

To K. Morton

Date August 3/1981

Copies To W.A. Moore, A.C. Hall, R. Kent (EPS), Cottrell, Ref.
File

From C. Q. Olesen

Subject Stack sampling test results June 23 & 24, July 14 1981.

The roaster off gas stack was sampled on June 23, June 24, and July 14 with the following results excluding June 23 due to power failure.

Total Arsenic Emission rate	June 24	July 14
	4.383 mg/m ³	5.509 mg/m ³
	(14.47 lb/day)	(18.41 lb/day)
Total Particulate emission rate	15.28 mg/m ³	19.85 mg/m ³
	(49.58 lb/day)	66.34 lb/day
Stack gas volumetric rate	36106 CFM	37184 CFM
	(1022.4 SCM)	(1052.9 SCM)

The baghouse shaker was in operation 0 % of the test period for June 24, and 16.67 % of the sampling period for July 14. Between 74.5 % & 60.9 % of the arsenic collected was found to be in vapor form, Isokenitic sampling conditions of 98.37 % and 97.05 % were respectively achieved for each of the test periods.

DATE	June 24/1981	
TEST #	6-24-81	
Baghouse Inlet Temperature	220	
Status of Shaking Cycle During Test	0%	
Ambient Temperature	58%	
Dry Gas Volume Sampled	93.170	
Moisture Content	6.46%	
Stack Gas Temperature	657 ⁰ R	
Stack Gas Velocity	12.947 ft/s (3.946 M/s)	
Stack Gas Volumetric Flowrate	36106 CFM (1022.45 SCM)	
Total Particulate Weight	40.3 mg.	
Total Arsenic Weight	11.76 mg.	
As to Filter and Probe	3.00 mg.	
As to Impingers	8.76 mg.	
	1.118 mg/M ³	
	3.265 mg/M ³	
As Particulate Emission Rate		
As Vapour Emission Rate		
Total As Emission Rate	4.383 mg/M ³ (14.47 lb/day)	
Particulate Emission Rate	15.28 mg/M ³ (49.58 lb/day)	
% Isokinetic	98.37%	
Baghouse Particulate Removal Efficiency	99.81	
Baghouse Arsenic Removal Efficiency.	99.91	
Baghouse Pressure During Test (in. H ₂ O)	1.4-1.8	
Comments		

PERTINENT DATA #2

Particulate Loading

Weight of filter	<u>378.8</u>	g final
	<u>397.0</u>	g initial
	<u>18.2</u>	g net
Acetone washings	<u>1444.7</u>	g final
	<u>1422.6</u>	g initial
	<u>22.1</u>	g net
Total Particulate Weight	<u>40.3</u>	mg

Arsenic Loading

Particulate

Total particulate weight _____ mg
Diluted volume _____ ml
SDDC concentration _____ ppm
Total As in particulate _____ mg

Vapour

Total excess water diluted volume _____ ml
 SDDC concentration _____ ppm
 Total As in vapour _____ mg

CALCULATIONS FOR STACK TEST

Dry Gas Volume

$$V = 17.95 \left(\frac{V_m}{T_m} \right) \left(P_{bar} + \frac{\Delta H}{13.6} \right)$$

$$17.95 \times \frac{95.275}{538} (29.15 + \frac{2.14}{13.6}) = 93.170$$

$$V_{in M^3} = V \times .028316$$

Volume of Water Vapour

$$V_w (ft^3) = (.0480) V_{ic}$$

$$V_w (M^3) = (.00136) V_{ic}$$

Moisture Content

$$B_{w0} = \frac{V_w}{V + V_w}$$

$$1 - B_{w0} = .9354$$

Stack Gas Velocity

$$U_{s ft/s} = K_p C_p (AP)^{\frac{1}{2}} \left(\frac{T_s}{P_s M_s} \right)^{\frac{1}{2}}$$

$$U_s \text{ IN Meters} = U_{s ft/s} \times .3048$$

Volumetric Flow Rate

$$Q_s = U_s (Avg) (60) A_s (1 - B_{w0}) \left(\frac{T_{ref}}{T_s (avg)} \right) \left(\frac{P_s}{P_{ref}} \right)$$

$$Q_s (ft^3/min) = 67196.791 (U_s (avg)) (1 - B_{w0}) \left(\frac{P_s}{T_s avg} \right)$$

