length 4'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.005 cfm 17" Hg
POST LEAK 0.005 cfm 15" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
1	0	11:37	585.125	.37	1.52	1.50	75	80	79	52	200	252	3
2	3	40	587.950	.36	1.48	1.50	75	84	79	52	200	252	3
3		43	589.635	.37	1.52	1.50	74	88	79	51	200	252	3
4	↓	46	591.015	.35	1.44	1.40	74	91	80	53	200	250	3
5		49	592.952	.37	1.52	1.50	75	93	81	54	200	250	3
6		52	594.950	.39	1.60	1.60	74	98	83	54	200	250	3.5
7		55	597.000	.45	1.55	1.80	74	100	84	54	200	250	4
8		58	599.170	.48	1.97	2.00	74	100	85	55	200	252	4
9		1201	601.446	.47	1.93	1.90	74	102	87	57	200	250	4
10	→	04	603.740	.48	1.97	2.00	74	103	88	58	205	252	4
	30	07	606.065										
AVERAGE /SUM													

FIELD DATA

Plant Dardsch
Date 1/15/91
Test Site Scrub #6
Run Number Cd5 6 I 1
Operator JK

Ambient Temp 78
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O)		TEMPERATURES						PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	
1	0	1222	606.065	.32	1.31	1.30	76	90	88	57	210	250	3
2		25	607.985	.32	1.31	1.30	75	92	87	57	210	250	3
3		28	609.855	.34	1.40	1.40	75	93	87	57	210	250	3
4		31	611.800	.35	1.44	1.40	75	95	87	55	210	250	3
5		34	613.770	.40	1.64	1.60	76	100	88	57	210	250	4
6		37	615.840	.41	1.68	1.70	76	102	89	57	215	250	4
7		40	617.980	.40	1.64	1.60	76	102	89	55	215	250	4
8		43	620.100	.42	1.72	1.70	76	103	90	59	215	250	4
9		46	622.240	.42	1.72	1.70	76	103	91	59	215	250	4
10		49	624.380	.42	1.72	1.70	76	104	91	60	215	250	4
	30	52	626.650										
AVERAGE /SUM	60		41.555	0.39		1.605	75.0	91		55	206	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.15.91

RUN# Cd56 I1 METHOD CARB 424 Cadmium

FACILITY Deutsch

TYPE Std. Imp.

TECHNICIAN A. Petramacy

IMP. SOLUTION 0.1N HNO3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp Soln	527.0	540.1	-13.1
IMPINGER # 2	100 ml Imp. Soln	579.4	573.4	6.0
IMPINGER # 3	Empty	455.9	452.3	3.6
IMPINGER # 4	Silica Gel	679.2	666.0	13.2
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 9.7

FIELD BLANKS

DISPOSITION/COMMENTS

lant DEUTSCH
ate 15 JAN 1991
est Site Scrubber #6
un Number CDS601
perator QRS

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLO TI
B 2	1 30	122
2	39	12
3	38	12
4	34 ~~42~~	12
5	~~42~~	12
6	~~45~~	12
7	48 ~~54~~	12
8	51 ~~54~~	12
9	54 ~~57~~	12
9	57 ~~60~~	12
	60	12
AVERAGE /SUM	60	

FIELD DATA

PAGE 1 OF 2

Plant DEUTSCH
Date 15 JAN 1991
Test Site Scrubber #6 out
Run Number CDS601
Operator QRS

Ambient Temp 75°
Barometer 29.96
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.89
Meter Gamma 0.09996
Meter Box # D81K
Nozzle Diameter 0.1875
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.017 cfm @15" Hg
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
A 2	0	1136	168.399	2.1	2.9	2.9	78	78	75	47	231	247	14
2	3	1139	171.20	2.1	2.9	2.9	80	80	74	46	237	247	14
3	6	1142	173.90	1.9	2.65	2.65	78	85	74	49	228	247	12.5
4	9	1145	176.48	1.8	2.5	2.5	80	88	75	52	237	247	12.0
5	12	1148	178.91	1.7	2.4	2.4	80	91	76	53	232	247	11.5
6	15	1151	181.41	1.8	2.5	2.5	78	94	77	54	230	247	11.5
7	18	1154	183.92	1.9	2.65	2.65	78	96	78	55	229	247	12.0
8	21	1157	186.45	1.8	2.5	2.5	80	97	79	56	228	247	11.5
9	24	1200	188.99	1.7	2.4	2.4	81	98	79	57	226	247	11.0
9	27	1203	191.51	1.7	2.4	2.4	80	99	81	58	226	247	11.0
	30	1206	193.801										
AVERAGE /SUM													

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.15.91

RUN# Cdsc01 METHOD CARB 424 CADMIUM

FACILITY Deutsch

TYPE Std. Imp.

TECHNICIAN A. Petravicz

IMP. SOLUTION 0.1N HNO_3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml Imp. Soln	533.9	535.8	-1.9
IMPINGER # 2	100ml Imp. Soln	553.7	550.2	3.5
IMPINGER # 3	Empty	461.2	459.9	1.3
IMPINGER # 4	Silica Gel	677.9	659.2	18.7
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 21.6

FIELD BLANKS

DISPOSITION/COMMENTS

FIELD DATA

Plant Dartmouth
Date 1/17/91
Test Site Scrub #6 IN
Run Number Cd36-I2
Operator JK

Ambient Temp 70
Barometer 30.18
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.50
Meter Gamma 1.004
Meter Box # D3010
Nozzle Diameter 0.157
Probe Length 9'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.017 cfm @ 6.5" Hg
POST LEAK 0.017 cfm @ 15" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 1		0957	724.525	.29	1.19	1.20	76	77	74	45	200	250	7
2	3	10:00	726.300	.28	1.15	1.10	76	81	74	47	200	250	6
3	6	03	727.995	.26	1.07	1.10	74	85	75	50	200	250	6
4	9	06	729.690	.33	1.35	1.40	75	87	76	52	200	250	8
5	12	09	731.625	.33	1.35	1.46	75	91	77	53	200	250	8
6	15	12	733.545	.34	1.40	1.40	75	93	81	54	200	250	8
7	18	15	735.475	.36	1.48	1.50	75	95	82	55	205	250	9
8	21	18	737.485	.39	1.60	1.60	75	98	84	57	210	250	9
9	24	21	739.545	.40	1.64	1.60	74	99	86	58	210	250	9.5
10	27	24	741.625	.40	1.64	1.60	74	100	87	59	210	250	9.5
	30	27	743.720										
AVERAGE /SUM													

FIELD DATA

Plant Rockwell
Date 11/19/91
Test Site Scrub #6
Run Number CdSG12
Operator JC

Ambient Temp
Barometer
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@
Meter Gamma
Meter Box #
Nozzle Diameter
Probe Length

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK
POST LEAK

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O)		TEMPERATURES						PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	
1		1037	743.730	.31	1.27	1.30	73	92	89	56	215	250	8
2	3	40	745.670	.31	1.27	1.30	73	95	89	56	215	250	8
3	6	43	747.625	.32	1.31	1.30	73	97	89	55	220	250	8
4	9	46	749.480	.40	1.64	1.60	77	100	90	56	225	250	9
5	12	49	751.435	.43	1.76	1.50	78	101	91	57	225	250	10
6	15	52	753.620	.43	1.76	1.80	78	102	92	57	225	250	10
7	18	55	755.750	.44	1.81	1.80	78	103	92	58	225	250	10
8	21	58	758.050	.47	1.93	1.90	78	103	93	59	225	250	11
9	24	1101	260.220	.56	2.05	2.10	78	104	94	60	225	250	13
10	27	04	762.585	.56	2.05	2.10	78	104	94	60	225	250	13
	30	07	764.980										
AVERAGE /SUM	60		40.455	0.37		1.54	76	90		55	213	250	

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.17.91

RUN# Cdse I 2 METHOD CARB 424-Cadmium

FACILITY Deutsch

TYPE Std. Imp.

TECHNICIAN A. Petersen

IMP. SOLUTION 0.1N HNO3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp. Sol'n	526.2	538.1	-11.9
IMPINGER # 2	100 ml Imp. Sol'n	540.5	532.7	7.8
IMPINGER # 3	Empty	454.4	452.3	2.1
IMPINGER # 4	Silica Gel	701.1	691.2	9.9
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 7.9

FIELD BLANKS

DISPOSITION/COMMENTS

Plant T	TRAVER POIN NUMBE	9													AVERAG /SUM
Date 1/															
Test SI															
Run Num															
Operato															

KLEINFELDER, INC.

