

ROYAL OAK MINES Inc.
Yellowknife Division - Giant Mine
Mill Department

To: K. Kim

CC: A. Jones

From: P. O'Hara

Date: October 22, 1993

Subject: STACK TESTING RESULTS - OCTOBER 14, 1993

The stack was sampled on Oct. 14 and the results are summarized below. The feed rate steady at 55 seconds during the test. The test was started at 2:05 pm and completed at 5:15 pm.

Volumetric Flowrate 39,948 m³/hr
 Arsenic Concentration 27.04 mg/m³
 Arsenic Emission Rate 29.2 kg/day -> 64.4 lb/day

Data for recent stack tests is summarized below:

Date	Flowrate (m ³ /hr)	Arsenic Conc (mg/m ³)	Arsenic Emission Rate	
			kg/day	lb/day
Sept 12/93		3.15	3.2	7.0
Oct 14/93	39,948	27.04	29.2	64.4
Jun 24/91	38,718	16.34	15.2	33.5
Aug 17/90	45,041	34.29	37.1	81.8
Oct 11/89	45,321	24.04	26.2	57.7

1983 40,550 8.62 31.4
 1981 36,106 4.383 ~~4.558~~ 14.47
 37,184 5.509 ~~6.254~~ 18.41

Bad Baghouse cleaning technique due to strike

Average =

30.55 lb/day

= 11,150 lb/year

= 11 tonnes/year

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STACK SAMPLING

Date: October 14, 1993
 Run # 93-1

Excess water in impingers and gel	92.2 mL	T _m (Ave Imp)	291.3 K -->	18.2 °C
Barometric pressure (P _{bm})	99.0100 kPa	P _t (Table1)	1.29 kPa	
Diameter of sampling nozzle	12.7 mm	Pitot Factor	0.844	
Volume of water vapour (V _{w,rel})	0.1254 m			
Dry gas volume (V _m)	2.0756 m ³	(V _{m,rel})	2.086 m ³	
Moisture content (B _{mo})	0.0697			
Absolute stack pressure (P _j)	99.0847 kPa	Volumetric Flow Rate (Q _j)	39,948.4	

NORTH/SOUTH TRAVERSE DATA

SAMPLE POINT	SAMPLE TIME (min.)	STACK GAS TEMPERATURE		VELOCITY PRESSURE (in H2O)	VELOCITY PRESSURE (kPa)	ORIFICE PRESSURE (in H2O)	ORIFICE PRESSURE (kPa)	GAS METER VOLUME (ft)	GAS METER VOLUME (m)	DRY GAS TEMPERATURE		IMPINGER TEMP F	STACK GAS VELOCITY (m/s)	PER CENT ISOKINETIC %
		F	K							F	K			
00	5.0	100	311	0.005	0.0012	0.29	0.0722	1.20	0.0340	61	289	35	1.269	81.45%
01	5.0	120	322	0.030	0.0075	1.67	0.4160	2.78	0.0787	61	289	35	3.164	78.67%
02	5.0	220	377	0.030	0.0075	1.44	0.3587	3.02	0.0855	61	289	35	3.427	92.49%
03	5.0	215	375	0.015	0.0037	0.73	0.1818	2.74	0.0776	64	291	36.0	2.414	117.34%
04	5.0	230	383	0.010	0.0025	0.48	0.1196	2.22	0.0629	63	290	36.0	1.993	117.88%
05	5.0	245	391	0.010	0.0025	0.48	0.1196	2.03	0.0575	61	289	35.0	2.014	109.38%
06	5.0	250	394	0.015	0.0037	0.73	0.1818	2.31	0.0654	60	289	34.0	2.476	102.25%
07	5.0	265	402	0.010	0.0025	0.48	0.1196	2.14	0.0606	61	289	34.0	2.043	116.93%
08	5.0	265	402	0.010	0.0025	0.48	0.1196	2.13	0.0603	61	289	33.0	2.043	116.38%
09	5.0	260	400	0.005	0.0012	0.24	0.0598	1.36	0.0385	64	291	34.0	1.439	104.06%
10	5.0	240	389	0.000	0.0000	0.00	0.0000	0.04	0.0011	63	290	38.0		
11	5.0	230	383	0.000	0.0000	0.00	0.0000	0.05	0.0014	63	290	41.0		
12	5.0	230	383	0.000	0.0000	0.00	0.0000	0.04	0.0011	63	290	42.0		
13	5.0	230	383	0.000	0.0000	0.00	0.0000	0.06	0.0017	64	291	42.0		
14	5.0	215	375	0.030	0.0075	1.45	0.3612	2.27	0.0643	65	291	40.0	3.414	68.74%
15	5.0	215	375	0.035	0.0087	1.71	0.4259	3.58	0.1014	68	293	42.0	3.687	99.85%
16	5.0	220	377	0.040	0.0100	1.95	0.4857	3.90	0.1104	79	299	48.0	3.957	100.10%

