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.

Background Report Reference

AP-42 Section Number: 12.20

Background Chapter: 4

Reference Number: 52

Title: Source Test of Chrome Crankshaft Co., 6845 FlorencePlace, Bell Gardens, CA

Truesdaile Laboratories

April 1987

ELECTROPLATING
REF. 4-52

Truesdail Laboratories, Inc.
Test Report 17350
Scrubber Inlet and Outlet

~~Chrome Crankshaft~~ Co.
6845 Florence Place
Bell Gardens, California 90201

UNACCEPTABLE

This report is unacceptable since none of the runs are within the plus or minus 10 percent of the acceptable isokinetic rate (90 - 110%).

The report also used a moisture content at the outlet location that was above saturation for that specific temperature and pressure.

There was no drawing of the traverse point lay out.

There were no meter box calibration sheets with the report.

3/1/89

MEMORANDUM

SUBJECT: Acceptability of Test Reports for use as a Data Base for Chromium NESHAP

FROM: Frank R. Clay

TO: Dallas Safriet
Pollutant Characterization Section (MD-15)

I have reviewed the following four test reports and have found them unacceptable for use in the Data Base for the Chromium NESHAP. The reasons that the reports are unacceptable are also given.

The reports have been returned to Andy Smith.

cc: Andy Smith

REPORT

#4

TRUESDAIL LABORATORIES, INC.

CHEMISTS - MICROBIOLOGISTS - ENGINEERS
RESEARCH — DEVELOPMENT — TESTING

14201 FRANKLIN AVENUE
TUSTIN, CALIFORNIA 92680
AREA CODE 714 • 730-6239
AREA CODE 213 • 225-1564
CABLE: TRUELABS

CLIENT
Chrome Crankshaft Co.
6845 Florence Place
Bell Gardens, CA 90201
Attention: Jerry Miller

DATE April 30, 1987

RECEIVED April 7, 1987

LABORATORY NO. 17350

SAMPLE
Inlet and Outlet of Scrubber Serving Plating Operation
P.O. #2949

INVESTIGATION

Total Chromium, Hexavalent Chromium

RESULTS

On April 2, 1987 representatives of Truesdail Laboratories, Inc. conducted tests to determine the chromium removal efficiency of the west scrubber serving the plating operations at Chrome Crankshaft Company in Bell Gardens, California. The tests were conducted at two inlets and the outlet of the scrubber simultaneously.

For each sampling location, the chromium was determined by collecting a 90-minute sample of the flue gas by the wet impingement method. The sampling train consisted of a glass sampling probe connected to a set of Greenburg-Smith impingers charged with 200 mls of distilled water, and followed by a glass fiber backup filter, a vacuum pump, and a dry gas meter. Each sample was collected isokinetically for 7.5 minutes at each of 12 traverse points in the duct.

The flue gas flow rate was determined at each sampling location by measuring the average velocity head with a Standard Pitot tube and a Magnehelic differential pressure gage, and by measuring the average temperature with a Chromel-Alumel thermocouple and a Micromite potentiometer.

The sample collections were analyzed for total chromium by atomic absorption spectroscopy, and for hexavalent chromium by the diphenylcarbazide colorimetric method. The samples were kept refrigerated until analysis.

The results were as follows:

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from these Laboratories.

TRUESDAIL LABORATORIES, INC.

CHROME CRANKSHAFT CO.
4-27-87

Flue Gas:	Scrubber Inlet West	Scrubber Inlet East	Scrubber Outlet
Temperature, °F	70	72	62
Static Pressure, in. H_2O	-0.47	-0.47	+0.25
Velocity, ft/sec	18.3	16.6	18.9
Flue Dimensions, in.	24 X 24	24 X 24	27 X 34.5
Flue Area, sq. ft.	4.00	4.00	6.47
Flow Rate, ACFM	4400	3980	7340
, SCFM	4300	3880	7310
, DSCFM	4240	3810	7160
Moisture, % by vol.	1.6	1.9	2.0

Chromium:

Sampling Time	(12:16-13:57)	(12:16-13:57)	(12:17-13:56)
Sample Volume, DSCF	57.35	53.65	52.86
Concentration, ppm			
Total Cr	71.9	4.69	0.027
Cr^{+6}	65.9	3.60	0.020
Concentration, mg/m^3			
Total Cr	157.7	10.3	0.059
Cr^{+6}	144.5	7.90	0.044
Emission Rate, lbs/hr			
Total Cr	2.51	0.147	0.002
Cr^{+6}	2.30	0.113	0.001
Removal Efficiency, %			
Total Cr			99.93
Cr^{+6}			99.96

Respectfully submitted,

TRUESDAIL LABORATORIES, INC.

S. Hugh Brown

S. Hugh Brown, Supervisor
Air Pollution Testing

APPENDIX

TRUESDAIL LABORATORIES, INC.

DATE: 4/2/87

Sampling Location: Choke Crankshaft

Static Pressure, Ps: -.47

Test No.: WEST Inlet

Barometric Pressure: 29.85

Top Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec	Bottom Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec	Bottom Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec
1	.030	70	11.58	1	.030	71	11.59	1	.030	71	11.59
2	.070	70	17.69	2	.130	71	24.14	2	.130	71	24.14
3	.150	70	25.90	3	.150	71	25.93	3	.150	70	25.93
4	.130	70	24.11	4	.150	70	25.90	4	.170	70	27.58
5	.050	70	14.95	5	.070	70	17.69	5	.100	70	21.15
6	.010	70	6.69	6	.010	70	6.69	6	.010	70	6.69

(E included)