TRAIN RECOVERY SHEET Cl Sec 2 424 - cadmium

DATE 1.17.91

RUN# ~~MS62~~ METHOD ~~mult. metals~~

FACILITY Deutsch

TYPE Std. Imp.

TECHNICIAN A. Pelerancy

IMP. SOLUTION ~~5% HNO3 / 10% H2O2~~ 0.1N HNO3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100ml Imp Soln	578.5	578.6	-0.1
IMPINGER # 2	100ml Imp. Soln	538.2	535.0	3.2
IMPINGER # 3	Empty	461.6	460.5	1.1
IMPINGER # 4	Silica Gel	678.0	667.4	10.6
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 14.8

FIELD BLANKS

DISPOSITION/COMMENTS

Plant Deutsch
Date 1/17/91
Test Site Scrub #6 IN
Run Number CdS6I3
Operator

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GA R
1	50	1408	7
2		11	7
3		14	79
4		17	79
5		20	79
6		23	79
7		26	79
8		29	80
9		32	583
10		35	825
	60	37	828
AVERAGE /SUM	60		42.

FIELD DATA

Plant Deutsch
Date 1/17/91
Test Site Scrub #6
Run Number CdS6I3
Operator JK

Ambient Temp 80
Barometer 30.10
Stack Pressure
Stack H2O %
Stack Dia

Meter ^H@ 1.80
Meter Gamma 1.004
Meter Box # DGC
Nozzle Diameter 0.25
Probe Length 4'

Probe Mat'l
Filter Number
Samp Box #
PRE LEAK 0.01 cfm @ 15" Hg
POST LEAK 0.01 cfm @ 15" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O)		TEMPERATURES						PUMP VAC. "Hg
					Desired	Actual	STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	
B	0	1330	765.580	.60	2.46	2.50	72	83	82	46	200	250	15
2		33	768.370	0.57	2.34	2.30	71	85	83	46	200	250	13
3		36	770.875	.62	2.54	2.50	72	87	82	49	200	250	14
4		39	773.435	.33	1.35	1.40	75	89	83	48	200	250	7
5		42	775.420	.35	1.44	1.40	74	93	85	50	200	250	7
6		45	777.365	.36	1.48	1.50	74	95	86	51	200	250	8
7		48	779.335	.35	1.44	1.40	75	96	86	52	200	250	7
8		51	781.295	.37	1.52	1.50	74	99	87	53	200	250	8
9		54	783.250	.40	1.64	1.60	74	100	88	53	200	250	9
10		57	785.320	.41	1.68	1.70	74	102	90	55	200	250	9
	30	1400	787.420										
AVERAGE /SUM													

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.17.91

RUN# Cd SG E3 METHOD Calc 424 - Cadmium

FACILITY [illegible]

TYPE XPS Imp.

TECHNICIAN [illegible]

IMP. SOLUTION 0.1 N HNO3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp. Sol.	529.9	537.1	-7.2
IMPINGER # 2	100 ml Imp. Sol.	579.5	573.8	5.7
IMPINGER # 3	Empty	454.9	452.3	2.6
IMPINGER # 4	Silica Gel	676.1	672.0	4.1
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 5.2

FIELD BLANKS

DISPOSITION/COMMENTS

Plant DEUTSCH
Date 17 JAN 1991
Test Site Scrubber #6-0
Run Number CdS603
Operator QRE

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME
A 2	30	1408
2	33	1411
3	36	1414
4	39	1417
5	42	1420
6	45	1423
7	48	1426
8	51	1429
9	54	1432
9	57	1435
	60	1438
AVERAGE /SUM	60	

FIELD DATA

Plant DEUTSCH
Date 17 JAN 1991
Test Site Scrubber #6-out
Run Number CdS603
Operator QRE

Ambient Temp 80°
Barometer 30.10
Stack Pressure
Stack H2O %
Stack Dia 19.5"

Meter ^H@
Meter Gamma
Meter Box # D817C
Nozzle Diameter 0.1875"
Probe Length

Probe Mat'l GLASS
Filter Number
Samp Box #
PRE LEAK 0.008 cfm @ 17" Hg
POST LEAK 0.001 cfm @ 19" Hg

TRAVERSE POINT NUMBER	ELAPSED TIME (mins)	CLOCK TIME	GAS METER READING (Vm)	VELOCITY HEAD (delta p)	ORIFICE PRESSURE (delta H, "H2O) Desired	Actual	TEMPERATURES STACK (Ts)	METER INLET	METER OUT	IMP	FILTER	PROBE	PUMP VAC. "Hg
B 2	0	1330	372.540	1.6	2.2	2.2	75	85	78	51	259	247	13.0
2	3	1333	374.86	1.6	2.2	2.2	74	86	80	48	255	247	13.0
3	6	1336	377.20	1.6	2.2	2.2	77	~~85~~ 90	80	45	258	247	13.0
4	9	1339	379.55	1.65	2.3	2.3	79	93	81	48	254	247	15.0
5	12	1342	381.91	1.7	2.4	2.4	79	93	83	52	267	247	14.5
6	15	1345	384.34	1.8	2.5	2.5	77	96	82	52	266	247	15.5
7	18	1348	386.83	1.8	2.5	2.5	77	95	84	53	261	247	15.5
8	21	1351	389.32	1.6	2.2	2.2	80	97	83	55	254	247	14.0
9	24	1354	391.72	1.5	2.1	2.1	78	99	85	55	257	247	13.0
9	27	1357	394.05	1.5	2.1	2.1	81	101	85	54	260	247	13.0
	30	1400	396.536										
AVERAGE /SUM													

KLEINFELDER, INC.

TRAIN RECOVERY SHEET

DATE 1.17.91

RUN# Cd5003 METHOD Calif 424 - Cadmium

FACILITY Deutsch

TYPE Sld. Imp.

TECHNICIAN A. Petaramoy

IMP. SOLUTION 0.1N HNO3

	SOLUTION	VOL. (ml)	DESCRIPTION
NOZZLE-PROBE RINSE			
UMBILICAL RINSE			

	SOLUTION	FINAL (g)	INITIAL(g)	NET(g)
IMPINGER # 1	100 ml Imp. Soln	574.9	577.7	-2.8
IMPINGER # 2	100 ml Imp Soln	539.4	534.1	5.3
IMPINGER # 3	Empty	462.2	460.5	1.7
IMPINGER # 4	Silica Gel	712.6	701.3	11.3
DESCRIPTION				
IMPINGER RINSE				

	CONDITION	FINAL (g)	INITIAL(g)	NET (g)
SILICA GEL				

	NUMBER	DESCRIPTION
FILTER		

TOTAL MOISTURE (g) 15.5

FIELD BLANKS

DISPOSITION/COMMENTS

KLEINFELDER

SHEET ____ OF ____

PROJECT _____ PROJECT NO. _____

SUBJECT _____ BY _____ DATE _____

REVIEWED BY _____ DATE _____

SCRUBBER #6

CADMIUM

1-IN	1-OUT	2-IN	2-OUT	3-IN	3-OUT
0.0055	0.009	0.01375	0.0105	0.00975	0.046

57.0
3.5
53.5

KLEINFELDER, INC.

City of Industry, California

PRELIMINARY VELOCITY TRAVERSE DATA

Plant DEUTSCH

Date 01/02/91

Location SCRUBBER #2 Inlet

Stack I.D. INLET

Barometric Pressure

Static Pres -2.3

Operators

Pitot No.

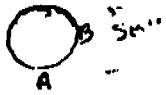
DIAMETER 53.5"

	TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
4.62	A 1	0.51	72°	
7.08	2	0.52	74°	
9.81	3	0.53	74°	
12.97	4	0.48	74°	
30	5	0.42	80	
22.5	6	0.59	79°	
38.17	7	0.65	77°	
43.6	8	0.60	75°	
47.5	9	0.57	73°	
50.69	10	0.53	73°	
53.4	11	0.53	72°	
55.6	12	0.57	72°	
		.5392		
	AVERAGE			

TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
B 1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
AVERAGE			

KLEINFELDER, INC.

City of Industry, California



PRELIMINARY VELOCITY TRAVERSE DATA

Plant DEUTSCH

Date 01/02/91

Location Scrubber #2 OUTLET

Stack I.D. OUTLET

Barometric Pressure

Static Pres + .28

Operators

Pitot No.

