

MEASUREMENT OF ENVIRONMENTAL EMISSIONS

FROM

PART B PROCESSES

at

SANDVIK HARD MATERIALS
PO BOX 89
TORRINGTON AVENUE
COVENTRY
CV4 9XG

REPORT NO:	OEH/31413a/STAK/SS70	CLIENT REF:	Purchase Order: 1014878
DATE OF VISIT:	3, 4 & 18 September, 2003	CONTACT ON SITE:	Mr H Hedstrom
DATE OF REPORT:	16 October, 2003	DISK REFERENCE:	N:\GenAdmin\$\JG\AQ\Reports\ OEH31413.doc 16/10/2003 12:27

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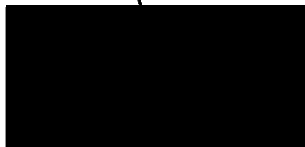
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EXECUTIVE SUMMARY

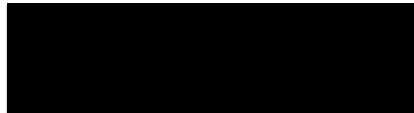
Date Of Test & Test Areas	Particulate emissions sampling from 9 stacks, 5 on the South Site and 4 on the North Site, was conducted on 3 rd , 4 th and 18 th September 2003.
Test Conditions	The processes were being operated under normal conditions throughout the sampling periods.
Compliance	<p>The nine stacks tested are defined as part B processes and fall under Local Authority control.</p> <p>Results have been compared to the limits set out in the process authorisation issued by Coventry City Council, reference Number 025.</p> <p>All measured particulate concentrations from all nine stacks were significantly below the 50 mg.m⁻³ limit set out in the above document.</p>

Surveyed and reported by:



Andy Barnes *BSc (Hons)*
Environmental Scientist

Verified by:



John Litterick *BSc (Hons)*
Environmental Scientist

for and on behalf of OEH Group Limited

If you have any queries or comments regarding this report, please contact Customer Services, OEH Group Ltd. Tel: 0121 359 5361.

1 INTRODUCTION

1.1 Purpose of Survey

The aim of the survey described in this report was to verify compliance with the requirements of Authorisation Reference 025, issued by Coventry City Council.

1.2 Terms of Reference

Sandvik Hard Materials, PO Box 89, Torrington Avenue, Coventry, CV4 9XG, has commissioned OEH Group Limited to carry out the work described in this report. Monitoring was carried out on 3rd, 4th and 15th September 2003, by Andy Barnes, at the request of Mr H Hedstrom.

The work was carried out in accordance with OEH Proposal ref: EFH-10146A dated 8th August 2003 and with the client's instructions as set out in purchase order number 1014878.

OEH Group is accredited under ISO-9002 for the provision of health, safety and environmental consultancy services. The work described in this report was carried out in accord with our ISO-9000 Standard Operating Procedures and Level III: Consultancy Work Instructions.

The field sampling and interpretations made in this report are not covered by the scope of OEH's accreditation under UKAS.

1.3 Plant conditions

Production schedules on the date of the survey were described as normal. Thus, the data reported herein must be considered typical and representative of the environmental levels experienced during normal daily workloads on this site.

2 PROCESS DESCRIPTION

Sandvik Hard Materials operate a number of industrial processes involved in the production of metallic chemical compounds, as part of the manufacture of Tungsten Carbide compounds and powders, and other 'Hard Metal' products.

Processes involving the melting of zinc for the recovery of tungsten carbide cobalt alloy, and the subsequent use of hard metal powder for the production of hard metal products are classified as Part B processes, and are dealt with in this report.

A number of the processes are classified as Part A processes, and are covered in a separate report, these are listed below:

- Reduction of WO_x to W metal.
- Carburisation of $W + C$ to WC
- New Generation Hardmetal Coating process
- Carbothermal Process $WO_x + C$ to WC.

3 METHODS

3.1 Stack Sampling

3.1.1 Stack Velocity & Temperature Measurements

Stack velocity was investigated using an ellipsoidal nosed pitot tube coupled to an electronic manometer. Temperature measurements were taken using a K-type thermocouple connected to an electronic thermometer.

The manometer and thermometer are subject to regular calibration by a UKAS accredited test house using NPL traceable standards.