A. AVERAGE VELOCITY (TRAVERSE) ft/sec 18.33

B. REFERENCE POINT VELOCITY (TRAVERSE) ft/sec

C. AVERAGE VELOCITY (REFERENCE PT.) ft/sec

D. FLUE FACTOR C/B

E. PITOT TUBE CORRECTION FACTOR S+D. 1.0

F. GAS DENSITY CORRECTION FACTOR

G. CORRECTED VELOCITY, AxExF, ft/sec 18.33
or, AxDxExF, ft/sec

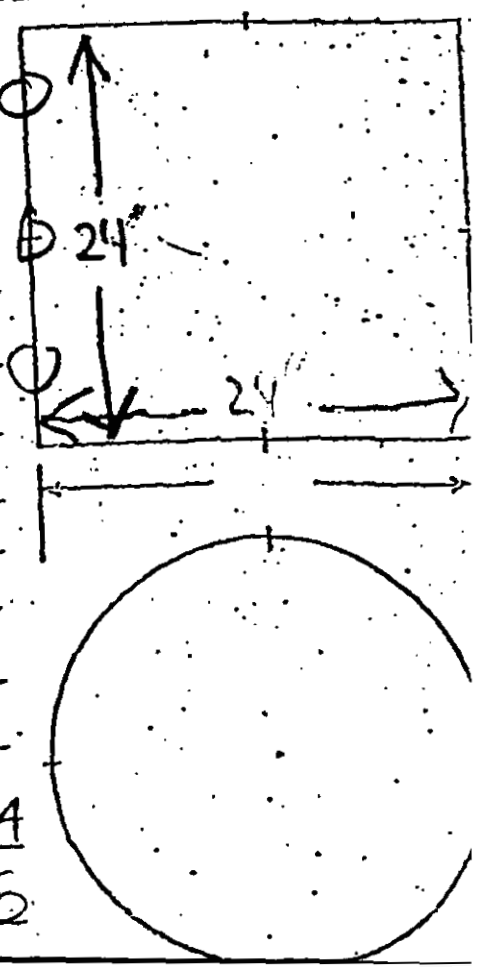
H. AREA OF FLUE, SQ. FT. 4.00

J. AVERAGE FLUE TEMPERATURE, °F 70

K. FLOW RATE, G x H x 60, CFM 4,399

L. FLOW RATE, $K \times \frac{520}{460 + J} \times \frac{BP + Ps/13.6}{29.9}$, SCFM 4,304

M. FLOW RATE, L x MOISTURE CORR., DSCFM 4,235



TRUESDAIL LABORATORIES, INC.

Date: 4/2/07

Sampling Location: Chaora Crankshaft

Barometric Pressure: 29.85

Test No. West Inlet

Nozzle Diameter: 5/16

	Time	Gas Meter Reading cu. ft. Vm	Gas Meter Press. in. H_2O Pm	Gas Meter Temp. °F Tm	Impinger Temp. °F Ti	Sample Point	CFM			
0	12:16	50.60	.50	70	35	2	.51	Top		
.5	12:24	54.43	.70	70	42	3	.74			
5.0	12:30	60.04	.68	70	42	4	.69			
2.5	12:38	65.26	.45	70	42	5	.43			
0.0	12:45	68.49				—				
0.0	12:52	68.49	.68	70	42	2	.69	middle		
7.5	13:00	73.67	.70	70	43	3	.74			
5.0	13:08	79.22	.70	71	43	4	.74			
.5	13:15	84.77	.48	73	43	5	.51			
0.0	13:23	88.60				—				
0.0	13:27	88.60	.68	78	43	2	.69	Bottom		
7.5	13:35	93.78	.70	78	43	3	.74			
5.0	13:42	99.33	.75	78	43	4	.79			
2.5	13:50	105.26	.60	78	44	5	.62			
0.0	13:57	109.91				—				
		59.31	.64	73	42					

PS = -.47 K = .8550

BP = 29.85

MF = .70

PF = 1.0

M = 388

Weight Collected, grams

Tare 0.1269

METER # 010

A. Total Weight

B. Condensate Volume, ml. 09 ml

C. Condensate Vapor Volume, $0.00267 \times \frac{460 + Tm}{B.P + Pm/13.6} \times B$, cu. ft. .43

D. Total Sample Volume, Vm + C, cu. ft. 59.74

E. Sample Volume, $D \times \frac{520}{460 + Tm} \times \frac{B.P. + Pm/13.6}{29.9} \times$ Moisture corr., DSCF .984 57.35

F. Concentration, 15.43 x A/E, grains/DSCF

G. Stack Gas Flow Rate, DSCFM 4,235

H. Emissions, 60 x G x F/7000, lbs/hr

TRUEBDAIL LABORATORIES, INC.

Sampling Station CHROME CRANKSHAFT WEST INLET Date 4/2/87

WATER VAPOR AND GAS DENSITY CALCULATIONS

Percent Water Vapor in Gases

A. Gas pressure at meter, in. Hg. (absolute) 29.90

B. Vapor pressure of water at impinger temp., in. Hg. .2677

C. Volume of metered gas, cu. ft. 59.31

D. Volume of water vapor metered, B X C/A, cu. ft. .53

E. Volume of water vapor condensed, cu. ft. .43

F. Total volume water vapor in gas sample, D + E, cu. ft. .96

G. Total volume of gas sample, C + E, cu. ft. 59.74

H. Percent water vapor in sampled gas, 100 x F/G 1.6

GAS DENSITY CORRECTION FACTOR

Component	Volume Percent/100	x Moisture Correction	x Mol. Wt.	= Wt./Mole Wet Basis
Water	.016	1.0	18.0	.289
Carbon Dioxide	Dry Basis	.984	44.0	
Carbon Monoxide	Dry Basis		28.0	
Oxygen	Dry Basis		32.0	
Nitrogen & Inerts	Dry Basis		28.2	
			Average Molecular Weight	

J. Density of gas referred to air = $\frac{\text{Av. Mol. Wt.}}{28.95}$ =

K. Gas density correction factor = $\sqrt{\frac{1.00}{J}}$ =

TRUESDAIL LABORATORIES, INC.