DIAMETER 58.0"

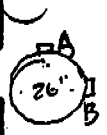
	TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
5.35	A 1	0.31		
9.59	2	0.38		
14.75	3	0.38		
22.23	4	0.41		
	5	0.45		
50.25	6	0.54		
55.41	7	0.73		
59.64	8	0.78		
	AVERAGE			

TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
B 1	0.54		
2	0.54		
3	0.41		
4	0.33		
5	0.36		
6	0.40		
7	0.44		
8	0.50		
		avg	0.468
	AVERAGE		

KLEINFELDER, INC.

City of Industry, California

PRELIMINARY VELOCITY TRAVERSE DATA



Plant: DEUTSCH

Date: 15 JAN 1991

Location: Scrubber #6

Stack I.D.: inlet

Barometric Pressure:

Static Pres: − 2.05

Operators:

Pitot No.:

DIAM. = 26.5"

	TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
0.66	A 1	0.40	80°	
2.2	2	0.39	80°	
4.0	3	0.39	80°	
6.0	4	0.40	80°	
9.0	5	0.41	80°	
17.5	6	0.45	81°	
20.5	7	0.47	81°	
22.75	8	0.45	81°	
24.3				
25.8				
	AVERAGE			

TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
B 1	0.43	80°	
2	0.43	80°	
3	0.42	80°	
4	0.41	80°	
5	0.39	81°	
6	0.39	81°	
7	0.39	81°	
8	0.38	81°	
AVERAGE			

KLEINFELDER, INC.

City of Industry, California

PRELIMINARY VELOCITY TRAVERSE DATA

Plant: DEUTSCH

Date: 15 JAN 1991

Location: Scrubber #6

Stack I.D.: outlet

Barometric Pressure:

Static Pres: -1.2

Operators: ARE / JK

Pitot No.:

DIAM = 19.5"

TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
A 1	2.1	65°	
2	2.2	65°	
3	1.4	65	
4	1.3	65	
5	1.6	65	
6	1.6	66	
7	1.6	65	
8	1.5	65	
AVERAGE			

TRAVERSE POINT NUMBER	VELOCITY HEAD	STACK TEMP.	CYCLONIC FLOW ANGLE
B 1	1.2	64	
2	1.4	65	
3	1.6	65	
4	1.6	65	
5	1.4	65	
6	1.4	65	
7	1.3	65	
8	1.3	65	
AVERAGE			

6.4 - 1
8.1 - 2
9.4 - 3
10.0 - 4
10.25 - 5
16.3 - 6
18.5 - 7
- 8
21.4 - 9
22.5 - 10

KLEINFELDER

SHEET ____ OF ____

PROJECT _____ PROJECT NO. _____

SUBJECT _____ BY _____ DATE _____

Cadmium - [illegible] REVIEWED BY _____ DATE _____

T_{STD} = 68 P_{STD} = 29.92

	IN-1	OUT-1	IN-2	OUT-2	IN-3	OUT-3
P_{BAR}	29.96	29.96				
T_M	91	85				
V_M	41.555	50.828				
V_{LC}	9.7	21.6				
Y	1.004	0.9996				
ΔH	1.605	2.52				
O_2	20.9	20.[illegible]				
CO_2	0	0				
CO	0	0				
P_{SS}	-2.05	1.2				
T_S	75	77				
C_P	0.84	0.84				
$\sqrt{\Delta P}$	0.627	1.3446				
D_S	26.5	19.5				
W_P - FRONT	0.0055	0.009				
W_P - FILTER	ϕ	ϕ				
W_P - BACK	—	—				
θ	60	60				
D_N	.250	0.1875				

Appndx B

Lab Data

(sample)

Received: 01/21/91 02/01/91 15:21:12

REPORT TO
Kleinfelder, Inc.
1370 Valley Vista Dr.
Suite 150
Diamond Bar, CA 91765
ATTEN ROWLAND HEBERT

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

CERTIFIED BY

ATTEN Ms. Carole Harris
PHONE 818-357-3247

CONTACT MCH

CLIENT KLEINFELDER SAMPLES 8
COMPANY Kleinfelder, Inc.
FACILITY

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.

WORK ID DEUTSCH
TAKEN BY KLEINFELDER STAFF
TRANS BY TMA STAFF
TYPE FILTERS & LIQUIDS
P.O. # 71-1621-042
INVOICE under separate cover

SAMPLE IDENTIFICATION

01 400122-96 FILTER
01 400122-49 ACETONE
01 400122-50 FRNT HALF
01 400122-51 BACK HALF
01 400122 KMnO4
01 400122 (TOTALS)
02 400122-95 FILTER
02 400122-52 ACETONE
02 400122-53 FRNT HALF
02 400122-54 BACK HALF
02 400122 KMnO4
02 400122 (TOTALS)
03 400122-98 FILTER
03 400122-55 ACETONE
03 400122-56 FRNT HALF
03 400122-57 BACK HALF
03 400122 KMnO4
03 400122 (TOTALS)
04 400122-97 FILTER
04 400122-58 ACETONE
04 400122-59 FRNT HALF

TEST CODES and NAMES used on this workorder

AS SED	As/Se Digestion
COMPEX	Sample Compositing
HG P	Hg Digestion
MIFILT	MMT Filter Digestion
MMTAA1	CARB Method 436-MMT
MMTAA2	CARB Method 436
MMTIC1	CARB Method 436
MMTIC2	CARB Method 436
MMTTOT	CARB Method 436
VOLUME	Sample Volume

SAMPLE IDENTIFICATION

04 400122-60 BACK HALF
04 400122 KMn04
04 400122 (TOTALS)
05 400122-92 FITER
05 400122-37 ACTONE
05 400122-38 FRNT HALF
05 400122-39 BACK HALF
05 400122 KMn04
05 400122 (TOTALS)
06 400122-73 FILTER
06 400122-40 ACTONE
06 400122-41 FRNT HALF
06 400122-42 BACK HALF
06 400122 KMn04
06 400122 (TOTALS)
07 400122-94 FILTER
07 400122-43 ACTONE
07 400122-44 FRNT HALF
07 400122-45 BACK HALF
07 400122 KMn04
07 400122 (TOTALS)
08 400122-93 FILTER
08 400122-46 ACTONE
08 400122-47 FRNT HALF
08 400122-48 BACK HALF
08 400122 KMn04
08 400122 (TOTALS)

Received: 01/21/91

Results by Sample

SAMPLE ID 400122-96 FILTER

SAMPLE # 01 FRACTIONS: A

Date & Time Collected not specified Category

MIFILT 01/25/91
Date Complete

SAMPLE ID 400122-49 ACETONE

SAMPLE # 01 FRACTIONS: B

Date & Time Collected 01/14/91 Category

VOLUME 86
mls

SAMPLE ID 400122-50 FRNT HALF

SAMPLE # 01 FRACTIONS: C

Date & Time Collected 01/14/91 Category

VOLUME 95
mls

W

Received: 01/21/91

TMA Inc. REPORT

Results by Sample

Work Order # A1-01-[illegible]9

SAMPLE ID 400122-50 FRNT HALF

FRACTION 01C TEST CODE MMTAA1 NAME CARB Method 436-MMT

Date & Time Collected 01/14/91 Category

CARB METHOD 436 -- MMT
Front Half composite results AA
Fraction 1A+1B

ELEMENT	RESULT ug	DET. LIMIT ug	RESULT mg/L	DET. LIMIT mg/L
Arsenic	NA		NA	
Lead	NA		NA	
Mercury	NA		NA	
Selenium	NA		NA	

Notes and Definitions for this Report:

ANALYST RSF

Final volume of composite 300 ml

Received: 01/21/91

TMA Inc. REPORT

Results by Sample

Work Order # A1-01 0

SAMPLE ID 400122-50 FRNT HALF

FRACTION 01C TEST CODE MMTIC1 NAME CARB Method 436

Date & Time Collected 01/14/91 Category

CARB METHOD 436 - MMT
Front Half Composite Results - ICAP
Fraction 01A

ELEMENT	RESULT ug	DET LIM ug	RESULT mg/L	DET LIM mg/L
Aluminum	NA	12	NA	
Antimony	NA	18	NA	
Barium	NA	3.0	NA	
Beryllium	NA	9.0	NA	
Cadmium	NA	4.2	NA	
x Chromium	NA	6.0	NA	
x Copper	33	6.0	0.11	0.020
Iron	NA	3.0	NA	
x Lead	14	0.30	0.046	0.0010
Manganese	NA	1.2	NA	
x Nickel	12	12	0.040	0.040
Phosphorus	NA	12	NA	
Silver	NA	3.0	NA	
Thallium	NA	72	NA	
Zinc	NA	9.0	NA	