$$Q_s (ft^3/min) = 36106$$

$$Q_s (M^3/min) = Q_s (ft^3/min) \times .028316$$

$$\begin{aligned} V_m &= 95.275 \text{ ft}^3 \\ T_m &= 538 \text{ } ^\circ R \\ P_{bar}^2 &= 29.15 \text{ IN Hg} \\ \Delta H &= 2.14 \text{ IN H}_2\text{O} \\ V &= 93.170 \text{ ft}^3 \\ V &= 2.638 \text{ M}^3 \end{aligned}$$

$$\begin{aligned} V_{ic} &= 134 \text{ ml} \\ V_w &= 6.432 \text{ ft}^3 \\ V_w &= .182 \text{ M}^3 \end{aligned}$$

$$\begin{aligned} V_w &= 6.432 \text{ ft}^3 \\ V &= 93.170 \text{ ft}^3 \\ B_{w0} &= .0646 \end{aligned}$$

$$\begin{aligned} \Delta P &= .042 \\ K_p &= 85.33 \text{ ft/s} \\ C_p &= .833 \\ M_s &= 28.53 \\ P_s &= 29.15 \text{ IN Hg} \\ T_s &= 657 \text{ } ^\circ R \\ U_s &= 12.947 \text{ ft/s} \\ &= 3.946 \text{ M/S} \end{aligned}$$

$$\begin{aligned} A_s &= 62.4 \text{ ft}^2 \\ T_{ref} &= 537 \text{ } ^\circ R \\ P_{(ref)} &= 29.92 \text{ IN Hg} \\ U_s &= 12.947 \text{ ft/s} \\ B_{w0} &= .0646 \\ T_s (avg) &= 657 \text{ } ^\circ R \\ P_s &= 29.15 \text{ IN Hg} \\ Q_s &= 36106 \text{ ft}^3/min \\ Q_s &= 1022.4 \text{ M}^3/min \end{aligned}$$

Total Particulate Rate

$$C_p = \frac{Mn}{1000} \left(\frac{1}{V} \right)$$

$$C_p = \frac{Mn}{V}$$

$$\begin{aligned} Mn &= 40.3 \text{ mg} \\ V &= 93.170 \text{ ft}^3 \\ C_p &= .0004325 \text{ gr/scf} \end{aligned}$$

$$\begin{aligned} Mn &= 40.3 \text{ mg} \\ V &= 2.638 \text{ M}^3 \\ C_p &= 15.28 \text{ mg/m}^3 \end{aligned}$$

Total As Rate

$$Cas = \frac{MASV + MASP}{1000} \left(\frac{1}{V} \right)$$

$$\begin{aligned} MASV &= 8.760 \text{ mg} \\ MASP &= 3.000 \text{ mg} \\ V &= 93.170 \text{ ft}^3 \\ Cas &= .0001262 \text{ gr/scf} \end{aligned}$$

$$Cas = \frac{MASV + MASP}{V}$$

$$\begin{aligned} MASV &= 8.760 \text{ mg} \\ MASP &= 3.000 \text{ mg} \\ V &= 2.683 \text{ M}^3 \\ Cas &= 4.383 \text{ mg/m}^3 \end{aligned}$$

Percent Isokinetic

$$I = \frac{1.667 \left[(.00267) Vic + \frac{Vm}{Tm} (Pbar + \frac{AH}{13.6}) \right] Ts}{\theta Us Ps An}$$

$$\begin{aligned} An &= .001364 \text{ ft}^2 \\ Vic &= 134 \text{ ml} \\ Vm &= 95.275 \text{ ft}^3 \\ Tm &= 538 \text{ R}^\circ \\ Pbar &= 29.15 \text{ IN Hg} \\ AH &= 2.14 \text{ IN H}_2\text{O} \\ Ts &= 657 \text{ R}^\circ \\ \theta &= 120 \text{ MINS} \\ Ps &= 29.15 \text{ IN Hg} \\ Us &= 12.947 \text{ fps} \\ \% I &= 98.37 \end{aligned}$$