Average per cent isokinetic variation =

105.29%

0.8686

37.8

2.673

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STACK SAMPLING

Date: October 14, 1993
Run # 93-1

EAST/WEST TRAVERSE DATA

SAMPLE POINT	SAMPLE TIME (min)	STACK GAS TEMPERATURE		VELOCITY PRESSURE (in H2O)	VELOCITY PRESSURE (kPa)	ORIFICE PRESSURE (in H2O)	ORIFICE PRESSURE (kPa)	GAS METER VOLUME (ft)	GAS METER VOLUME (m)	DRY GAS TEMPERATURE		IMPINGER TEMP F	STACK GAS VELOCITY (m/s)	PER CENT ISOKINETIC %
		F	K							F	K			
00	5.0	120	322	0.020	0.0050	1.13	0.2815	2.87	0.0813	65	291	40	.	-
01	5.0	115	319	0.015	0.0037	0.85	0.2117	2.76	0.0782	65	291	35	2.228	108.91%
02	5.0	180	355	0.005	0.0012	0.25	0.0623	1.67	0.0473	67	292	32	1.357	119.79%
03	5.0	235	386	0.010	0.0025	0.49	0.1221	1.95	0.0552	67	292	30	2.000	103.13%
04	5.0	260	400	0.005	0.0012	0.24	0.0598	1.54	0.0436	68	293	32	1.439	116.94%
05	5.0	270	405	0.010	0.0025	0.49	0.1221	1.99	0.0564	67	292	30	2.050	107.87%
06	5.0	285	414	0.010	0.0025	0.49	0.1221	2.12	0.0600	68	293	31	2.071	115.87%
07	5.0	280	411	0.005	0.0012	0.24	0.0598	1.61	0.0456	67	292	30	1.459	124.18%
08	5.0	280	411	0.010	0.0025	0.49	0.1221	1.79	0.0507	65	291	39	2.064	98.06%
09	5.0	280	411	0.010	0.0025	0.49	0.1221	2.05	0.0581	64	291	45	2.064	112.52%
10	5.0	275	408	0.015	0.0037	0.72	0.1793	2.28	0.0646	63	290	47	2.519	102.09%
11	5.0	275	408	0.020	0.0050	0.98	0.2441	2.71	0.0767	63	290	47	2.909	105.15%
12	5.0	275	408	0.030	0.0075	1.45	0.3612	3.30	0.0935	64	291	50	3.563	104.47%
13	5.0	270	405	0.040	0.0100	1.93	0.4807	3.86	0.1093	65	291	50	4.100	105.39%
14	5.0	270	405	0.050	0.0125	2.41	0.6003	4.26	0.1206	65	291	50	4.583	104.16%
15	5.0	270	405	0.050	0.0125	2.41	0.6003	4.38	0.1240	69	294	50	4.583	106.28%
16	5.0	275	408	0.050	0.0125	2.41	0.6003	4.35	0.1232	71	295	50	4.599	105.52%

Average per cent isokinetic variation = 108.35% 1.2069984 40.500 2.724

Average isokinetic variation for the entire test = 106.82%

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STACK TESTING

DATE : October 14, 1993

RUN : 93-1

TEST CONDUCTED BY : P. O'Hara/ D. Roy

REF:STACKMST.WR1

IMPINGER #	IMPINGER CONTENTS	WEIGHT (g)	
1	100 mL water	Final	1,635.8
		Initial	1,419.6
		GAIN	216.2 (a)
2	100 mL water	Final	1,360.1
		Initial	1,412.8
		GAIN	(52.7) (b)
3	100 mL water	Final	1,335.8
		Initial	1,420.1
		GAIN	(84.3) (c)
4	empty	Final	1,286.5
		Initial	1,282.0
		GAIN	4.5 (d)
5	200 g silica gel	Final	208.5
		Initial	200.0
		GAIN	8.5 (e)

Total volume of excess water = a + b + c + d + e = 92.2mL

DATE : October 14, 1993
RUN : 93-1

STACK SAMPLING - CONDITIONS DURING SAMPLING

STACK CONDITIONS

Fair.

ROASTER CONDITIONS

Stack fan setting : D

Feed rate : 6.98 tph

COTTRELL CONDITIONS

Inlet temperature : 700 degrees F

Outlet temperature : 550 degrees F

BAGHOUSE CONDITIONS

Inlet temperature : 225 degrees F

Pressure drops : -1 in H2O

Shaking cycle : 5 %

COMMENTS

The day was cloudy, windy and the temperature was slightly below freezing

DATE : October 14, 1993
RUN : 93-1

STACK SAMPLING - CALCULATIONS

PARTICULATE LOADING

Weight of filter	Final	0.63 mg
	Initial	0.57 mg

Total particulate weight		0.06 mg

ARSENIC LOADING

PARTICULATE

Total particulate weight	0.06 mg
Diluted volume	100.0 mL
Arsenic concentration	44.0 ppm
Total As in particulate	4.4 mg

VAPOUR

Total wash water volume	2,000 mL
Arsenic concentration	26.0 ppm
Total As in vapour	52.0 mg

TOTAL ARSENIC LOADING 56.4 mg

ARSENIC CONCENTRATION 27.04 mg/m³

VOLUMETRIC FLOWRATE 39,948.4 m³/hr

ARSENIC MASS EMISSION RATE 1.1 kg/hr or 57.1 lb/day

FIGURE 2 MOISTURE ANALYSIS DATA SHEET

Plant _____
 Location _____
 Test Number _____
 Date Oct 14/03
 Test Conducted by PO/DR

Impinger Number	Impinger Contents	Weight (g)	
1	Water	Final <u>1555.8 + 80</u> Initial <u>1415.6</u> Gain _____	(a)
2	Water	Final <u>1360.1</u> Initial <u>1415.5</u> Gain _____	(b)
3	Water	Final <u>1335.8</u> Initial <u>1420.1</u> Gain _____	(c)
4	Empty	Final <u>1286.5</u> Initial <u>1282.0</u> Gain _____	(d)

Weight of Water Collected (W_{H_2O}) = $a + b + c + d$

Silica = 208.5

W_{H_2O} = _____ g

1509.4

#5 - 1594.5

filter - 0.0020

1.55

Operator PO / PR
Ambient Temperature, °C

#1

Probe Tip Dia., in
Probe Length, ft
Probe Heater Setting

POINT	CLOCK TIME	DRY GAS METER (ft³)	PITOT In H2O (P)	ORIFICE (H), In H2O		TEMPERATURE °F		PUMP VACUUM (Hg)	TEMPERATURE (°F)			STACK PRESS. (In Hg)
				DESIRED	ACTUAL	DRYGAS	PROBE		SAMPLE CASE	IMPINGE	STACK	
00	0	755.24	.005	.29	.29	61	112	7	50	35	100	.25
01	5	755.24	.03	1.67	1.65	61	75	108	50	35	120	
02	10	755.13	.030	1.44	1.45	61	90	8.5	50 ⁶⁴	35	220	
03	15	760.00	.015	.73	.73	64	115	5.5	67	36	215	
04	20	767.35	.01	.48	.48	63	153	4.5	66	36	230	
05	25	767.17	.01	.48	.48	61	180	4.5	63	35	245	
06	30	769.20	.015	.73	.73	60	195	5.2	85	34	250	
07	35	771.51	.01	.48	.48	61	200	4.0	95	34	265	
08	40	773.65	.01	.48	.48	61	205	4.0	110	33	265	
09	45	775.78	.005	.24	.24	64	175	1.8	100	34	260	
10	50	777.81	0	0	0	63	165	.2	80	39	240	
11	55	778.18	0	0	0	63	180	.2	80	41	230	
12	60	778.23	0	0	0	63	190	.2	75	42	230	
13	65	778.21	0	0	0	64	190	.2	80	42	230	
14	70	778.33	.03	1.45	1.45	65	160	8.5	95	40	215	
15	75	779.60	.035	1.71	1.71	68	145	8	100	42	215	
16	80	783.18	.04	1.95	1.95	70	155	8.5	100	48	220	

85 787.08

Operator _____
Ambient Temperature, °C _____

#12

Probe Tip Dia., in _____
Probe Length, ft _____
Probe Heater Setting _____

POINT	CLOCK TIME	DRY GAS METER (ft³)	PITOT in H2O (P)	ORIFICE (H), in H2O		TEMPERATURE °F		PUMP VACUUM (Hg)	TEMPERATURE (°F)			STACK PRESS. (in Hg)
				DESIRED	ACTUAL	DRYGAS	PROBE		SAMPLE CASE	IMPINGE	STACK	
00	0	787.08	.02	1.13	1.13	65	120	5	45	40	120	
01	5	789.95	.015	.85	.85	65	60	4.5	45	35	115	
02	10	792.71	.005	0.25	.25	67	75	1.2	45	32	180	
03	15	794.38	.01	.49	.49	67	120	2.5	60	30	235	
04	20	796.33	.005	.24	.24	68	145	1.2	70	32	260	
05	25	797.87	.01	.49	.49	67	175	2.5	75	30	270	
06	30	799.86	.01	.49	.49	68	195	2.5	75	31	285	
07	35	801.98	.005	.24	.24	67	210	1.2	75	30	280	
08	40	803.59	.01	.49	.49	65	195	4.5	80	39	280	
09	45	805.38	.01	.49	.49	64	205	5	85	45	280	
10	50	807.43	.015	.72	.72	63	210	6	85	47	275	
11	55	809.71	.02	.98	.98	63	175	7.5	85	47	275	
12	60	812.42	.03	1.45	1.45	64	165	10	83	50	275	
13	65	815.72	.04	1.93	1.93	65	160	11	85	50	270	
14	70	819.58	.05	2.41	2.41	65	150	11	80	50	270	
15	75	823.84	.05	2.41	2.41	69	150	10.5	75	50	270	
16	80	828.22	.05	2.41	2.41	71	155	10	75	50	275	

85 832.57
836.03

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