Notes and Definitions for this Report:

ANALYST RSF
Final volume of composite, mL 300

Received: 01/21/91

Results by Sample

SAMPLE ID 400122-51 BACK HALF

SAMPLE # 01 FRACTIONS: D

Date & Time Collected 01/14/91

Category

VOLUME 308 mls

Received: 01/21/91

TMA Inc. REPORT
Results by Sample

Work Order # A1-01-[illegible]0

SAMPLE ID 400122-51 BACK HALF

FRACTION 01D TEST CODE MMTAA2 NAME CARB Method 436
Date & Time Collected 01/14/91 Category

CARB METHOD 436 - MMT
Back half results
Fraction 2A+2B

ELEMENT	RESULT ug	DET LIM ug	RESULT mg/L	DET LIM mg/L
Arsenic	NA		NA	
Lead	NA		NA	
Mercury	NA		NA	
Selenium	NA		NA	

Notes and Definitions for this Report:

ANALYST RSF
Initial volume back half sample, ml. 300
Final digestate volume, ml. 150

Received: 01/21/91

TMA Inc. REPORT
Results by Sample

Work Order # A1-01(0

SAMPLE ID 400122-51 BACK HALF

FRACTION 01D TEST CODE MMTIC2 NAME CARB Method 436
Date & Time Collected 01/14/91 Category

CARB METHOD 436 - MMT
Back Half Results - ICAP
Fraction 2A

ELEMENT	RESULT ug	DET LIM ug	RESULT mg/L	DET LIM mg/L
Aluminum	NA		NA	
Antimony	NA		NA	
Barium	NA		NA	
Beryllium	NA		NA	
Cadmium	NA		NA	
Chromium	NA		NA	
Copper	ND	3.6	ND	0.020
Iron	NA		NA	
Lead	3.0	0.18	0.017	0.0010
Manganese	NA		NA	
Nickel	3.0	7.2	ND	0.040
Phosphorus	NA		NA	
Silver	NA		NA	
Thallium	NA		NA	
Zinc	NA		NA	

Notes and Definitions for this Report:

ANALYST RSF
Initial volume back half sample, mL 308
Final digestate volume, mL 150

Received: 01/21/91

TMA Inc. REPORT

Results by Sample

Work Order # A1-01[illegible]0

SAMPLE ID 400122 (TOTALS)

FRACTION 01F TEST CODE MMTTOT NAME CARB Method 436

Date & Time Collected 01/14/91 Category

CARB METHOD 436 - Multiple Metal Train Analysis

Total Train Results

ELEMENT	RESULT ug	Det. Limit ug
Aluminum	NA	
Antimony	NA	
Arsenic	NA	
Barium	NA	
Beryllium	NA	
Cadmium	NA	
Chromium	NA	
Copper	33	9.6
Iron	NA	
Lead	17	0.48
Manganese	NA	
Mercury	NA	
Nickel	15*	19.2
Phosphorus	NA	
Selenium	NA	
Silver	NA	
Thallium	NA	
Zinc	NA	

Notes and Definitions for this Report:

ANALYST

* denotes some present but less than nominal detection limits

Received: 01/21/91

Results by Sample

SAMPLE ID 400122-95 FILTER

SAMPLE # 02 FRACTIONS: A

Date & Time Collected not specified Category

MIFILT 01/25/91
Date Complete

SAMPLE ID 400122-52 ACETONE

SAMPLE # 02 FRACTIONS: B

Date & Time Collected not specified Category

VOLUME 86
mls

SAMPLE ID 400122-53 FRNT HALF

SAMPLE # 02 FRACTIONS: C

Date & Time Collected 01/14/91 Category

VOLUME 94
mls

Received: 01/21/91

Results by Sample

SAMPLE ID 400122-53 FRNT HALF FRACTION 02C TEST CODE MMTAA1 NAME CARB Method 436-MMT
Date & Time Collected 01/14/91 Category

CARB METHOD 436 - MMT
Front Half composite results AA
Fraction 1A+1B

ELEMENT	RESULT ug	DET. LIMIT ug	RESULT mg/L	DET. LIMIT mg/L
Arsenic	NA		NA	
Lead	NA		NA	
Mercury	NA		NA	
Selenium	NA		NA	

Notes and Definitions for this Report:

ANALYST RSF

Final volume of composite 300 ml

Received: 01/21/91

TMA Inc. REPORT

Results by Sample

Work Order # A1-01-0

SAMPLE ID 400122-53 FRNT HALF

FRACTION 02C TEST CODE MMTIC1 NAME CARB Method 436

Date & Time Collected 01/14/91 Category

CARB METHOD 436 - MMT
Front Half Composite Results - ICAP
Fraction 01A

ELEMENT	RESULT ug	DET LIM ug	RESULT mg/L	DET LIM mg/L
Aluminum	NA		NA	
Antimony	NA		NA	
Barium	NA		NA	
Beryllium	NA		NA	
Cadmium	NA		NA	
Chromium	NA		NA	
Copper	ND	6.0	ND	0.020
Iron	NA		NA	
Lead	13	0.30	0.042	0.0010
Manganese	NA		NA	
Nickel	24	12	0.080	0.040
Phosphorus	NA		NA	
Silver	NA		NA	
Thallium	NA		NA	
Zinc	NA		NA	

Notes and Definitions for this Report:

ANALYST RSF
Final volume of composite, mL 300

SAMPLE ID 400122-54 BACK HALF SAMPLE # 02 FRACTIONS: D
Date & Time Collected 01/14/91 Category

VOLUME 300 mls

Received: 01/21/91

TMA Inc. REPORT

Results by Sample

Work Order # A1-01(0

SAMPLE ID 400122-54 BACK HALF

FRACTION 02D TEST CODE MMTAA2 NAME CARB Method 436

Date & Time Collected 01/14/91 Category

CARB METHOD 436 - MMT
Back half results
Fraction 2A+2B

ELEMENT	RESULT ug	DET LIM ug	RESULT mg/L	DET LIM mg/L
Arsenic	NA		NA	
Lead	NA		NA	
Mercury	NA		NA	
Selenium	NA		NA	

Notes and Definitions for this Report:

ANALYST RSF
Initial volume back half sample, ml. 300
Final digestate volume, ml. 150

Received: 01/21/91

TMA Inc. REPORT

Results by Sample

Work Order # A1-01-[illegible]0

SAMPLE ID 400122-54 BACK HALF

FRACTION 02D TEST CODE MMT1C2 NAME CARB Method 436

Date & Time Collected 01/14/91 Category

CARB METHOD 436 - MMT
Back Half Results - ICAP
Fraction 2A

ELEMENT	RESULT ug	DET LIM ug	RESULT mg/L	DET LIM mg/L
Aluminum	NA		NA	
Antimony	NA		NA	
Barium	NA		NA	
Beryllium	NA		NA	
Cadmium	NA		NA	
Chromium	NA		NA	
Copper	ND	3.6	ND	0.020
Iron	NA		NA	
Lead	ND	0.18	ND	0.0010
Manganese	NA		NA	
Nickel	7.2	7.2	0.040	0.040
Phosphorus	NA		NA	
Silver	NA		NA	
Thallium	NA		NA	
Zinc	NA		NA	

Notes and Definitions for this Report:

ANALYST RSF
Initial volume back half sample, mL 300
Final digestate volume, mL 150

Received: 01/21/91

TMA Inc. REPORT Work Order # A1-01[illegible]0

Results by Sample

SAMPLE ID 400122 (TOTALS) FRACTION 02F TEST CODE MMTTOT NAME CARB Method 436

Date & Time Collected not specified Category

CARB METHOD 436 - Multiple Metal Train Analysis

Total Train Results

ELEMENT	RESULT ug	Det. Limit ug
Aluminum	NA	
Antimony	NA	
Arsenic	NA	
Barium	NA	
Beryllium	NA	
Cadmium	NA	
Chromium	NA	
Copper	ND	9.6
Iron	NA	
Lead	13	0.48
Manganese	NA	
Mercury	NA	
Nickel	31	19.2
Phosphorus	NA	
Selenium	NA	
Silver	NA	
Thallium	NA	
Zinc	NA	

Notes and Definitions for this Report:

ANALYST

* denotes some present but less than nominal detection limits

Received: 01/21/91

Results by Sample

SAMPLE ID 400122-92 FITER SAMPLE # 05 FRACTIONS: A
Date & Time Collected 01/07/91 Category