4/2/07

Sampling Location: CHROME CRANKSHAFT

Static Pressure, Ps: -.47

Test No.: EAST Inlet

Barometric Pressure: 29.85

	Top Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec	Middle Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec	Bottom Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec
2.0	1	.010	71	6.69	1	.010	71	6.69	1	.010	71	6.69
6.0	2	.050	72	14.98	2	.050	71	14.97	2	.150	71	25.93
10.0	3	.100	72	21.19	3	.150	71	25.93	3	.150	71	25.93
14.0	4	.100	72	21.19	4	.130	71	24.14	4	.130	71	24.14
18.0	5	.050	72	14.98	5	.100	72	21.19	5	.100	72	21.19
22.0	6	.010	72	6.70	6	.010	72	6.70	6	.020	72	9.48

A. AVERAGE VELOCITY (TRAVERSE) ft/sec 16.60 (Excluded)

B. REFERENCE POINT VELOCITY (TRAVERSE) ft/sec

C. AVERAGE VELOCITY (REFERENCE PT.) ft/sec

D. FLUE FACTOR C/B

E. PITOT TUBE CORRECTION FACTOR 2' STD 1.0

F. GAS DENSITY CORRECTION FACTOR

G. CORRECTED VELOCITY, AxExF, ft/sec 16.60
or, AxDxExF, ft/sec

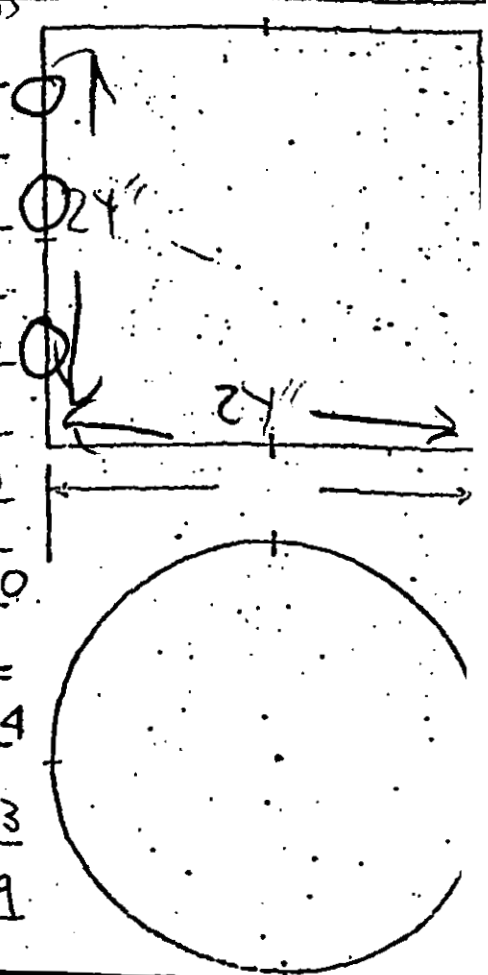
H. AREA OF FLUE, SQ. FT. 4.00

J. AVERAGE FLUE TEMPERATURE, °F 72

K. FLOW RATE, G x H x 60, CFM 3,984

L. FLOW RATE, $K \times \frac{520}{460 + J} \times \frac{BP + Ps/13.6}{29.9}$, SCFM 3,883

M. FLOW RATE, L x MOISTURE CORR., DSCFM 3,809



TRUESDAIL LABORATORIES, INC.

Date: 4/2/87

Sampling Location: Chrome Conversion

Barometric Pressure: 29.85

Test No. EAST Inlet

Nozzle Diameter: 5/16

	Time	Gas Meter Reading cu. ft. Vm	Gas Meter Press. in. H_2O Pm	Gas Meter Temp. °F Tm	Impinger Temp. °F Ti	Sample Point	CFM			
0	12:16	82.00	.28	70	42°F	2	.43	Top		
1.5	12:21	86.20	.51	70	42°F	3	.61			
5.0	12:30	89.78	.51	70	41°F	4	.61			
2.5	12:35	94.36	.28	70	41°F	5	.43			
1.0	12:45	98.90	—	—	—	—				
.0	12:53	98.90	.28	71	41°F	2	.43	Middle		
.5	13:00	102.75	.63	71	42°F	3	.74			
.0	13:08	107.80	.61	72	43°F	4	.69			
.5	13:15	112.08	.51	72	43°F	5	.61			
0.0	13:22	116.69	—	—	—	—				
.0	13:27	116.69	.63	72	43	2	.74	Bottom		
.5	13:35	123.50	.63	72	43	3	.74			
5.0	13:42	128.30	.61	73	43	4	.69			
2.5	13:50	133.00	.51	73	44	5	.61			
0.0	13:57	137.30	—	—	—	—				
		55.30	.50	71	42					

P_s = -.47 K = .8550

Bp = 29.85

MF = .90

PF = 1.0

@ M = 372

Weight Collected, grams

METER - 004

TARE LOT - 13036

A. Total Weight _____

B. Condensate Volume, ml. 12 ml

C. Condensate Vapor Volume, $0.00267 \times \frac{460 + Tm}{B.P + Pm/13.6} \times B$, cu. ft. .57

D. Total Sample Volume, Vm + C, cu. ft. 55.87

E. Sample Volume, $D \times \frac{520}{460 + Tm} \times \frac{B.P. + Pm/13.6}{29.9}$ x Moisture corr., DSCF 53.65 (.981)

F. Concentration, 15.43 x A/E, grains/DSCF _____

G. Stack Gas Flow Rate, DSCFM 3,909

H. Emissions, 60 x G x F/7000, lbs/hr _____

TRUESDAIL LABORATORIES, INC.