3.1.2 Total Particulate Matter (Including Tungsten & Cobalt)

Periodic extractive sampling for total particulate matter was conducted using a Stackmite 9096 sampling train. Duplicate samples were taken at each position. Within the limitations of the stack and field conditions, the sampling protocol was in accordance with the main procedural requirements of BS EN 13284-1:2002. The sampling train was set up and checked for leaks before commencement of the survey and between each sample. The Stackmite unit is calibrated annually and is traceable to NPL standards. Calibration dated 31st March 2003.

3.2 Analysis

3.2.1 Techniques & Detection Limits

Analyte	Analysis Technique	Detection Limit	Analytical Precision, %	Method Reference
TPM	Gravimetric	20 µg	1	LSOP 202
Metals (Tungsten & Cobalt)	Atomic Absorption	1 µg	1	Sub Contract

3.2.2 Accreditation

Service Category	ISO-9002	UKAS ¹
Consultancy	Yes	No
Analysis		
- Dusts (air filter samples); Lab Method LSOP 202, based on MDHS14 (latest issue)	Yes	Yes
¹ UKAS lab number 1821		
<i>Stack sampling team is a member of the Source Testing Association</i>		

4 PRESENTATION OF RESULTS

The following table gives summary details of the mean emission concentrations measured for all parameters from all stacks.

Stack Reference	Mean Emission Concentration (mg.m ⁻³)		
	Total Particulate	Tungsten	Cobalt
North Site - Vent 3	0.10	0.07	<0.01
North Site - Vent 5	0.55	0.03	<0.01
North Site - Vent 6	0.28	0.04	<0.01
North Site - Vent 7	0.10	0.10	<0.01
South Site - Vent 25	<0.04	0.02	<0.01
South Site - Vent 23	<0.05	0.04	<0.01
South Site - Vent 28	0.05	0.02	<0.01
South Site - Vent 30	0.27	<0.01	<0.01
South Site - Vent 34	1.24	<0.01	<0.01

Results reported at Standard Conditions of 273K and 101.3kPa, no correction for oxygen or water vapour content.

Appendix I lists in tabular form further details of the particulate results for each position, including additional data from the pitot traverses, along with filter weight details and sampling parameters.

5 DISCUSSION

The current Authorisation (reference 025) specifies the following emission limit.

Emissions	Limit
Total Particulate Matter	50 mg.m ⁻³

5.1 Total Particulate Matter

All tests for particulate matter for all other stacks yielded results significantly below the 50 mg.m⁻³ limit.

5.2 Metals (Tungsten & Cobalt)

There are no limits specified in the guidance note for metals, in all cases the measured concentrations were relatively low and are of no significant environmental concern.

6 CONCLUSIONS

All stacks yielded results well below the current emissions limits.

7 APPENDICES

Appendix I: Detailed Particulate Results Tables

APPENDIX I
DETAILED PARTICULATE RESULTS TABLES

Plant Type	Vent 3 - North Site	Meter Temp (C)	30
Job Number	OEH 31413		
Client Name	Sandvik		
Date	4th September 2003		
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	5.00

Flow readings not possible due to grille configuration

Sampling Run 1 Time: 14:13 - 14:43

Sampling Point	LHS
Sampling Rate (l/min)	18
Sampling Duration (mins)	30
Filter No	8017
Volume Sampled (m ³)	Meter 0.550

Initial Meter Reading (l)	216022
Final Meter Reading (l)	216572
Volume Sampled (l)	550

Corrected Volume = 0.50 Nm³ (at NTP)

Sampling Run 2 Time: 14:45 - 15:15

Sampling Point	RHS
Sampling Rate (l/min)	18
Sampling Duration (mins)	30
Filter No	8018
Volume Sampled (m ³)	Meter 0.550

Initial Meter Reading (l)	216573
Final Meter Reading (l)	217123
Volume Sampled (l)	550

Corrected Volume = 0.50 Nm³ (at NTP)

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8017	56.42	56.45	0.00	0.03
2	8018	54.56	54.62	0.00	0.06