MIFILT 01/25/91
Date Complete

SAMPLE ID 400122-37 ACTONE SAMPLE # 05 FRACTIONS: B
Date & Time Collected 01/07/91 Category

VOLUME 93
mls

SAMPLE ID 400122-38 FRNT HALF SAMPLE # 05 FRACTIONS: C
Date & Time Collected 01/07/91 Category

VOLUME 99
mls

Received: 01/21/91

TMA Inc. REPORT

Results by Sample

Work Order # A1-01-0

SAMPLE ID 400122-38 FRNT HALF

FRACTION 05C TEST CODE MMTAA1 NAME CARB Method 436-MMT

Date & Time Collected 01/07/91 Category

CARB METHOD 436 - MMT
Front Half composite results AA
Fraction 1A+1B

ELEMENT	RESULT ug	DET. LIMIT ug	RESULT mg/L	DET. LIMIT mg/L
Arsenic	NA		NA	
Lead	NA		NA	
Mercury	NA		NA	
Selenium	NA		NA	

Notes and Definitions for this Report:

ANALYST RSF

Final volume of composite 300 ml

Received: 01/21/91 Results by Sample

SAMPLE ID 400122-38 FRNT HALF FRACTION 05C TEST CODE MMTIC1 NAME CARB Method 436
Date & Time Collected 01/07/91 Category

CARB METHOD 436 - MMT
Front Half Composite Results - ICAP
Fraction 01A

ELEMENT	RESULT ug	DET LIM ug	RESULT mg/L	DET LIM mg/L
Aluminum	NA		NA	
Antimony	NA		NA	
Barium	NA		NA	
Beryllium	NA		NA	
Cadmium	NA		NA	
Chromium	NA		NA	
Copper	570	6.0	1.9	0.020
Iron	NA		NA	
Lead	66	0.30	0.22	0.0010
Manganese	NA		NA	
Nickel	60	12	0.20	0.040
Phosphorus	NA		NA	
Silver	NA		NA	
Thallium	NA		NA	
Zinc	NA		NA	

Notes and Definitions for this Report.

ANALYST RSF
Final volume of composite, mL 300

SAMPLE ID 400122-39 BACK HALF SAMPLE # 05 FRACTIONS: D
Date & Time Collected 01/07/91 Category

VOLUME 304
mls

Appendix

Process Data

KLEINFELDER

PROJECT Deutsch PROJECT NO.

SUBJECT Emission Factors BY RPH DATE 5/30/91

Current Applied REVIEWED BY DATE

Multi-Metal Test Results

Scrubber	Metal	#/HR	AMP-MIN	Test Time	#/AMP-HR
2	Cu	0.0656	2605	98	2.468E-03
		0.0135	494	78	2.132E-03
		0.00358	806	81	3.598E-04
	Ni	0.00690	5103	98	1.325E-04
		0.00304	9708	78	2.442E-05
		0.00208	9520	81	1.770E-05
6	Cd	0.000199	20250	45	4.422E-07
		0.000203	32850	73	4.622E-07
		0.000142	39150	87	3.156E-07

KLEINFELDER SHEET 2 OF 2

PROJECT Deutsch PROJECT NO.

SUBJECT Emission Factors BY RPH DATE 5/30/01

Non-Current REVIEWED BY DATE

SCRUBBER	METAL	#/HR	TEST TIME	#IN TANK	#/#
2	Pb	0.00759	64		
		0.00214	64		
		0.00185	64		
	Cr+6	<0.000155	64	29.40	5.645E-06
		<0.000150	64	29.40	5.442E-06
		<0.000154	64	29.40	5.587E-06
6	Zn*	0.274	60	30.07	9.112E-03
		0.294	60	30.07	9.777E-03
		0.293	60	30.07	9.744E-03

*Assume OZ/GAL is Liquid/Liquid

$$\frac{120\ GAL}{} \Big| \frac{38.5\ OZ}{GAL} \Big| \frac{0.1\ ZnO_x}{} \Big| \frac{GAL}{128\ OZ} \Big| \frac{8.33\ LB}{GAL} = 30.07\ \#\ ZnO_x$$

AMP. MINUTES

TEST # 1 1/7/91 @ 10:00 a.m.

Nickel TANK # 133 – 221

Nickel Tank # 139 – 1332

Nickel Tank # 219 – Ø

Nickel Tank # 220 – Ø

Nickel Tank # 320 – 134

Nickel Tank # 337 – 3416

Copper Tank # 339 – 2605

Test # 2 1/7/91 @ 2:30 p.m.

Nickel Tank # 133 – Ø

" " # 139 – Ø

" " # 219 – Ø

" " # 220 – 845

" " # 320 – 2657

" " # 337 – 3512

Copper Tank # 339 – 3264

AMP. MINUTES

TEST #3 (multi-metal) 1/8/91 @ 8:35 a.m.

Nickel Tank	#133	1886
" "	#139	1220
" "	#219	Ø
" "	#220	Ø
" "	#320	3627
" "	#337	2975
Copper Tank	#339	494

TEST #4 (verification metal) 1/8/91 @ 12:45 p.m.

Nickel Tank	#133	1928
" "	#139	Ø
" "	#219	806
" "	#220	1807
" "	#320	3127
" "	#337	3280

DATE 1-14-91 @ 9:04 am
TEST NO. _____

MULTIMETAL SOURCE TEST (nickel & copper)

AMP. MINUTES:

Nickel	Tank	#	337	-	1403
"	"	#	320	-	3110
"	"	#	219	-	2149
"	"	#	220	-	1587
"	"	#	133	-	Ø
"	"	#	139	-	1271
Copper	Tank	#	339	-	806

AMP. MINUTES

TEST #5 (verification Metal "Ni") 1-10-91 @ 9:55 a.m.

Nickel	Tank	# 337	–	3011
"	"	# 320	–	2643
"	"	# 219	–	1603
"	"	# 220	–	2250
"	"	# 133	–	1119
"	"	# 139	–	1388

DATE 1-14-91 @ 12:32
TEST NO.

VERIFICATION METAL (nickel)

AMP. MINUTES:

Nickel	Tank	#	337	-	3314
"	"	#	320	-	4997
"	"	#	219	-	1419
"	"	#	220	-	178
"	"	#	133	-	Ø
"	"	#	139	-	96

DATE 1-10-91
TEST NO. 1

CHROMIUM SOURCE TEST

TEST START TIME: 1:12 p.m.
TEST STOP TIME: 2:47 p.m.

TOTAL TEST TIME = 95 minutes

CAPACITY OF TANK INVOLVED:

TANK # 430/431 — 168 gallons.

CONCENTRATION OF CHROMIUM IN TANK:

TANK # 430/431 — .175 lb/gal (chromic acid)

DATE 1-11-91
TEST NO. 2

CHROMIUM SOURCE TEST

TEST START TIME: 9:11 a.m.
TEST STOP TIME: 10:38 a.m.

TOTAL TEST TIME = 87 minutes

CAPACITY OF TANK INVOLVED:

TANK # 430/431 — 168 gallons.

CONCENTRATION OF CHROMIUM IN TANK:

TANK # 430/431 — .175 lb/gal (chromic acid)

DATE 1-11-91
TEST NO. 3

CHROMIUM SOURCE TEST

TEST START TIME: 12:25 p.m.
TEST STOP TIME: 1:52 p.m.

TOTAL TEST TIME = 87 minutes

CAPACITY OF TANK INVOLVED:

TANK # 430/431 — 168 gallons.

CONCENTRATION OF CHROMIUM IN TANK:

TANK # 430/431 — .175 lb/gal (chromic acid)

DATE 1-16-91
TEST NO 1

MULTIMETAL SOURCE TEST (cadmium & zinc)

TEST START TIME: 8:05
TEST STOP TIME: 9:34

TOTAL TEST TIME 89 minutes

CAPACITY OF TANK:

Tank # 540/541 — 432 gal
Tank # 528/529 — 120 gal.

Concentration of metal in tanks:

Tank # 540/541 — 3.25 oz/gal (cadmium oxide)
Tank # 528/529 — 38.5 oz/gal. Alumin EN® @ 10% zinc oxide

AMP. MINUTES:

* Cadmium Tank # 540/541 — 20,250 amp. min.
Zincate Tank # 528/529 — no current used.

* one 45 min. load @ 450 amps.

1 x 45 x 450 = 20,250 amp min.