Emission Rate

$$\begin{aligned} G &= C (0.002205) Qs (60) 24 \\ &= C (Qs) 3.175 \end{aligned}$$

$$\begin{aligned} G &= \text{lb/day} \\ C &= \text{g/scf} \\ Qs &= \text{ft}^3/\text{min} \\ 0.002205 &= \text{g to lb} \\ 60 &= \text{min/hr} \\ 24 &= \text{hr/day} \end{aligned}$$

SYMBOLS

V	=	Dry Gas Volume (Std. Conditions)
V _m	=	Gas Volume (Meter Conditions)
T _m	=	Gas Temperature
V _{ic}	=	Excess Water in Impingers & Gel
V _w	=	Volume of Excess Water
B _{wo}	=	Moisture Content
AP	=	Average Velocity head of Stack Gas
P _s	=	Average Stack Gas Pressure
T _s	=	Average Stack Gas Temperature
M _s	=	Molecular Weight of Stack Gas
V _s	=	Stack Gas Velocity
A _s	=	Cross-sectional area of Stack
Q _s	=	Volumetric Flowrate
M _n	=	Amount of Particulate or Arsenic
C _p	=	Concentration of Particulate
C _{asp}	=	Concentration of Arsenic in Particulate
C _{asv}	=	Concentration of Arsenic in Vapour
M _{asp}	=	Weight of Arsenic in Particulate
M _{asv}	=	Weight of Arsenic in Vapour
A _n	=	Cross-sectional area of Nozzle
θ	=	Sampling Time
I	=	Percent Isokinetic
G	=	Emission Rate

Plant GiantRun Number 180⁰Location Stack 10:30-12:45Date June 24/1981Operator Evans, Olesen, RobinsonSample Case No. Monitor Unit No. Very Important - Fill in BlanksRead and record at the start of
each test point.Ambient temperature, °F 58Barometric pressure, in. Hg 29.15Assumed moisture % Heater box setting, °F Pitobe tip dia. in. 1/2"Pitobe length, ft. 10'Pitobe heater setting

Point	Clock Time	Dry Gas Meter ft ³	Pitot, in. H ₂ O P	Orifice H, in. H ₂ O		Dry gas temperature OF		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature OF	Impinger Temp- erature, OF	Stack Pressure in. Hg	Stack Temp- erature OF
				Desired	Actual							
3	0	413.300	.018	.96	.95	65 ⁰		4.5	170 ⁰	50		150
4	3	414.920	.026	1.35	1.35	65 ⁰		5.5	205 ⁰	45		170
5	6	416.780	.030	1.53	1.55	65 ⁰		6.0	230 ⁰	46		180
6	9	418.765	.029	1.43	1.45	65 ⁰		6.0	250 ⁰	50		200
6	12	420.715	.030	1.50	1.50	70		6.0	265 ⁰	53		200
8	15	422.720	.035	1.75	1.75	70 ⁰		6.5	270	55		200
9	18	424.850	.040	1.99	2.00	70 ⁰		7.0	275	55		200
10	21	427.135	.045	2.25	2.25	70 ⁰		8.0	250	55		200
11	24	429.575	.050	2.52	2.50	75 ⁰		9.0	240	55		200
12	27	432.105	.050	2.52	2.50	75 ⁰		9.0	235	60		200
12	30	434.655	.050	2.54	2.55	80 ⁰		9.0	230	60		200
11	33	437.220	.050	2.54	2.55	80 ⁰		9.0	230	60		200
10	36	439.895	.045	2.29	2.30	80 ⁰		9.0	230	65		200
9	39	442.285	.048	2.44	2.45	80 ⁰		8.5	225	65		200

Comments:

Figure 36. Suggested Particulate Field Data Form

Plant Giant

Run Number 180

Location Stack

Date June 24, 1981

Operator Evans, Olesen, Robinson

Sample Case No. _____

Monitor Unit No. _____

Very Important - Fill in Blanks

Read and record at the start of each test point.

Ambient temperature, °F _____

Barometric pressure, in. Hg _____

Assumed moisture % _____

Heater box setting, °F _____

Pitobe tip dia. in. _____

Pitobe length, ft. _____

Pitobe heater setting _____

Point	Clock Time	Dry Gas Meter ft ³	Pitot, in. H ₂ O P	Orifice H, in. H ₂ O		Dry gas temperature °F		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature °F	Impinger Temp- erature, °F	Stack Pressure in. Hg	Stack Temp- erature °F
				Desired	Actual							
8	42	444.840	.050	2.54	2.55	80°		9.0	220	65		200
7	45	447.485	.040	2.03	2.05	80°		8.0	220	70		200
7	48	449.910	.045	2.29	2.30	80°		8.0	220	70		200
5	51	452.360	.042	2.14	2.15	80°		8.0	220	70		200
4	54	454.755	.037	1.88	1.90	80°		7.0	223	73.5		200
3	57	457.080	.028	1.47	1.50	80°		6.0	220	75		200
	60	459.022										

Comments:

Figure 36. Suggested Particulate Field Data Form

Plant Giant

Run Number 900

Location Stack

Date June 24/81

Operator Robinson, Olesen, Evans

Sample Case No. _____

Monitor Unit No. _____

Very Important - Fill in Blanks

Read and record at the start of each test point.

Ambient temperature, °F _____

Barometric pressure, in. Hg _____

Assumed moisture % _____

Heater box setting, °F _____

Pitobe tip dia. in. _____

Pitobe length, ft. _____

Pitobe heater setting _____

Point	Clock Time	Dry Gas Meter ft ³	Pitot, in. H ₂ O P	Orifice H, in. H ₂ O		Dry gas temperature of		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature of	Impinger Temp- erature of	Stack Pressure in. Hg	Stack Temp- erature of
				Desired	Actual							
3	0	459.022	.033	1.72	1.70	75		6.0	85	50		180
4	3	461.228	.034	1.78	1.80	80		6.0	127	55		180
5	6	463.425	.040	2.03	2.05	80		6.0	155	55		200
6	9	465.775	.042	2.14	2.15	80		7.0	180	55		200
7	12	468.285	.045	2.29	2.30	80		7.5	195	56.6		200
8	15	470.665	.046	2.34	2.35	80		8.0	200	55		200
9	18	473.170	.050	2.54	2.55	80		8.5	207	56		200
10	21	475.770	.047	2.39	2.40	80		8.5	210	55		200
11	24	478.350	.052	2.64	2.65	80		9.0	200	58		200
12	27	480.950	.045	2.29	2.30	80		8.0	180	56		200
12	30	483.540	.048	2.44	2.45	80		8.5	155	57		200
11	33	486.075	.042	2.14	2.15	80		8.0	150	56		200
10	36	488.595	.048	2.44	2.45	80		8.5	145	56		200
8	39	491.060	.048	2.44	2.45	80		9.0	142	56		200

Comments:

Figure 36. Suggested Particulate Field Data Form

Plant GiantRun Number 90° cont.Location StackDate June 24/81Operator Robinson, Olesen, Evans

Sample Case No. _____

Monitor Unit No. _____

Very Important - Fill in BlanksRead and record at the start of
each test point.

Ambient temperature, °F _____

Barometric pressure, in. Hg _____

Assumed moisture % _____

Heater box setting, °F _____

Pitobe tip dia. in. _____

Pitobe length, ft. _____

Pitobe heater setting _____

Point	Clock Time	Dry Gas Meter ft ³	Pitot, in. H ₂ O P	Orifice H, in. H ₂ O		Dry gas temperature OF		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature OF	Impinger Temp- erature, OF	Stack Pressure in. Hg	Stack Temp- erature OF
				Desired	Actual							
9	42	493.655	.049	2.49	2.50	80		9.0	136	57		200
7	45	496.230	.050	2.54	2.55	80		9.0	160	58		200
6	48	498.885	.046	2.36	2.35	85		8.5	153	57		200
5	51	501.300	.042	2.16	2.15	85		8.0	157	58		200
4	54	503.825	.041	2.11	2.10	85		8.0	148	58		200
3	57	506.220	.041	2.11	2.10	85		7.5	152	59.6		200
	60	508.575										

Comments:

Figure 36. Suggested Particulate Field Data Form

% I for June 24, 1981

Vm	Ts	$\frac{\Delta H}{Pbar + 13.6}$	Us	Tm	I %
1.620	610	29.22	8.186	525	100.4
1.860	630	29.25	9.996	525	97.61
1.985	640	29.26	10.824	525	97.76
1.950	660	29.27	10.806	525	99.24
2.005	660	29.26	10.992	530	99.33
2.130	660	29.28	11.871	530	97.78
2.285	660	29.30	12.691	530	98.19
2.440	660	29.32	13.462	530	98.90
2.530	660	29.28	14.190	535	96.25
2.550	660	29.28	14.190	535	97.00
2.565	660	29.34	14.190	540	96.87
2.675	660	29.34	14.190	540	101.03
2.390	660	29.32	13.462	540	95.08
2.555	660	29.33	13.904	540	98.45
2.645	660	29.34	14.190	540	99.89
2.425	660	29.30	12.691	540	102.26
2.450	660	29.32	13.462	540	97.47
2.395	660	29.31	13.005	540	98.59
2.325	660	29.24	12.207	540	101.73
1.942	640	29.21	10.456	540	96.09
2.203	640	29.28	11.352	535	101.58
2.200	640	29.28	11.523	540	99.02
2.350	660	29.30	12.691	540	99.10
2.510	660	29.31	13.005	540	103.33
2.407	660	29.27	13.080	540	98.39
2.505	660	29.32	13.610	540	98.57
2.600	660	29.34	14.190	540	98.20
2.530	660	29.28	13.758	540	98.35
2.650	660	29.15	14.469	540	97.52
2.590	660	29.27	13.080	540	105.87
2.535	660	29.28	13.904	540	97.51
2.520	660	29.31	13.005	540	103.74
2.465	660	29.28	13.904	540	94.82
2.595	660	29.28	13.904	540	99.82
2.575	660	29.65	14.047	540	99.28
2.655	660	29.34	14.190	540	100.27
2.415	660	29.15	13.610	545	93.61
2.525	660	29.31	13.005	545	102.99
2.395	660	29.32	12.849	545	98.91
2.355	660	29.32	12.849	545	97.26

DATE	7-14-81	
TEST #	July 14/1981	
Baghouse Inlet Temperature	220° F	
Status of Shaking Cycle During Test		
Ambient Temperature	70° F	
Dry Gas Volume Sampled	71.000 ft ³	
Moisture Content	(2.010 M ³	
	6.57%	
Stack Gas Temperature	653° R	
Stack Gas Velocity	13,097 ft/s	
Stack Gas Volumetric Flowrate	(3.992 M/s	
	37184 CFM	
Total Particulate Weight	1052.9 SCM	
Total Arsenic Weight	39.9 mg.	
As to Filter and Probe	11.073 mg.	
As to Impingers	4.333 mg.	
	6.740 mg.	
As Particulate Emission Rate	2.156 mg/M ³	
As Vapour Emission Rate	3.353 mg/M ³	
Total As Emission Rate	5.509 mg/M ³	
	(18.41 lb/day	
Particulate Emission Rate	19.85 mg/M ³	
	66.34 lb/day	
% Isokinetic	97.05%	
Baghouse Particulate Removal Efficiency	99.81%	
Baghouse Arsenic Removal Efficiency	99.92%	
Baghouse Pressure During Test (in. H ₂ O)	1.6-1.2-1.9	
Comments		

JULY 14/81

PERTINENT DATA #1

Liquid in impingers 387 ml final
300 ml initial
87 ml net

Silicagel 250 g final
267 g initial
17 g net

Total Volume of Excess Water 104 ml
(ml net + g net)

Stack Conditions: Good

Roaster Conditions: Good

Cottrell Conditions: Good

Baghouse Conditions: Inlet Temp: 200 °F
Pressure Drops: 1.6-1.2-1.9 IN H₂O
Shaking Cycle: 16.67 %

PERTINENT DATA #2

Particulate Loading

Weight of filter	<u>.3970</u>	g final
	<u>.3803</u>	g initial
	<u>.0167</u>	g net
Acetone washings	<u>1.4468</u>	g final
	<u>1.4236</u>	g initial
	<u>.0232</u>	g net
Total Particulate Weight		mg

Arsenic Loading

Particulate

Total particulate weight _____ mg
Diluted volume _____ ml
SDDC concentration _____ ppm
Total As in particulate _____ mg

Vapour

Total excess water diluted volume _____ ml
 SDDC concentration _____ ppm
 Total As in vapour _____ mg

CALCULATIONS FOR STACK TEST

Dry Gas Volume

$$V = 17.95 \left(\frac{V_m}{T_m} \right) \left(P_{bar} + \frac{\Delta H}{13.6} \right)$$

$$V_{in M^3} = V \times .028316$$

$$\begin{aligned} V_M &= 72.46 \text{ ft}^3 \\ T_m &= 544 \text{ } ^\circ R \\ P_{bar}^2 &= 29.53 \text{ IN Hg} \\ \Delta H &= 2.239 \text{ IN H}_2\text{O} \\ V &= 71.000 \text{ ft}^3 \\ V &= 2.010 \text{ M}^3 \end{aligned}$$

Volume of Water Vapour

$$V_w (\text{ft}^3) = (.0480) V_{ic}$$

$$V_{w(M^3)} = (.00136) V_{ic}$$

$$\begin{aligned} V_{ic} &= 104 \text{ ml} \\ V_w &= 4.992 \text{ ft}^3 \\ V_w &= .141 \text{ M}^3 \end{aligned}$$

Moisture Content

$$B_{w_0} = \frac{V_w}{V + V_w}$$

$$1 - B_{w_0} = .9343$$

$$\begin{aligned} V_w &= 4.992 \text{ ft}^3 \\ V &= 71.000 \text{ ft}^3 \\ B_{w_0} &= .0657 \end{aligned}$$

Stack Gas Velocity

$$\begin{aligned} U_{s \text{ ft/s}} &= K_p C_p (AP)^{\frac{1}{2}} \left(\frac{T_s}{P_s M_s} \right)^{\frac{1}{2}} \\ &= 13.097 \end{aligned}$$

$$U_s \text{ IN Meters} = U_{s \text{ ft/s}} \times .3048$$

$$\begin{aligned} \Delta P &= .0438 \\ K_p &= 85.33 \text{ ft/s} \\ C_p &= .833 \\ M_s &= 28.53 \\ P_s &= 29.53 \text{ IN Hg} \\ T_s &= \text{OR} \\ U_s &= 653 \text{ ft/s} \\ &= 13.097 \text{ M/S} \end{aligned}$$

Volumetric Flow Rate

$$\begin{aligned} Q_s &= U_s (\text{Avg}) (60) A_s (1 - B_{w_0}) \left(\frac{T_{ref}}{T_s (\text{avg})} \right) \left(\frac{P_s}{P_{ref}} \right) \\ Q_s (\text{ft}^3/\text{min}) &= 67196.791 (U_s (\text{avg})) (1 - B_{w_0}) \left(\frac{P_s}{T_s \text{ avg}} \right) \\ Q_s (\text{ft}^3/\text{min}) &= 37184 \\ Q_s (\text{M}^3/\text{min}) &= Q_s (\text{ft}^3/\text{min}) \times .028316 \end{aligned}$$

$$\begin{aligned} &3.992 \\ A_s &= 62.4 \text{ ft}^2 \\ T_{ref} &= 537 \text{ } ^\circ R \\ P(\text{ref}) &= 29.92 \text{ IN Hg} \\ U_s &= 13.097 \text{ ft/s} \\ B_{w_0} &= .0657 \\ T_s (\text{avg}) &= 653 \text{ } ^\circ R \\ P_s &= 29.53 \text{ IN Hg} \\ Q_s &= 37184 \text{ ft}^3/\text{min} \\ Q_s &= 1052.9 \text{ M}^3/\text{min} \end{aligned}$$

Total Particulate Rate

$$C_p = \frac{Mn}{1000} \left(\frac{1}{V} \right)$$

$$C_p = \frac{Mn}{V}$$

$$\begin{aligned} Mn &= 39.9 \text{ mg} \\ V &= 71.000 \text{ ft}^3 \\ C_p &= .0005619 \text{ gr/scf} \end{aligned}$$

$$\begin{aligned} Mn &= 39.9 \text{ mg} \\ V &= 2.010 \text{ M}^3 \\ C_p &= 19.85 \text{ mg/m}^3 \end{aligned}$$

Total As Rate

$$Cas = \frac{MASV + MASP}{1000} \left(\frac{1}{V} \right)$$

$$\begin{aligned} MASV &= 6.740 \text{ mg} \\ MASP &= 4.333 \text{ mg} \\ V &= 71.000 \text{ ft}^3 \\ Cas &= .0001559 \text{ gr/scf} \end{aligned}$$

$$Cas = \frac{MASV + MASP}{V}$$

$$\begin{aligned} MASV &= 6.740 \text{ mg} \\ MASP &= 4.333 \text{ mg} \\ V &= 2.010 \text{ M}^3 \\ Cas &= 5.509 \end{aligned}$$

Percent Isokinetic

$$I = \frac{1.667 \left[(.00267) Vic + \frac{V_m}{T_m} (Pbar + \frac{AH}{13.6}) \right] Ts}{\theta Us Ps An}$$

$$\begin{aligned} An &= .001364 \text{ ft}^2 \\ Vic &= 104 \text{ ml} \\ V_m &= 72.46 \text{ ft}^3 \\ T_m &= 544 \text{ R}^\circ \\ Pbar &= 29.53 \text{ IN Hg} \\ AH &= 2.239 \text{ IN H}_2\text{O} \\ Ts &= 653 \text{ R}^\circ \\ \theta &= 90 \text{ MINS} \\ Ps &= 29.53 \text{ IN Hg} \\ Us &= 13.097 \text{ fps} \\ \%I &= 97.05 \end{aligned}$$

Emission Rate

$$G = C (0.002205) Qs (60) 24$$

$$= C (Qs) 3.175$$

$$As = (.0001559) (37184) 3.175 = 18.41 As^\#$$

$$\begin{aligned} G &= 66.34 \text{ lb/day} \\ C &= .0005619 \text{ gr/scf} \\ Qs &= 37184 \text{ ft}^3/\text{min} \\ 0.002205 &= \text{g to lb} \\ 60 &= \text{min/hr} \\ 24 &= \text{hr/day} \end{aligned}$$

SYMBOLS

V	=	Dry Gas Volume (Std. Conditions)
V _m	=	Gas Volume (Meter Conditions)
T _m	=	Gas Temperature
V _{ic}	=	Excess Water in Impingers & Gel
V _w	=	Volume of Excess Water
B _w	=	Moisture Content
AP	=	Average Velocity head of Stack Gas
P _s	=	Average Stack Gas Pressure
T _s	=	Average Stack Gas Temperature
M _s	=	Molecular Weight of Stack Gas
V _s	=	Stack Gas Velocity
A _s	=	Cross-sectional area of Stack
Q _s	=	Volumetric Flowrate
M _n	=	Amount of Particulate or Arsenic
C _p	=	Concentration of Particulate
C _{asp}	=	Concentration of Arsenic in Particulate
C _{asv}	=	Concentration of Arsenic in Vapour
M _{asp}	=	Weight of Arsenic in Particulate
M _{asv}	=	Weight of Arsenic in Vapour
A _n	=	Cross-sectional area of Nozzle
θ	=	Sampling Time
I	=	Percent Isokinetic
G	=	Emission Rate

Plant _____
 Run Number _____
 Location Giant Stack
 Date July 14/81
 Operator Evans & Olesen
 Sample Case No. _____
 Monitor Unit No. _____

Very Important - Fill in Blanks
 Read and record at the start of
 each test point.

Ambient temperature, °F 20 °C
 Barometric pressure, in. Hg 29.53
 Assumed moisture % 6
 Heater box setting, °F Hi 225
 Pitobe tip dia. in. .5
 Pitobe length, ft. 10'
 Pitobe heater setting Hi

Point	Clock Time	Dry Gas Meter ft ³	Pitot, in. H ₂ O P	Orifice H, in. H ₂ O		Dry gas temperature °F		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature °F	Impinger Temp- erature, °F	Stack Pressure in. Hg	Stack Temp- erature °F
				Desired	Actual							
3	3	518.0	.019	1.04	1.04	70		4	62	45		140
4	6	519.65	.024	1.25	1.25	70		4.5	65	40		170
5	9	521.43	.032	1.60	1.60	70		5.2	65	40		200
6	12	523.46	.032	1.60	1.60	70		5.2	65	40		200
7	15	525.51	.05	2.0	2.0	75		6.2	70	40		200
8	18	527.8	.04	2.0	2.0	75		6.2	70	42		200
9	21	530.7	.05	2.5	2.5	75		7	70	45		200
10	24	532.6	.05	2.5	2.5	75		7.2	70	45		200
11	27	535.15	.05	2.5	2.5	80		7.2	70	45		200
12	30	537.73	.052	2.67	2.7	85		7.5	71	45		200
12	33	540.38	.055	2.82	2.8	85		8	72	45		200
11	36	543.075	.055	2.82	2.8	85		8	75	45		200
10	39	545.8	.055	2.85	2.8	90		8	75	45		200
9	42	548.52	.052	2.69	2.7	90		8	78	45		200

Comments:

Figure 36. Suggested Particulate Field Data Form

Plant _____
 Run Number _____
 Location Giant Stack
 Date July 14/81
 Operator Evans & Olesen
 Sample Case No. _____
 Monitor Unit No. _____

Very Important - Fill in Blanks
 Read and record at the start of
 each test point.

Ambient temperature, °F _____
 Barometric pressure, in. Hg _____
 Assumed moisture % 6
 Heater box setting, °F _____
 Pitobe tip dia. in. .5
 Pitobe length, ft. 10'
 Pitobe heater setting _____

Point	Clock Time	Dry Gas Meter ft ³	Pitot, in. H ₂ O P	Orifice H, in. H ₂ O		Dry gas temperature OF		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature OF	Impinger Temp- erature, OF	Stack Pressure in. Hg	Stack Temp- erature OF
				Desired	Actual							
8	45	551.22	.05	2.58	2.6	90		7.8	80	45		200
7	48	553.87	.045	2.33	2.35	90		7.2	80	47		200
6	51	556.39	.045	2.33	2.35	90		7.2	86	50		200
5	54	558.89	.042	2.17	2.2	90		7	90	50		200
4	57	561.305	.036	1.86	1.86	90		6.2	85	47		200
3	60	563.59	.026	1.43	1.43	90		5.5	82	52		160
3	63	565.6	.028	1.55	1.55	85		5.5	80	58		150
4	66	567.655	.028	1.50	1.5	85		5.5	90	55		170
5	69	569.68	.035	1.79	1.80	85		5.8	90	55		200
6	72	571.87	.04	2.05	2.05	85		6.5	93	56		200
7	75	574.2	.048	2.46	2.50	85		7.5	95	56		200
8	78	576.76	.045	2.31	2.3	85		7.2	98	56		200
9	81	579.24	.058	3.00	3	90		8.8	102	56		200
10	84	582.2	.055	2.85	2.85	90		8.5	101	56		200

Comments:

Figure 36. Suggested Particulate Field Data Form

Monitor Unit No.

Read and record at the start of each test point.

Pitobe heater setting

[illegible]

Comments :

Figure 36. Suggested Particulate Field Data Form

% I for July 14/81

Vm	Ts	Pbar + $\frac{H}{13.6}$	Vs	Tm	% I
1.65	600	29.61	8.2682	530	98.81
1.78	630	29.62	9.5222	530	97.21
2.03	660	29.65	11.2540	530	98.37
2.05	660	29.65	11.2540	530	99.34
2.29	660	29.68	14.0674	535	88.04
2.90	660	29.68	12.5822	535	124.65
1.90	660	29.71	14.0674	535	73.12
2.55	660	29.71	14.0674	535	98.13
2.58	660	29.71	14.0674	540	98.37
2.65	660	29.73	14.3461	545	98.23
2.695	660	29.74	14.7541	545	97.17
2.725	660	29.74	14.7541	545	98.25
2.72	660	29.74	14.7541	550	97.18
2.70	660	29.73	14.3461	550	99.17
2.65	660	29.72	14.0674	550	99.23
2.52	660	29.70	13.3455	550	99.40
2.50	660	29.70	13.3455	550	98.61
2.415	660	29.69	12.8930	550	98.57
2.285	660	29.67	11.9367	550	100.67
2.01	620	29.63	9.8320	550	100.86
2.055	610	29.64	10.1205	545	99.50
2.025	630	29.64	10.2850	545	99.64
2.19	660	29.66	11.7697	545	98.72
2.33	660	29.68	12.5822	545	98.31
2.56	660	29.71	13.7831	545	98.70
2.48	660	29.70	13.3455	545	98.72
2.96	660	29.75	15.1510	550	103.02
2.58	660	29.74	14.7541	550	92.34
2.90	660	29.77	15.6648	550	97.68
2.78	660	29.74	14.7541	550	99.32