Sampling Station CHROME CRANKSHAFT EAST INLET Date 4/7/87

WATER VAPOR AND GAS DENSITY CALCULATIONS

Percent Water Vapor in Gases

A. Gas pressure at meter, in. Hg. (absolute) 29.89

B. Vapor pressure of water at impinger temp., in. Hg. .2677

C. Volume of metered gas, cu. ft. 55.30

D. Volume of water vapor metered, B X C/A, cu. ft. .50

E. Volume of water vapor condensed, cu. ft. .57

F. Total volume water vapor in gas sample, D + E, cu. ft. 1.07

G. Total volume of gas sample, C + E, cu. ft. 55.87

H. Percent water vapor in sampled gas, 100 x F/G 1.9

GAS DENSITY CORRECTION FACTOR

Component	Volume Percent/100	x Moisture Correction	x Mol. Wt.	= Wt./Mole Wet Basis
Water	.019	1.0	18.0	.345
Carbon Dioxide	Dry Basis	.981	44.0	
Carbon Monoxide	Dry Basis		28.0	
Oxygen	Dry Basis		32.0	
Nitrogen & Inerts	Dry Basis		28.2	
			Average Molecular Weight	

J. Density of gas referred to air = $\frac{\text{Av. Mol. Wt.}}{28.95}$ = _____

K. Gas density correction factor = $\sqrt{\frac{1.00}{J}}$ = _____

TRUESDAIL LABORATORIES, INC.

Sampling Location:

Static Pressure, Ps: -.5

Test No.:

Barometric Pressure:

Left Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec	Middle Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec	Rt. Point	Vel. Head H_2O"	Temp. °F	Velocity ft/sec
1	.115	63	22.51	1	.100	62	20.97	1	.105	61	21.47
2	.115	62	22.49	2	.070	62	17.55	2	.070	61	17.53
3	.090	62	19.89	3	.065	62	16.91	3	.065	61	16.84
4	.070	62	17.55	4	.060	62	16.24	4	.065	61	16.84
		.66									
		.66									
		.54									
		.51									

A. AVERAGE VELOCITY (TRAVERSE) ft/sec 18.91 (E included)

B. REFERENCE POINT VELOCITY (TRAVERSE) ft/sec

C. AVERAGE VELOCITY (REFERENCE PT.) ft/sec

D. FLUE FACTOR C/B

E. PITOT TUBE CORRECTION FACTOR STD 1.0

F. GAS DENSITY CORRECTION FACTOR

G. CORRECTED VELOCITY, AxExF, ft/sec 18.91
or, AxDxExF, ft/sec

H. AREA OF FLUE, SQ. FT. 6.47

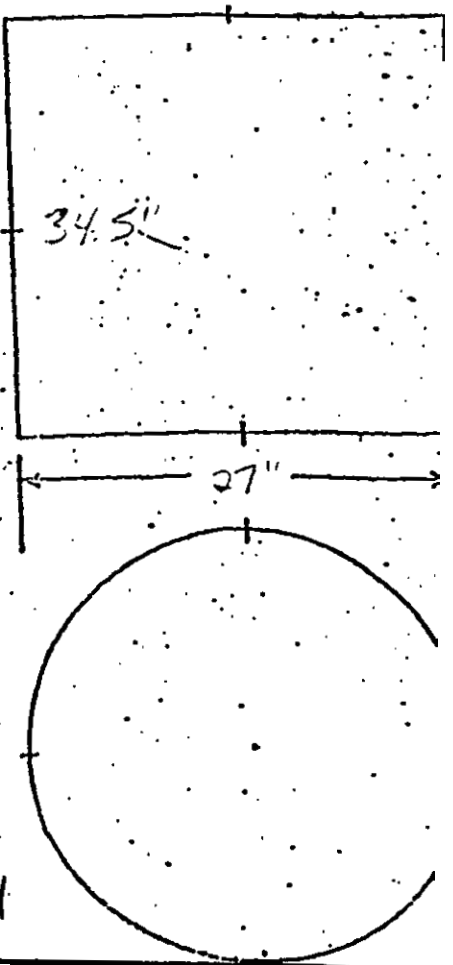
J. AVERAGE FLUE TEMPERATURE, °F 62

K. FLOW RATE, G x H x 60, CFM 7,341

L. FLOW RATE, $K \times \frac{520}{460 + J} \times \frac{BP + Ps/13.6}{29.9}$, SCFM 7,305

.980

M. FLOW RATE, L x MOISTURE CORR., DSCFM 7,159



TRUEBDAIL LABORATORIES, INC.

Sampling Location:
Test No.

Date: 4/12
Barometric Pressure:
Nozzle Diameter: 5/16

	Time	Gas Meter Reading cu. ft. Vm	Gas Meter Press. in. H_2O Pm	Gas Meter Temp. °F Tm	Impinger Temp. °F Ti	Sample Point	CFM			
0	1217	58.24	[illegible]	70°	32°	[illegible]	.66	MID	4.3"	
.5	1225	64.46	.80	71°	46°	=	.66		12.9"	
5.0	1233	69.02	.79	72°	47°	3	.59		21.6"	
.5	1240	73.70	.74	73°	47°	4	.52		30.2	
.0	1250	77.36		74°	47°	—				
.0	1250	77.36	.80	75°	47°	1	.66	LF		
.5	1258	81.90	.80	75°	47°	2	.66			
.0	1305	84.96	.71	75°	45°	3	.58			
5	1312	89.58	.71	75	46°	4	.51			
0	1320	91.36		75	49°	—				
.0	1325	94.30	.80	77°	43	1	.66	RT		
5	1333	99.20	.80	75°	46°	2	.66			
.0	1340	104.26	.79	75°	48°	3	.59			
.5	1348	109.72	.74	75°	48°	4	.52			
.0	1356	113.05		75°	47°					
		54.81	.78	74	45					