DATE 1-15-91 @ 11:36 a.m.
TEST NO. 1

CADMIUM SOURCE TEST

TEST START TIME : 11:36

TEST STOP TIME : 12:58

TOTAL TEST TIME = 82 minutes

CAPACITY OF TANK :

TANK # 540/541 — 432 gallons

CONCENTRATION OF CADMIUM IN TANK :

3.25 oz/gal (cadmium oxide)

AMP. MINUTES :

1500

DATE 1-16-91
TEST NO. 2

MULTIMETAL SOURCE TEST (cadmium & zinc)

TEST START TIME: 1:55
TEST STOP TIME: 3:08

TOTAL TEST TIME 73 minutes

CAPACITY OF TANKS:

Cadmium Tank # 540/541 — 432 gallons
Zincate Tank # 528/529 — 120 gallons

CONCENTRATION OF METAL IN TANKS:

Tank # 540/541 — 3.25 oz/gal (cadmium oxide)
Tank # 528/529 — 3.85 oz/gal Alumen EN® @ 10% zinc oxide

AMP. MINUTES:

* Cadmium Tank # 540/541 — 40500 amp. minutes
Zincate Tank # 528/529 — N/A, no current used.

* Two 45 minute loads @ 450 amps each

2 x 45 x 450 = 40500

DATE 1-18-91 RAC
TEST NO. [redacted] LAST ONE

MULTIMETAL SOURCE TEST (cadmium & zinc)

TEST START TIME: ~~1:55~~ 8:14 am
TEST STOP TIME: ~~3:08~~ 9:41 am

TOTAL TEST TIME ~~73~~ minutes 87 minutes

CAPACITY OF TANKS

8:20	9:05 450 amp 45'
8:55	9:40 450 amp 45'

Cadmium Tank # 540/541 — 432 gallons
Zincate Tank # 528/529 — 120 gallons

CONCENTRATION OF METAL IN TANKS.

Tank # 540/541 — 3.25 oz/gal. (cadmium oxide)
Tank # 528/529 — 385 oz/gal Alumen EN® @ 10% zinc oxide

AMP. MINUTES:

Two Loads

O.K.

* Cadmium Tank # 540/541 — 40500 amp. minutes
Zincate Tank # 528/529 — N/A, no current used.

* Two 45 minute loads @ 450 amps each

2 x 45 x 450 = 40500

DATE 1-17-91
TEST NO 2

CADMIUM SOURCE TEST

TEST START TIME: 9:58
TEST STOP TIME: 11:08

TOTAL TIME: 70 minutes

TANK CAPACITY:

432 gallons

Concentration of metal in Tank:

3.25 oz/gal cad. oxide.

Amp. Minutes:

20,250 amp. min

DATE 1-17-91
TEST NO 3

CADMIUM SOURCE TEST

TEST START TIME : 1:28
TEST STOP TIME : 2:38

TOTAL TEST TIME 70 mins

CAPACITY OF TANK:

432 gal.

Concentration of Metal in Tank:

3.25 oz/gal cad. oxide

Amp. minutes:

1350 amp. minutes

Appendix

Calibration Data

KLEINFELDER, INC.

Diamond Bar, California

TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 1/21/91

Thermocouple No. 12

Barometric Pressure 30.02 in. Hg

Ambient Temperature 72 °F

Calibrated by Jon K

Reference: Mercury in glass —

Other

Reference Point Number	Source (Specify)	Reference Thermometer Temperature (deg F)	Thermocouple Potentiometer Temperature (deg F)	Difference %
Low	Ice bath	32	32.0	0
Ambient	H_2O	72	71.3	0.13
High	Boiling H_2O	212	212.0	0

$$\text{Diff.} = \frac{(\text{Ref. Temp} + 460) - (\text{Test Temp} + 460)}{(\text{Ref. Temp.} + 460} \times 100$$

Diamond Bar, California

TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 1/21/91

Barometric Pressure 30.02 in. Hg

Calibrated by Jon K

Thermocouple No. F

Ambient Temperature 72 °F

Reference: Mercury in glass ✓

Other

Reference Point Number	Source (Specify)	Reference Thermometer Temperature (deg F)	Thermocouple Potentiometer Temperature (deg F)	Difference %
Low	Ice bath	32	32.0	0
Ambient	H_2O	72	71.4	0.11
High	Boiling H_2O	212	212.4	0.06

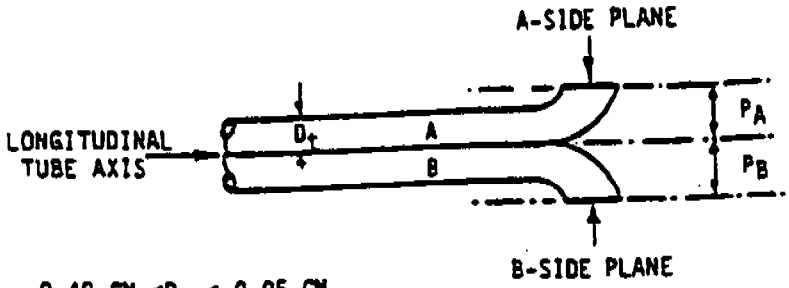
$$\text{Diff.} = \frac{(\text{Ref. Temp} + 460) - (\text{Test Temp} + 460)}{(\text{Ref. Temp.} + 460} \times 100$$

KLEINFELDER, INC.

Diamond Bar, California

PITOT TUBE CALIBRATION

Tube ID: P3 Date: 1/20/91 Calibrated By: Jon K



NOTE:

$1.05\ D_t < P < 1.50\ D_t$

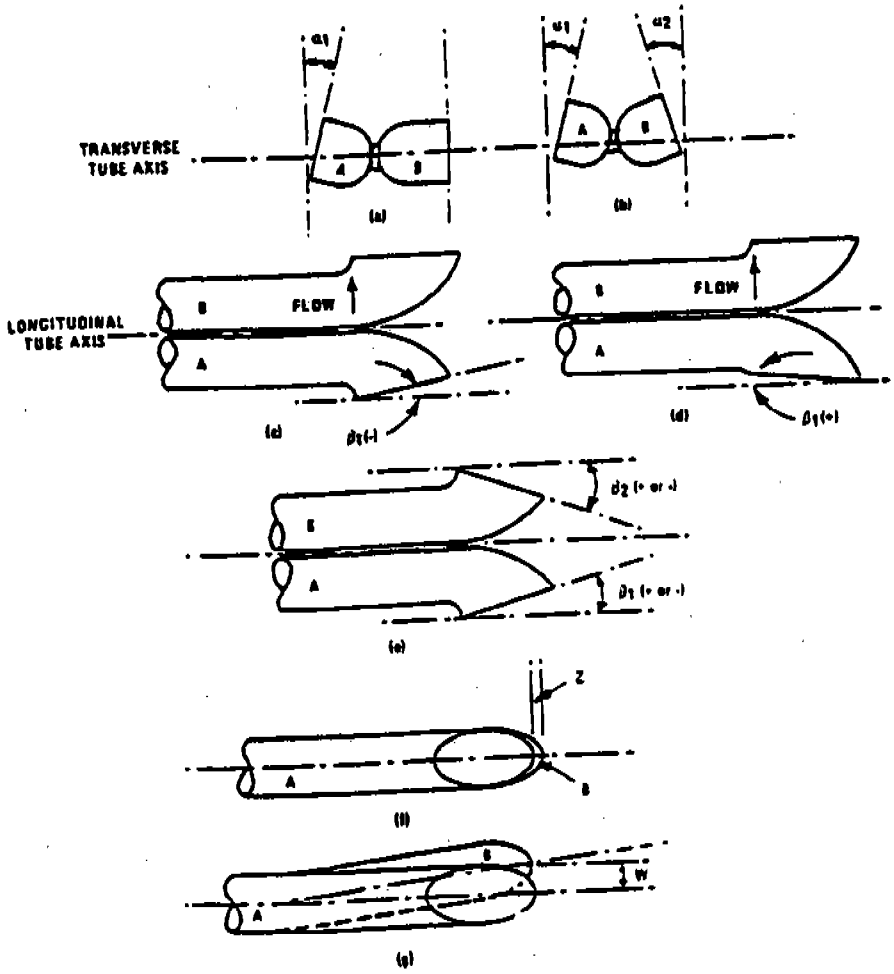
$P_A = P_B$

$0.48\ CM \leq D_t \leq 0.95\ CM$
(3/16 IN.) (3/8 IN.)