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm ³)	0.06	0.12	0.09

Plant Type	Vent 5 - North Site	Stack Area (m ²)	0.100
Job Number	OEH 31413	Meter Temp (C)	30
Client Name	Sandvik	Stack Dimensions (cm)	20 x 50
Date	18th September 2003	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	0
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	5.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.125	0.250	0.375	0.450	0.550	0.625	0.750	0.875	0.935
Pitot Reading (Pa)	50	50	60	60	70	70	65	65	60	55
Temperature (°C)	28	28	28	28	28	28	28	28	28	28
Duct Velocity (m/s)	9.2	9.2	10.1	10.1	10.9	10.9	10.5	10.5	10.1	9.7
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.125	0.250	0.375	0.450	0.550	0.625	0.750	0.875	0.935
Pitot Reading (Pa)	45	48	55	55	60	60	55	50	45	40
Temperature (°C)	28	28	28	28	28	28	28	28	28	28
Duct Velocity (m/s)	8.8	9.1	9.7	9.7	10.1	10.1	9.7	9.2	8.8	8.3

Absolute Mean Duct Velocity (m/s) 9.7
Absolute Flow Rate (m³/hr) 3507
Normalised Flow Rate (Nm³/hr) 3181
No stack fitted, so flow measurements are indication only. (therefore so is mass emission)
Non-isokinetic sampling.

Sampling Run 1 Time: 09:10 - 09:25

Sampling Point	CP	Initial Meter Reading (l)	678153
Sampling Rate (l/min)	10	Final Meter Reading (l)	678305
Sampling Duration (mins)	15	Volume Sampled (l)	152
Filter No	7986		
Volume Sampled (m ³)	Meter 0.152		
Corrected Volume =	0.14 Nm ³ (at NTP)		

Sampling Run 2 Time: 09:44 - 09:59

Sampling Point	CP	Initial Meter Reading (l)	678315
Sampling Rate (l/min)	10	Final Meter Reading (l)	678451
Sampling Duration (mins)	15	Volume Sampled (l)	136
Filter No	7987		
Volume Sampled (m ³)	Meter 0.136		
Corrected Volume =	0.12 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	7986	54.45	54.50	0.00	0.05
2	7987	55.73	55.82	0.00	0.09

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.37	0.73	0.55
Mass Emission (g/hr)	1.16	2.34	1.75

Plant Type	Vent 6 - North Site	Stack Area (m ²)	0.088
Job Number	OEH 31413	Meter Temp (C)	30
Client Name	Sandvik	Stack Dimensions (cm)	35 x 25
Date	4th September 2003	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	0
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	5.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.125	0.250	0.375	0.450	0.550	0.625	0.750	0.875	0.935
Pitot Reading (Pa)	4	4	4	5	4	4	2	3	4	3
Temperature (°C)	35	35	35	35	35	35	35	35	35	35
Duct Velocity (m/s)	2.6	2.6	2.6	3.0	2.6	2.6	1.9	2.3	2.6	2.3
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.125	0.250	0.375	0.450	0.550	0.625	0.750	0.875	0.935
Pitot Reading (Pa)	3	3	2	3	2	2	1	1	2	1
Temperature (°C)	35	35	35	35	35	35	35	35	35	35
Duct Velocity (m/s)	2.3	2.3	1.9	2.3	1.9	1.9	1.3	1.3	1.9	1.3

Absolute Mean Duct Velocity (m/s)	2.2
Absolute Flow Rate (m³/hr)	690
Normalised Flow Rate (Nm³/hr)	612
No stack fitted, so flow measurements are indication only. (therefore so is mass emission)	
Non-isokinetic sampling.	

Sampling Run 1 Time: 10:00 - 10:30

Sampling Point	CP	Initial Meter Reading (l)	213595
Sampling Rate (l/min)	18	Final Meter Reading (l)	214145
Sampling Duration (mins)	30	Volume Sampled (l)	550
Filter No	8012		
Volume Sampled (m ³)	Meter 0.550		
Corrected Volume =	0.50 Nm ³ (at NTP)		

Sampling Run 2 Time: 10:32 - 10:42

Sampling Point	CP	Initial Meter Reading (l)	214146
Sampling Rate (l/min)	10	Final Meter Reading (l)	214336
Sampling Duration (mins)	18	Volume Sampled (l)	190
Filter No	8011		
Volume Sampled (m ³)	Meter 0.190		
Corrected Volume =	0.17 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8012	55.14	55.21	0.00	0.07
2	8011	54.66	54.73	0.00	0.07

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.14	0.41	0.28
Mass Emission (g/hr)	0.09	0.25	0.17