P_s = +.25 K = .8542
BP: 29.85
MF: .90
PC: 1.0

M = 383

Weight Collected, grams
METER # 069
TARE WT. 0.1284

A. Total Weight _____

B. Condensate Volume, ml. 12 ml

C. Condensate Vapor Volume, 0.00267 X $\frac{460 + Tm}{B.P + Pm/13.6}$ x B, cu. ft. .57

D. Total Sample Volume, Vm + C, cu. ft. 55.38

E. Sample Volume, D x $\frac{520}{460 + Tm}$ x $\frac{B.P. + Pm/13.6}{29.9}$ x Moisture corr., DSCF .980 52.86

F. Concentration, 15.43 x A/E, grains/DSCF _____

G. Stack Gas Flow Rate, DSCFM 7,159

H. Emissions, 60 x G x F/7000, lbs/hr _____

TRUESDAIL LABORATORIES, INC.

Sampling Station CHROME CRANKSHAFT OUTLET Date 4/2/87

WATER VAPOR AND GAS DENSITY CALCULATIONS

Percent Water Vapor in Gases

A. Gas pressure at meter, in. Hg. (absolute) 29.91

B. Vapor pressure of water at impinger temp., in. Hg. .3004

C. Volume of metered gas, cu. ft. 54.81

D. Volume of water vapor metered, B X C/A, cu. ft. .55

E. Volume of water vapor condensed, cu. ft. .57

F. Total volume water vapor in gas sample, D + E, cu. ft. 1.12

G. Total volume of gas sample, C + E, cu. ft. 55.38

H. Percent water vapor in sampled gas, 100 x F/G 2.02

GAS DENSITY CORRECTION FACTOR

Component	Volume Percent/100	x Moisture Correction	x Mol. Wt.	= Wt./Mole Wet Basis
Water	.020	1.0	18.0	
Carbon Dioxide	Dry Basis	.980	44.0	
Carbon Monoxide	Dry Basis		28.0	
Oxygen	Dry Basis		32.0	
Nitrogen & Inerts	Dry Basis		28.2	
			Average Molecular Weight	

J. Density of gas referred to air = $\frac{\text{Av. Mol. Wt.}}{28.95}$ =

K. Gas density correction factor = $\sqrt{\frac{1.00}{J}}$ =

```
          XROM "METH 5"
RUN NUMBER
EAST INLET
                    RUN
METER BOX Y?
                    RUN
DELTA H?
           .5000    RUN
BAR PRESS ?
         29.8500    RUN
METER VOL ?
         55.3000    RUN
MTR TEMP F?
         71.0000    RUN
STATIC HOH IN ?
          -.4700    RUN
STACK TEMP.
         72.0000    RUN
ML. WATER ?
         12.0000    RUN


SAT % = 2.7


IMP. % HOH = 1.0

% HOH=1.0


% CO2?
           .7000    RUN
% OXYGEN?
         21.0000    RUN

MWd =28.95
MW WET=28.84


PITOT CP ?
           .8400    RUN
SQRT PSTS ?
          5.8102    RUN
TIME MIN ?
         90.0000    RUN
NOZZLE DIA ?
           .3125    RUN
STK DIA INCH ?
                    RUN
AREA SQ FT ?
          4.0000    RUN

* VOL MTR STD = 54.926
  STK PRES ABS = 29.82
  VOL HOH GAS = 0.56
  % MOISTURE = 1.02
  MOL DRY GAS = 0.990
  % NITROGEN = 78.30
  MOL WT DRY = 28.95
  MOL WT WET = 28.84
  VELOCITY FPS = 14.23
  STACK AREA = 4.00
  STACK ACFM = 3,415.
* STACK DSCFM = 3,343.
  % ISOKINETIC =  137.18


END OF FIELD DATA
```

```
          XROM "METH 5"
RUN NUMBER
                    RUN
METER BOX Y?
                    RUN
DELTA H?
           .5000    RUN
BAR PRESS ?
         29.8500    RUN
METER VOL ?
         55.3000    RUN
MTR TEMP F?
         71.0000    RUN
STATIC HOH IN ?
          -.4700    RUN
STACK TEMP.
         72.0000    RUN
ML. WATER ?
                    RUN
% MOISTURE ?
          1.9000    RUN


SAT % = 2.7


IMP. % HOH = 0.0

% HOH=1.9


% CO2?
           .7000    RUN
% OXYGEN?
         21.0000    RUN

MWd =28.95
MW WET=28.74


PITOT CP ?
           .8400    RUN
SQRT PSTS ?
          5.8102    RUN
TIME MIN ?
         90.0000    RUN
NOZZLE DIA ?
           .3125    RUN
STK DIA INCH ?
                    RUN
AREA SQ FT ?
          4.0000    RUN

* VOL MTR STD = 54.926
  STK PRES ABS = 29.82
  VOL HOH GAS = 0.00
  % MOISTURE = 1.90
  MOL DRY GAS = 0.981
  % NITROGEN = 78.30
  MOL WT DRY = 28.95
  MOL WT WET = 28.74
  VELOCITY FPS = 14.25
  STACK AREA = 4.00
  STACK ACFM = 3,421.
* STACK DSCFM = 3,319.
  % ISOKINETIC =  138.18


END OF FIELD DATA
```

OUTLET

```
XROM "METH 5"
RUN NUMBER
OUTLET
                    RUN
METER BOX Y?
                    RUN
DELTA H?
          .7700     RUN
BAR PRESS ?
        29.8500     RUN
METER VOL ?
        54.8100     RUN
MTR TEMP F?
        74.0000     RUN
STATIC HOH IN ?
          .2500     RUN
STACK TEMP.
        62.0000     RUN
ML. WATER ?
        12.0000     RUN

SAT % = 1.9

IMP. % HOH = 1.0

% HOH=1.0

% CO2?
          .7000     RUN
% OXYGEN?
        21.0000     RUN

MWd =28.95
MW WET=28.84

PITOT CP ?
          .8400     RUN
SQRT PSTS ?
         6.5140     RUN
TIME MIN ?
        90.0000     RUN
NOZZLE DIA ?
          .3125     RUN
STK DIA INCH ?
                    RUN
AREA SQ FT ?
         6.4688     RUN

* VOL MTR STD = 54.170
  STK PRES ABS = 29.87
  VOL HOH GAS = 0.56
  % MOISTURE = 1.03
  MOL DRY GAS = 0.990
  % NITROGEN = 78.30
  MOL WT DRY = 28.95
  MOL WT WET = 28.84
  VELOCITY FPS = 15.94
  STACK AREA = 6.47
  STACK ACFM = 6,186.
* STACK DSCFM = 6,182.
  % ISOKINETIC =  118.31

END OF FIELD DATA
```

WEST INLET

```
XROM "METH 5"
RUN NUMBER
WEST INLET
                    RUN
METER BOX Y?
                    RUN
DELTA H?
          .6400     RUN
BAR PRESS ?
        29.8500     RUN
METER VOL ?
        59.3100     RUN
MTR TEMP F?
        73.0000     RUN
STATIC HOH IN ?
        -7.0000     CLX
         -.4700     RUN
STACK TEMP.
        70.0000     RUN
ML. WATER ?
         9.0000     RUN

SAT % = 2.5

IMP. % HOH = 0.7

% HOH=0.7

% CO2?
          .7000     RUN
% OXYGEN?
        21.0000     RUN

MWd =28.95
MW WET=28.87

PITOT CP ?
          .8400     RUN
SQRT PSTS ?
         6.3094     RUN
TIME MIN ?
        90.0000     RUN
NOZZLE DIA ?
          .3125     RUN
STK DIA INCH ?
                    RUN
AREA SQ FT ?
         4.0000     RUN

* VOL MTR STD = 58.708
  STK PRES ABS = 29.82
  VOL HOH GAS = 0.42
  % MOISTURE = 0.72
  MOL DRY GAS = 0.993
  % NITROGEN = 78.30
  MOL WT DRY = 28.95
  MOL WT WET = 28.87
  VELOCITY FPS = 15.44
  STACK AREA = 4.00
  STACK ACFM = 3,706.
* STACK DSCFM = 3,653.
  % ISOKINETIC =  134.19

END OF FIELD DATA
```

OUT Their Holt

```
XROM "METH 5"
RUN NUMBER
                    RUN
METER BOX Y?
                    RUN
DELTA H?
          .7700     RUN
BAR PRESS ?
        29.8500     RUN
METER VOL ?
        54.8100     RUN
MTR TEMP F?
        74.0000     RUN
STATIC HOH IN ?
          .2500     RUN
STACK TEMP.
        62.0000     RUN
ML. WATER ?
                    RUN
% MOISTURE ?
         2.0000     RUN

SAT % = 1.9

IMP. % HOH = 0.0

% HOH=1.9

% CO2?
          .7000     RUN
% OXYGEN?
        21.0000     RUN

MWd =28.95
MW WET=28.75

PITOT CP ?
          .8400     RUN
SQRT PSTS ?
         6.5140     RUN
TIME MIN ?
        90.0000     RUN
NOZZLE DIA ?
          .3125     RUN
STK DIA INCH ?
                    RUN
AREA SQ FT ?
         6.4688     RUN

* VOL MTR STD = 54.170
  STK PRES ABS = 29.87
  VOL HOH GAS = 0.00
  % MOISTURE = 1.87
  MOL DRY GAS = 0.981
  % NITROGEN = 78.30
  MOL WT DRY = 28.95
  MOL WT WET = 28.75
  VELOCITY FPS = 15.96
  STACK AREA = 6.47
  STACK ACFM = 6,196.
* STACK DSCFM = 6,139.
  % ISOKINETIC =  119.14

END OF FIELD DATA
```

```
XROM "METH 5"
RUN NUMBER
WEST INLET
THEIR MOISTUR
                    RUN
METER BOX Y?
                    RUN
DELTA H?
          .6400     RUN
BAR PRESS ?
        29.8500     RUN
METER VOL ?
        59.3100     RUN
MTR TEMP F?
        73.0000     RUN
STATIC HOH IN ?
         -.4700     RUN
STACK TEMP.
        70.0000     RUN
ML. WATER ?
                    RUN
% MOISTURE ?
         1.6000     RUN

SAT % = 2.5

IMP. % HOH = 0.0

% HOH=1.6

% CO2?
          .7000     RUN
% OXYGEN?
        21.0000     RUN

MWd =28.95
MW WET=28.78

PITOT CP ?
          .8400     RUN
SQRT PSTS ?
         6.3094     RUN
TIME MIN ?
        90.0000     RUN
NOZZLE DIA ?
          .3125     RUN
STK DIA INCH ?
                    RUN
AREA SQ FT ?
         4.0000     RUN

* VOL MTR STD = 58.708
  STK PRES ABS = 29.82
  VOL HOH GAS = 0.00
  % MOISTURE = 1.60
  MOL DRY GAS = 0.984
  % NITROGEN = 78.30
  MOL WT DRY = 28.95
  MOL WT WET = 28.78
  VELOCITY FPS = 15.47
  STACK AREA = 4.00
  STACK ACFM = 3,712.
* STACK DSCFM = 3,626.
  % ISOKINETIC =  135.16

END OF FIELD DATA
```

WEST INLET

SUMMARY OF EMISSIONS

PLANT _____ LOCATION _____

SAMPLED SOURCE _____

RUN	DATE	(1) V_m Std.	(2) DSCFM	FRONT HALF MILLIGRAMS PROBE	CYCLONE	FILTER	(3) TOTAL	(4) BACK HALF	5 FRONT + BACK TOTAL

CONCENTRATIONS

RUN	FRONT HALF Gr/DSCF	Mg/M^3	Lb/Hr	Kg/Hr	BACK HALF Gr/DSCF	Mg/M^3	Lb/Hr	Kg/Hr	TOTAL Gr/DSCF	Mg/M^3	Lb/Hr	Kg/Hr
	6	7	8	9	10	17	18	19	20	21	22	23

Remarks: _____

SAMPLING SUMMARY SHEET

PLANT Chrome Crankshaft 17350 LOCATION

SAMPLED SOURCE

Run	Date	N_p	3 Y_m	4 ΔH	5 P Bar.	6 V_m	7 T_m	8 V_m Std.	9 %	10 P_{st}	17 P_s	18 T_s	19 VP	20 V_w	21 $V_{w_{gas}}$	22 %M	23 M_d
West Inlet	2 APR 87	12	1.00	.64	29.85	59.310	73	58.708		-.47	29.82	70		9.0	.42	.72	.993
EAST Inlet	2 APR 87	12	1.00	.50	29.85	55.300	71	54.926		-.47	29.82	72		12.0	.56	1.02	.990
OUTLET	2 APR 87	12	1.00	.77	29.85	54.810	74	54.170		+.25	29.87	62		12.0	.56	1.03	.990

Run	24 CO_2	25 O_2	26 N_2	27 CO	28 —	29 MW_d	30 MW	31 C_p	32 $\sqrt{\Delta P_s (T_s + 460)}$	33 T_t	34 D_n	35 V_s	36 D_s	37 Area	38 ACFM	39 DSCFM	40 %I
WEST INLET	0.7	21.0	78.3			28.95	28.87	.84	6.3094	90	.3125	15.4		4.0	3706	3653	135.2 ~~134.2~~
EAST INLET	0.7	21.0	78.3			28.95	28.84	.84	5.8102	90	.3125	14.2		4.0	3415	3343	138.2 137.2
OUTLET	0.7	21.0	78.3			28.95	28.84	.84	6.5140	90	.3125	15.9		6.4688	6186	6182	119.1 118.3

$$V_m \text{ Std.} = Y_m \frac{17.64 \times V_m \left(P \text{ Bar.} + \frac{\Delta H}{13.6}\right)}{(T_m + 460)}$$

$$XM = \frac{100 \times V_{w_{gas}}}{V_m \text{ Std.} + V_{w_{gas}}}$$

$$V_{w_{gas}} = 0.0471\ V_w$$

$$M_d = \frac{100 - XM}{100}$$

$$MW_d = XCO_2 \times .44 + (XO_2 \times .32) + (XCO + XN_2) \times .28 + \left(X\text{Other} \times \frac{\text{Mol. wt.}}{100}\right)$$

$$MW = MW_d \times M_d + 18(1 - M_d)$$

$$P_s = P \text{ Bar.} \pm \frac{P_{st}}{13.6}$$

$$V_s = 85.49 \times C_p \sqrt{\Delta P_s (T_s + 460)} \left[\frac{1}{P_s \times MW}\right]^{1/2}$$

$$XI = \frac{0.09450 \times (T_s + 460) \times V_m \text{ Std.}}{V_s \times T_t \times P_s \times M_d \times A_n}$$

N_p = Total No. of Sampling points

Y_m = Meter Box Correction Factor

ΔH = Average Orfice Pressure Drop, inches H_2O

P Bar. = Barometric Pressure, Inches Hg, Absolute

V_m = Volume of Dry Gas at Meter Conditions, DCF

T_m = Average Meter Temperature, °F.

V_m Std. = Volume of Dry Gas at STP. DSCF[a]

X = Per Cent other gas removed before Dry Gas Meter

P_{st} = Static Pressure of Stack Gas, inches H_2O

P_s = Stack Gas Pressure, inches Hg.

T_s = Average Stack Temperature, °F

VP = Vapor Pressure of H_2O At Stack Temperature

V_w = Total H_2O Collected in Impingers and Silica Gel

$V_{w_{gas}}$ = Volumn of water vapor collected at STP, SCF[b]

XM = Per Cent Moisture by volume

M_d = Mole Fraction of Dry Gas

XCO_2 = Volume % Dry

XO_2 = Volume % Dry

XN_2 = Volume % Dry

XCO = Volume % Dry

MW_d = Molecular Weight of Stack Gas Dry Basis

MW = Molecular Weight of Stack Gas, Wet Basis

C_p = Pitot Tube Coefficient

$\sqrt{\Delta P_s (T_s + 460)}$ Is determined by averaging the square root of the product of the velocity head (P) and the absolute stack temperature from each sampling point.

T_t = Net time of test in minutes

D_n = Sampling Nozzle Diameter, inches

A_n = Area of Nozzle opening, ft^2.

V_s = Stack Gas Velocity at Stack Conditions, Feet per second.

D_s = Diameter of Stack, inches

Area = Area of duct in ft^2

ACFM = Actual Cubic Feet per minute

DSCFM = Dry Standard Cubic Feet per minute

%I = Per Cent Isokinetic

[a]Dry Standard Cubic Feet @ 68°F, 29.92 in. Hg.

[b]Standard Conditions @ 66°F. 29.92 in. Hg.

#11

Reject

CHROME CRANKSHAFT CO.
5845 EAST FLORENCE PLACE • BELL GARDENS, CALIF. 90201
TELEPHONE 773-5936 AREA CODE 213

POST OFFICE BOX 2126, BELL GARDENS, CALIF. 90201

LOS ANGELES, CAL. • CHICAGO, ILL.

COMPLETE CRANKSHAFT RECLAMATION

December 9, 1986

Frances Cameron, P.E.
Assoc. Air Resources Engineer
State of California
Air Resources Board
Toxic Pollutants Branch/
Compound Evaluation Section
P.O. Box 2815
Sacramento, CA 95812

Re: Scrubber Test Results

Dear Ms. Cameron,

As per your telecon with Mr. Jerry Miller, I am enclosing copies of our recent wet scrubber test results. I trust that this information is as you require to facilitate the successful evaluation procedures toward air emission guidelines.

Thank you for your assistance in these matters and if we can be of further help, please let me know.

Very Truly Yours,

CHROME CRANKSHAFT CO., INC.

David S. Davies

David S. Davies
Vice President

DSD
encl.

TRUESDAIL LABORATORIES, INC.

LN 17207

CHROME CRANKSHAFT CO.
10/22/86

Test No: 1(as is make up water) Flue Gas	Scrubber Inlet A	Scrubber Inlet B	Scrubber Outlet
Temperature, °F	73	75	61
Velocity, ft/sec	24.6	21.4	26.3
Static pressure, in. H_2O	-0.95	-0.95	-0.50
Flue Diameter, in.	24x24	24x24	27x35
Flue Area, Sq. ft.	4.00	4.00	6.56
Flow Rate, ACFM	5900.	5140.	10,300.
, SCFM	5750.	5000.	10,300.
, DSCFM	5680.	4930.	10,200.
Moisture, % by vol.	1.2	1.1	1.3
Chromium	(11:10-12:10)	(11:10-12:10)	(11:10-12:10)
Sample Volume, DSCF	28.83	27.18	29.28
Concentration			
Total Cr, PPM	5.06	0.22	0.04
, mg/m^3	11.1	0.48	0.08
Cr^{+6}, PPM	3.75	0.16	0.01
, mg/m^3	8.22	0.35	0.03
Emission Rate, lbs/hr			
Total Cr	0.236	0.009	0.003
Cr^{+6}	0.175	0.006	0.001
Removal Efficiency, %			
Total Cr			98.8
Cr^{+6}			99.4

vol. wt. mean mg/m³, Tcr 6.17
10⁻¹¹ gr/dscf 26.9

TRUESDAIL LABORATORIES, INC.

LN 17207

CHROME CRANKSHAFT CO.
10/22/86

Test No: 2(ph neutral-make up water)	Scrubber Inlet A	Scrubber Inlet B	Scrubber Outlet
Flue Gas			
Temperature, °F			
Velocity, ft/sec			
Static pressure, in. H_2O			
Flue Diameter, in.	24x24	24x24	27x35
Flue Area, Sq. ft.	4.00	4.00	6.56
Flow Rate, ACFM			
, SCFM	(from Test 1)		
, DSCFM	5680.	4930.	10,200.
Moisture, % by vol.	1.1	1.5	1.9
Chromium	(13:05-14:05)	(13:05-14:05)	(13:05-14:05)
Sample Volume, DSCF	28.62	26.79	27.94
Concentration			
Total Cr, PPM	3.84	0.39	0.12
, mg/m^3	8.42	0.86	0.27
Cr^{+6}, PPM	2.82	0.28	0.09
, mg/m^3	6.18	0.61	0.20
Emission Rate, lbs/hr			
Total Cr	0.180	0.016	0.010
Cr^{+6}	0.132	0.011	0.008
Removal Efficiency, %			
Total Cr			94.9
Cr^{+6}			94.4
vol. wt. mean mg/m³	4.91		
10^{-4} gr/dscf	21.41		

TRUESDAIL LABORATORIES, INC.

LN 17207

CHROME CRANKSHAFT CO.
10/29/86

Test No: 3 (clean make up water)

Flue Gas	Scrubber Inlet A	Scrubber Inlet B	Scrubber Outlet
Temperature, °F	79	81	69
Velocity, ft/sec	23.6	25.2	27.8
Static pressure, in. H_2O	-0.98	-0.98	-0.43
Flue Diameter, in.	24x24	24x24	27x35
Flue Area, Sq. ft.	4.00	4.00	6.56
Flow Rate, ACFM	5660.	6050.	10,900.
, SCFM	5440.	5800.	10,700.
, DSCFM	5300.	5650.	10,400.
Moisture, % by vol.	2.6	2.6	2.7
Chromium	(12:20-13:20)	(12:19-13:19)	(12:20-13:20)
Sample Volume, DSCF	34.71	29.78	32.38
Concentration			
Total Cr, PPM	1.54	0.25	0.01
, mg/m^3	3.39	0.17	0.02
Cr^{+6}, PPM	1.06	0.08	0.01
, mg/m^3	2.32	0.17	0.01
Emission Rate, lbs/hr			
Total Cr	0.072	0.012	0.001
Cr^{+6}	0.050	0.003	0.001
Removal Efficiency, %			
Total Cr			98.8
Cr^{+6}			98.1

vol. wt. mean mg Tcr/m³ .87
10^{-1} gr/dscf 3.8

respectfully submitted,

Truesdail Laboratories. Inc.

S. Hugh Brown

S. Hugh Brown, Supervisor
Air Pollution Testing