D_t = 3/8"

P_a = 1.50

P_b = 1.50



a_1 = 0

a_2 = 0

B_1 = 0

B_2 = +1.0

Z = 0

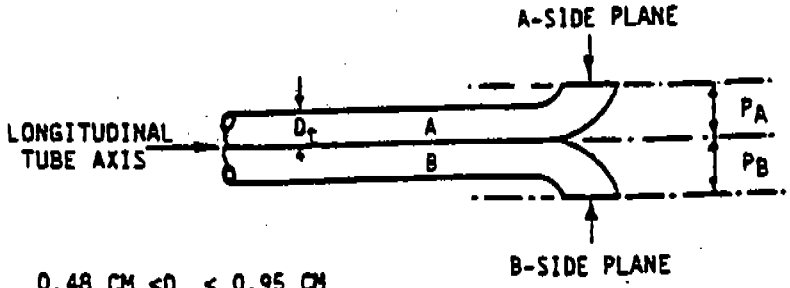
W = 0

KLEINFELDER, INC.

Diamond Bar, California

PITOT TUBE CALIBRATION

Tube ID: P5 Date: 1/20/91 Calibrated By: Jon K



NOTE:

$1.05\ D_t < P < 1.50\ D_t$

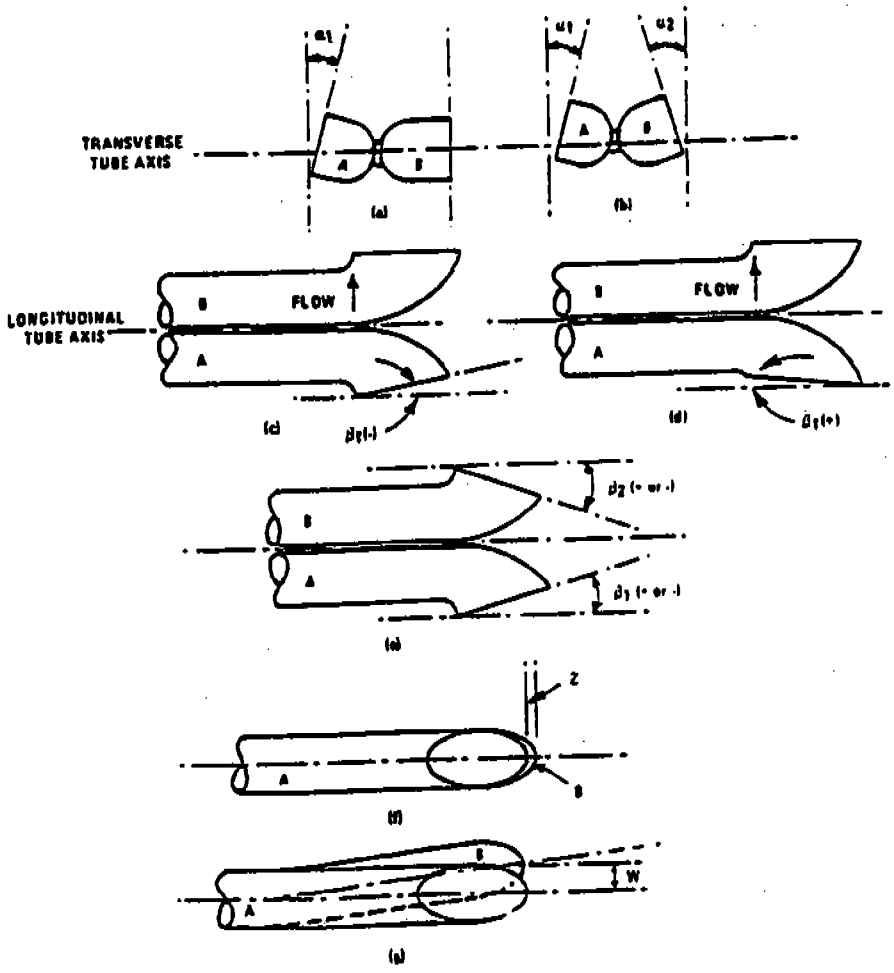
$P_A = P_B$

D_t = 3/8"

P_a = 1.33

P_b = 1.33

0.48 CM $\leq D_t \leq$ 0.95 CM
(3/16 IN.) (3/8 IN.)



a_1 = 1.0

a_2 = 0.5

B_1 = +0.5

B_2 = 0

Z = 0.04

W = 0.02

KLEINFELDER, INC.
City of Industry, California

METER BOX CALIBRATION DATA

Date 24 JUL 90

Meter Box No. 801C

Calibrated by RAH

Barometric Pressure (Pb) 29.22

Orifice Manometer (in. H_2O) H	Gas Volume: Wet Test Meter (ft^3) V_w	Gas Volume: Dry Gas Meter (ft^3) V_d	Temperatures: Wet Test Meter (deg F) T_w	Temperatures: Dry Gas Meter (deg F) T_d	Time (min) T_i	Y_i	$H@_i$
0.5	5.000	5.087	68	80	12.39	1.004	1.72
1.0	5.000	5.085	68	81	8.87	1.005	1.76
1.5	5.000	5.107	68	83	7.38	1.003	1.82
2.0	5.000	5.115	68	85	6.49	1.004	1.87
3.0	10.000	10.241	68	87	10.53	1.004	1.84
4.0	10.000	10.262	68	90	9.02	1.005	1.79
					Avg	1.004	1.80

H	$Y_i = \frac{(V_w)\ (P_b)\ (T_d+460)}{(V_d)\ (P_b+H/13.6)\ (T_w+460)}$	$H@_i = \frac{(0.0317)\ (H)}{(P_b)\ (T_d+460)} \left[\frac{(T_w+460)\ (T_i)}{V_w}\right]^2$
0.5		
1.0		
1.5		
2.0		
3.0		
4.0		

Each individual Y_i must be within 0.02 of the average Y
Each individual $H@_i$ must be within 0.15 of the average H@

KLEINFELDER, INC.
City of Industry, California

POST TEST METER BOX CALIBRATION FORM

Meter Box No. D801C Date 1/22/91 Calibrated by Jim

Barometric Pressure 30.08 Ambient Temp 78 Pre Test Y_1 1.004

Project Name Deutsch Project No. 71-1/22/22 post Hrun 1.0 Vac 3

Orifice Manometer (in. H_2O) H	Gas Volume		Temperatures		Time (min) T_1	Y_1	$H@_1$
	Wet Test Meter (ft^3) V_w	Dry Gas Meter (ft^3) V_d	Wet Test Meter (° F) T_w	Dry Gas Meter (° F) T_d			
1.0	5.408	5.675	69	86.5	10	0.9821	1.84
1.0	5.586	5.675	69	90	10	1.0209	1.72
1.0	5.376	5.675	69	93	10	0.9879	1.84
						Y_1 AVG 0.9970	$\overline{H@_1}$ = 1.80

METER BOX CALIBRATION HISTORY

Last Calibration Date _____ Calibrated by _____

$H_@$ of Calibration _____ Y_1 of Calibration _____

KLEINFELDER, INC.
City of Industry, California

POST TEST METER BOX CALIBRATION FORM

Meter Box No. D817C Date 1/22/91 Calibrated by Joh

Barometric Pressure 30.08 Ambient Temp 79 Pre Test Y_i 0.9996

Project Name Deutsch Project No. 71-400122 post Hrun 1.0 Vac 3

Orifice Manometer (in. H_2O) H	Gas Volume: Wet Test Meter (ft^3) V_w	Gas Volume: Dry Gas Meter (ft^3) V_d	Temperatures: Wet Test Meter (° F) T_w	Temperatures: Dry Gas Meter (° F) T_d	Time (min) T_i	Y_i	$H@_i$
1.0	5.691	5.640	73.5	91	10	1.0189	1.72
1.0	5.605	5.654	73.5	86	10	1.0121	1.75
1.0	5.637	5.615	73	90.5	10	1.0344	1.71
						Y_i AVG 1.0218	$\overline{H@_i}$ = 1.72

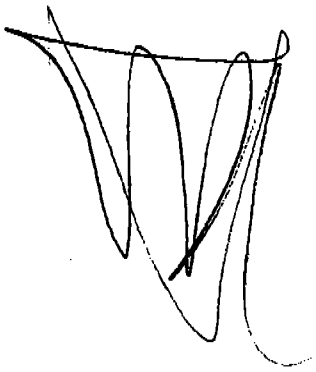
METER BOX CALIBRATION HISTORY

Last Calibration Date _____ Calibrated by _____

$H_@$ of Calibration _____ Y_i of Calibration _____

E

APP. C



APP
D

E

APPC

Source category: Electroplating
Plant name : Deutch Engineered Connecting Devices
Process : Zn, Cd, Ni, and Cu electroplating
chromic acid anodizing