Plant Type	Vent 7 - North Site	Stack Area (m ²)	0.165
Job Number	OEH 31413	MeterTemp (C)	30
Client Name	Sandvik	Stack Dimensions (cm)	55 x 30
Date	4th September 2003	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	350
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	6.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.125	0.250	0.375	0.450	0.550	0.625	0.750	0.875	0.935
Pitot Reading (Pa)	45	50	50	55	56	50	56	50	50	50
Temperature (°C)	32	32	32	32	32	32	32	32	32	32
Duct Velocity (m/s)	8.8	9.3	9.3	9.8	9.8	9.3	9.8	9.3	9.3	9.3
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.125	0.250	0.375	0.450	0.550	0.625	0.750	0.875	0.935
Pitot Reading (Pa)	55	56	58	55	54	52	50	52	50	45
Temperature (°C)	32	32	32	32	32	32	32	32	32	32
Duct Velocity (m/s)	9.8	9.8	10.0	9.8	9.7	9.5	9.3	9.5	9.3	8.8

Absolute Mean Duct Velocity (m/s)	9.5
Absolute Flow Rate (m³/hr)	5627
Normalised Flow Rate (Nm³/hr)	5054

Sampling Run 1 Time: 11:11 - 11:41

Sampling Point	A3	A8	B3	B8	Initial Meter Reading (l)	214337
Sampling Rate (l/min)	15	15	16	15	Final Meter Reading (l)	214787
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	450
Filter No	8013	8013	8013	8013	Isokineticity Error (%)	-1.6
Volume Sampled (m ³)	Meter	0.450	Expectex	0.458	<i>(Maximum Allowed Error = -5 to +15%)</i>	
Corrected Volume =	0.41 Nm ³ (at NTP)					

Sampling Run 2 Time: 11:42 - 12:12

Sampling Point	B3	B8	A3	A8	Initial Meter Reading (l)	214788
Sampling Rate (l/min)	16	15	15	15	Final Meter Reading (l)	215238
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	450
Filter No	8014	8014	8014	8014	Isokineticity Error (%)	-1.6
Volume Sampled (m ³)	Meter	0.450	Expectex	0.458	<i>(Maximum Allowed Error = -5 to +15%)</i>	
Corrected Volume =	0.41 Nm ³ (at NTP)					

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8013	55.28	55.30	0.00	0.02
2	8014	55.83	55.89	0.00	0.06

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.05	0.15	0.10
Mass Emission (g/hr)	0.25	0.75	0.50

Plant Type	Vent 23 - South Site	Stack Area (m ²)	0.018
Job Number	OEH 31413	Meter Temp (C)	30
Client Name	Sandvik	Stack Diameter (cm)	15
Date	3rd September 2003	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	900
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	3.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	1050	980	800	750	700	700	650	600	500	500
Temperature (°C)	36	36	36	36	36	36	36	36	36	36
Duct Velocity (m/s)	42.9	41.4	37.4	36.2	35.0	35.0	33.7	32.4	29.6	29.6
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	750	700	650	650	600	650	600	650	700	700
Temperature (°C)	36	36	36	36	36	36	36	36	36	36
Duct Velocity (m/s)	36.2	35.0	33.7	33.7	32.4	33.7	32.4	33.7	35.0	35.0

Absolute Mean Duct Velocity (m/s)	34.7
Absolute Flow Rate (m³/hr)	2210
Normalised Flow Rate (Nm³/hr)	1970

Sampling Run 1 Time: 11:15 - 11:45

Sampling Point	CP	Initial Meter Reading (l)	210530
Sampling Rate (l/min)	15	Final Meter Reading (l)	210980
Sampling Duration (mins)	30	Volume Sampled (l)	450
Filter No	7935	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.450	Expecter 0.450	(Maximum Allowed Error = -5 to +15%)
Corrected Volume =	0.41 Nm ³ (at NTP)		

Sampling Run 2 Time: 11:47 - 12:17

Sampling Point	CP	Initial Meter Reading (l)	210985
Sampling Rate (l/min)	15	Final Meter Reading (l)	211435
Sampling Duration (mins)	30	Volume Sampled (l)	450
Filter No	7936	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.450	Expecter 0.450	(Maximum Allowed Error = -5 to +15%)
Corrected Volume =	0.41 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	7935	56.88	56.90	0.00	0.02
2	7936	56.08	56.10	0.00	0.02

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.05	0.05	0.05
Mass Emission (g/hr)	0.10	0.10	0.10

These results below limit of detection

Plant Type	Vent 25 - South Site	Stack Area (m ²)	0.031
Job Number	OEH 31413	Meter Temp (C)	30
Client Name	Sandvik	Stack Diameter (cm)	20
Date	3rd September 2003	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	20
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	5.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	160	150	145	140	130	130	145	150	155	160
Temperature (°C)	55	55	55	55	55	55	55	55	55	55
Duct Velocity (m/s)	17.3	16.7	16.4	16.1	15.5	15.5	16.4	16.7	17.0	17.3
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	90	110	125	130	140	140	150	180	190	165
Temperature (°C)	55	55	55	55	55	55	55	55	55	55
Duct Velocity (m/s)	12.9	14.3	15.2	15.5	16.1	16.1	16.7	18.3	18.8	17.5

Absolute Mean Duct Velocity (m/s)	16.3
Absolute Flow Rate (m³/hr)	1848
Normalised Flow Rate (Nm³/hr)	1538

Sampling Run 1 Time: 12:23 - 12:53

Sampling Point	CP	Initial Meter Reading (l)	211436
Sampling Rate (l/min)	18	Final Meter Reading (l)	211976
Sampling Duration (mins)	30	Volume Sampled (l)	540
Filter No	7937	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.540	Expectex 0.540	(Maximum Allowed Error = -5 to +15%)
Corrected Volume =	0.49 Nm ³ (at NTP)		

Sampling Run 2 Time: 12:55 - 13:25

Sampling Point	CP	Initial Meter Reading (l)	211980
Sampling Rate (l/min)	18	Final Meter Reading (l)	212520
Sampling Duration (mins)	30	Volume Sampled (l)	540
Filter No	7938	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.540	Expectex 0.540	(Maximum Allowed Error = -5 to +15%)
Corrected Volume =	0.49 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	7937	56.27	56.29	0.00	0.02
2	7938	56.46	56.48	0.00	0.02

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.04	0.04	0.04
Mass Emission (g/hr)	0.06	0.06	0.06

These results below limit of detection

Plant Type	Vent 28 - South Site	Stack Area (m ²)	0.488
Job Number	OEH 31413	Meter Temp (C)	30
Client Name	Sandvik	Stack Dimensions (cm)	65 x 75
Date	3rd September 2003	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	0
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	5.00

PITOT SURVEY

Traversal Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.125	0.250	0.375	0.450	0.550	0.625	0.750	0.875	0.935
Pitot Reading (Pa)	11	25	35	40	45	40	35	25	20	12
Temperature (°C)	28	28	28	28	28	28	28	28	28	28
Duct Velocity (m/s)	4.3	6.5	7.7	8.3	8.8	8.3	7.7	6.5	5.8	4.5
Traversal Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.125	0.250	0.375	0.450	0.550	0.625	0.750	0.875	0.935
Pitot Reading (Pa)	15	18	20	25	25	30	25	20	15	11
Temperature (°C)	28	28	28	28	28	28	28	28	28	28
Duct Velocity (m/s)	5.1	5.5	5.8	6.5	6.5	7.2	6.5	5.8	5.1	4.3

Absolute Mean Duct Velocity (m/s) 6.3
Absolute Flow Rate (m³/hr) ###
Normalised Flow Rate (Nm³/hr) ###
No stack fitted, so flow measurements are indication only. (therefore so is mass emission)
Non-isokinetic sampling.

Sampling Run 1 Time: 10:38 - 11:08

Sampling Point	CP	Initial Meter Reading (l)	209925
Sampling Rate (l/min)	20	Final Meter Reading (l)	210525
Sampling Duration (mins)	30	Volume Sampled (l)	600
Filter No	7933		
Volume Sampled (m ³)	Meter 0.600		
Corrected Volume =	0.54 Nm ³ (at NTP)		

Sampling Run 2 Time: 14:45 - 15:17

Sampling Point	CP	Initial Meter Reading (l)	212956
Sampling Rate (l/min)	20	Final Meter Reading (l)	213594
Sampling Duration (mins)	32	Volume Sampled (l)	638
Filter No	7934		
Volume Sampled (m ³)	Meter 0.638		
Corrected Volume =	0.57 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	7933	57.28	57.32	0.00	0.04
2	7934	56.82	56.84	0.00	0.02

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm ³)	0.07	0.03	0.05
Mass Emission (g/hr)	0.75	0.35	0.55

Plant Type	Vent 30 - South Site	Stack Area (m ²)	0.283
Job Number	OEH 31413	Meter Temp (C)	20
Client Name	Sandvik	Stack Diameter (cm)	60
Date	3rd September 2003	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	17
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	6.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	50	45	25	40	90	95	55	45	40	25
Temperature (°C)	30	30	30	30	30	30	30	30	30	30
Duct Velocity (m/s)	9.3	8.8	6.6	8.3	12.4	12.8	9.7	8.8	8.3	6.6
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	40	45	48	55	85	100	65	50	40	35
Temperature (°C)	30	30	30	30	30	30	30	30	30	30
Duct Velocity (m/s)	8.3	8.8	9.1	9.7	12.1	13.1	10.6	9.3	8.3	7.8

Absolute Mean Duct Velocity (m/s)	9.4
Absolute Flow Rate (m³/hr)	9594
Normalised Flow Rate (Nm³/hr)	8645

Sampling Run 1 Time: 09:30 - 10:00

Sampling Point	A2	A9	B2	B9	Initial Meter Reading (l)	209050
Sampling Rate (l/min)	15	14	15	14	Final Meter Reading (l)	209485
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	435
Filter No	7931	7931	7931	7931	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.435	Expectex 0.435	(Maximum Allowed Error = -5 to +15%)			
Corrected Volume =	0.41 Nm ³ (at NTP)					

Sampling Run 2 Time: 10:03 - 10:33

Sampling Point	B2	B9	A2	A9	Initial Meter Reading (l)	209488
Sampling Rate (l/min)	15	14	15	14	Final Meter Reading (l)	209923
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	435
Filter No	7932	7932	7932	7932	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.435	Expectex 0.435	(Maximum Allowed Error = -5 to +15%)			
Corrected Volume =	0.41 Nm ³ (at NTP)					

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	7931	55.69	55.85	0.00	0.16
2	7932	55.93	55.99	0.00	0.06

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.39	0.15	0.27
Mass Emission (g/hr)	3.4	1.3	2.3

Plant Type	Vent 34 - South Site	Stack Area (m ²)	0.126
Job Number	OEH 31413	Meter Temp (C)	30
Client Name	Sandvik	Stack Diameter (cm)	40
Date	3rd September 2003	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	1
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	7.00

PITOT SURVEY

Traverse Point	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	4	4	4	4	5	5	5	4	4	4
Temperature (°C)	20	20	20	20	20	20	20	20	20	20
Duct Velocity (m/s)	2.6	2.6	2.6	2.6	2.9	2.9	2.9	2.6	2.6	2.6
Traverse Point	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Distance From Near Wall (D)	0.065	0.150	0.250	0.350	0.450	0.550	0.650	0.750	0.850	0.935
Pitot Reading (Pa)	4	4	4	4	5	5	5	4	4	4
Temperature (°C)	20	20	20	20	20	20	20	20	20	20
Duct Velocity (m/s)	2.6	2.6	2.6	2.6	2.9	2.9	2.9	2.6	2.6	2.6

Absolute Mean Duct Velocity (m/s)	2.7
Absolute Flow Rate (m³/hr)	1208
Normalised Flow Rate (Nm³/hr)	1126

Sampling Run 1 Time: 13:42 - 14:12

Sampling Point	A2	A9	B2	B9	Initial Meter Reading (l)	212530
Sampling Rate (l/min)	7	7	7	7	Final Meter Reading (l)	212740
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	210
Filter No	7939	7939	7939	7939	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.210	Expectex 0.210	(Maximum Allowed Error = -5 to +15%)			
Corrected Volume =	0.19 Nm ³ (at NTP)					

Sampling Run 2 Time: 14:14 - 14:44

Sampling Point	B2	B9	A2	A9	Initial Meter Reading (l)	212745
Sampling Rate (l/min)	7	7	7	7	Final Meter Reading (l)	212955
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	210
Filter No	7940	7940	7940	7940	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.210	Expectex 0.210	(Maximum Allowed Error = -5 to +15%)			
Corrected Volume =	0.19 Nm ³ (at NTP)					

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	7939	56.04	56.26	0.00	0.22
2	7940	56.92	57.17	0.00	0.25

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	1.16	1.32	1.24
Mass Emission (g/hr)	1.3	1.5	1.4