Filename: REF-67.WQ1
Location: Oceanside, CA
Test date: 1/7-18/91

Date: 04/19/96
Ref. No.: 67
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	Concentration gr/DSCF	Concentration mg/DSCM	Emission rate, lb/hr	Process rate, A-hr	Emission factor mg/A-hr	Emission factor gr/A-hr	Rat.
Cr2O3 anodizing (to WS No. 2)	None	total Cr	1	CARB 425	75	90.8	54.33	38,042	5.65	1.6E-06	0.0037	0.00052				
		total Cr	2		85	93.3	50.24	34,254	2.73	8.4E-07	0.0019	0.00025				
		total Cr	3		80	91.9	50.00	34,603	0.09	2.8E-08	6.4E-05	8.2E-06				
										8.2E-07	0.0019		Average			NR
		Cr+6	1	CARB 425	75	90.8	54.3	38,042	BDL							
		Cr+6	2		85	93.3	50.2	34,254	BDL							
		Cr+6	3		80	91.9	50.0	34,603	BDL							
													Average			NR
	WS	total Cr	1	CARB 425	75	100.2	47.88	40,173	3.70	1.2E-06	0.0027	0.00041				
		total Cr	2		85	103.9	48.79	39,486	0.36	1.1E-07	0.00026	3.9E-05				
		total Cr	3		80	101.3	48.10	33,990	0.80	2.6E-07	0.00059	7.5E-05				
										5.2E-07	0.0012		Average			NR
		Cr+6	1	CARB 425	75	100.2	47.9	40,173	BDL							
		Cr+6	2		85	103.9	48.6	39,486	BDL							
		Cr+6	3		80	101.3	48.1	33,990	BDL							
													Average			NR
Cu plating tank	None	copper	1	0012	73	94.3	64.07	29,628	30.0	7.2E-06	0.0165	0.0018	43.4	23	0.36	
		copper	2		90	93.6	67.82	31,593	BDL				8.2			
		copper	3		80	91.3	48.72	33,923	BDL				13.4			
										7.2E-06	0.0165		Average	23	0.36	NR
	None	lead	1	0012	73	94.3	64.07	29,628	22.0	5.3E-06	0.012	0.0013	0			
		lead	2		90	93.6	67.82	31,593	16.0	3.6E-06	0.0083	0.0010	0			
		lead	3		80	91.3	48.72	33,923	13.0	4.1E-06	0.0094	0.0012	0			
										4.4E-06	0.010		Average			NR
	WS	copper	1	0012	73	96.7	45.44	39,508	570.00	0.00019	0.44	0.066	43.4	833	13	
		copper	2		90	98.7	46.70	39,783	120.00	4.0E-05	0.091	0.014	8.2	1,117	17	
		copper	3		80	102.5	48.33	39,645	33.00	1.1E-05	0.024	0.0036	13.4	161	2.5	
										8.1E-05	0.19		Average	704	11	C
	WS	lead	1	0012	73	96.7	45.44	39,508	66.00	2.2E-05	0.051	0.0076	0			
		lead	2		90	98.7	46.70	39,783	19.00	6.3E-06	0.014	0.0021	0			
		lead	3		80	102.5	48.33	39,645	17.00	5.4E-06	0.012	0.0018	0			
										1.1E-05	0.026		Average			NR
3-4 Ni plating tanks	None	nickel	1	0012	73	94.3	64.07	29,628	280.00	6.7E-05	0.15	0.017	85.1	111	1.7	
		nickel	2		90	93.6	67.82	31,593	190.00	4.3E-05	0.099	0.012	161.8	49	0.76	
		nickel	3		80	91.3	48.72	33,923	31.00	9.8E-06	0.022	0.0029	158.7	11	0.17	
										4.0E-05	0.092		Average	57	0.88	B
	WS	nickel	1	0012	73	96.7	45.44	39,508	6.00	2.0E-06	0.0047	0.00069	85.1	4.5	0.069	
		nickel	2		90	98.7	46.70	39,783	27.00	8.9E-06	0.020	0.0030	161.8	13	0.20	
		nickel	3		80	102.5	48.33	39,645	19.20	6.1E-06	0.014	0.0021	158.7	7.9	0.12	
										5.7E-06	0.013		Average	8.4	0.13	B

Source	Type of control	Pollutant	Run No.	Test Method	Samp. time, min	Isokinetic, %	Gas volume, DSCF	Volum. flow rate, DSCFM	Mass, ug	Concentration gr/DSCF	Concentration mg/DSCM	Emission rate, lb/hr	Process rate, A-hr	Emission factor mg/A-hr	Emission factor gr/A-hr	Rat.
5-6 Ni plating tanks	None	nickel	1	CARB 424	65	90.0	54.28	26,298	117.50	3.3E-05	0.076	0.0075	117	32	0.49	
		nickel	2		120	92.1	45.64	31,515	75.00	2.5E-05	0.058	0.0068	182	34	0.53	
		nickel	3		90	91.6	48.87	33,937	27.50	8.7E-06	0.020	0.0025	200	8.6	0.13	
										2.2E-05	0.051			25	0.38	C
	WS	nickel	1	CARB 424	65	98.4	47.27	40,387	32.50	1.1E-05	0.024	0.0037	117	15	0.24	
		nickel	2		120	100.2	47.64	39,983	25.00	8.1E-06	0.019	0.0028	182	14	0.21	
		nickel	3		90	99.0	46.49	39,503	12.50	4.1E-06	0.0095	0.0014	200	4.8	0.074	
										7.6E-06	0.017			11	0.17	B
2 Cd tanks 2 Zn tanks (to WS No. 6)	None	cadmium	1	0012	89	96.5	44.22	8,577	98.00	3.4E-05	0.078	0.0025	338	5.0	0.077	
		cadmium	2		73	94.7	40.92	8,090	6.30	2.4E-06	0.0054	0.00016	548	0.17	0.0026	
		cadmium	3		87	97.4	42.11	8,093	7.60	2.8E-06	0.0064	0.00019	653	0.19	0.0030	
										1.3E-05	0.030		Average	1.8	0.028	C
	None	zinc	1	0012	89	96.5	44.22	8,577	9,900	0.0035	7.9	0.25	0			
		zinc	2		73	94.7	40.92	8,090	12,000	0.0045	10	0.31	0			
		zinc	3		87	97.4	42.11	8,093	12,000	0.0044	10	0.31	0			
										0.0041	9.4		Average			NR
	WS	cadmium	1	0012	89	95.9	47.82	8,987	8.00	2.6E-06	0.0059	0.00020	338	0.40	0.0061	
		cadmium	2		73	97.6	48.25	8,914	8.50	2.7E-06	0.0062	0.00021	548	0.21	0.0032	
		cadmium	3		87	97.8	48.06	8,861	5.80	1.9E-06	0.0043	0.00014	653	0.14	0.0022	
										2.4E-06	0.0055		Average	0.25	0.0038	B
	WS	zinc	1	0012	89	95.9	47.82	8,987	11,000	0.0035	8.1	0.27	0			
		zinc	2		73	97.6	48.25	8,914	12,000	0.0038	8.8	0.29	0			
		zinc	3		87	97.8	48.06	8,861	12,000	0.0039	8.8	0.29	0			
										0.0037	8.6		Average			NR
Cd plating tanks	None	cadmium	1	CARB 433	82	94.2	40.19	7,990	5.50	2.1E-06	0.0048	0.00014	25	3.6	0.055	
		cadmium	2		70	95.0	39.37	7,759	13.75	5.4E-06	0.012	0.00036	338	0.56	0.0087	
		cadmium	3		70	94.4	41.18	8,172	9.75	3.7E-06	0.0084	0.00026	23	6.0	0.093	
										3.7E-06	0.0085		Average	3.4	0.052	C
	WS	cadmium	1	CARB 433	82	98.0	49.59	9,128	9.00	2.8E-06	0.0064	0.00022	25	5.4	0.084	
		cadmium	2		70	95.5	48.98	9,247	10.50	3.3E-06	0.0076	0.00026	338	0.41	0.0063	
		cadmium	3		70	91.7	45.31	8,907	46.00	1.6E-05	0.036	0.0012	23	28	0.43	
										7.3E-06	0.017		Average	11	0.17	C

Basis for rating: Lack of data or inconsistencies in reported data; wide variations from run to run; controlled emissions often comparable or higher than uncontrolled emissions.
Emission data for Pb, Cr, and Zn are not rated because processses are unspecified nonelectroplating; no electrical current was applied.

Other notes: