

MEASUREMENT OF ENVIRONMENTAL EMISSIONS

FROM

PART B PROCESSES

at

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

REPORT NO:	OEH/32889/STAK/SS70	CLIENT REF:	Phil Moran
DATE OF VISIT:	24 to 25 August & 16 September 2004.	CONTACT ON SITE:	Phil Moran
DATE OF REPORT:	07 October 2004	DISK REFERENCE:	N:\Consultants\$\Air Quality\Andy Barnes\Jobs 2003-2004\32889 Sandvic\OEH32889 CS F.doc

DATA PROTECTION ACT REGISTRATION NO: B0479 03 4

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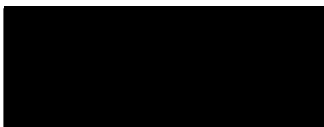
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EXECUTIVE SUMMARY

Date Of Test & Test Areas	Sampling from eleven emissions points serving the Part B processes on the North & South Sites, was conducted between 24 and 25 August and on 16 September 2004.
Test Conditions	The processes were being operated under normal conditions throughout the sampling periods.
Compliance	<p>The eleven 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:

Verified by:


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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 Limited, PO Box 89, Torrington Avenue, Coventry, Warwickshire, CV4 9XG, has commissioned OEH Group Limited to carry out the work described in this report. Monitoring was carried out between the 24th & 25th August and on 16th September 2004, by Andy Barnes and Paul Calland, at the request of Mr Phil Moran. The work was carried out in accordance with OEH Proposal ref: SK10993, dated 8th July 2004, and with the client's instructions.

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 Field Staff Used

Name	MCERTS Registration No:	MCERTS Qualifications	Function
Andrew Barnes	MM 03235	Level 2, TE1, TE3 & TE4	[Team Leader]
Paul Calland	MM 03212	Level 2 & TE1	[Assistant]

1.4 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 two off Stackmite 9096 sampling trains. 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 trains were set up and checked for leaks before commencement of the survey and between each sample. The Stackmite units are calibrated annually and are traceable to NPL standards. Calibrations dated February 2004.

Metals determinations were made by acid digestion of the filters sampled above, followed by analysis, using atomic absorption.

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
Tungsten Cobalt	Atomic Absorption	0.25 µg 0.75 µg	1	Sub Contract

3.2.2 Accreditation

Service Category	ISO-9002	UKAS ¹
Consultancy – Field sampling and interpretation	Yes	No
Analysis		
- Dusts (air filter samples); Lab Method LSOP 202, based on MDHS14	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 – LEV 2a (Vent 6)	0.13	<0.001	<0.001
North Site - LEV 3 (Vent 7)	0.05	<0.001	<0.001
North Site – LEV 8 (Vent 3)	0.02	<0.001	<0.001
North Site – LEV 9 (Vent 5)	0.08	0.011	<0.001
South Site – LEV 002 (Vent 30)	0.10	0.001	<0.001
South Site – LEV 12a	0.06	0.007	<0.001
South Site – LEV 15	0.09	0.002	<0.001
South Site – LEV 20	0.05	0.002	<0.001
South Site – LEV 22	0.09	0.009	<0.001
South Site – LEV 24 (Vent 45)	0.06	<0.001	<0.001
South Site – LEV 28	0.13	0.011	<0.001

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 AND FLOWRATE RESULTS TABLES

Plant Type	LEV 2A - North Site	Stack Area (m ²)	0.088
Job Number	OEH 32889	Meter Temp (C)	25
Client Name	Sandvik	Stack Dimensions (cm)	35 x 25
Date	16th September 2004	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	0
Vent 6		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	4	4	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	2.6	2.6	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	4	4	4	4	3	4	4	3	2
Temperature (°C)	35	35	35	35	35	35	35	35	35	35
Duct Velocity (m/s)	2.3	2.6	2.6	2.6	2.6	2.3	2.6	2.6	2.3	1.9

Absolute Mean Duct Velocity (m/s) 2.5
Absolute Flow Rate (m³/hr) 808
Normalised Flow Rate (Nm³/hr) 716
No stack fitted, so flow measurements are indication only. (therefore so is mass emission)
Non-isokinetic sampling.

Sampling Run 1 Time: 10:23 - 11:03

Sampling Point	CP	Initial Meter Reading (l)	266677
Sampling Rate (l/min)	18	Final Meter Reading (l)	267400
Sampling Duration (mins)	40	Volume Sampled (l)	723
Filter No	8749		
Volume Sampled (m ³)	Meter 0.723		

Corrected Volume = 0.66 Nm³ (at NTP)

Sampling Run 2 Time: 11:05 - 11:45

Sampling Point	CP	Initial Meter Reading (l)	267400
Sampling Rate (l/min)	20	Final Meter Reading (l)	268195
Sampling Duration (mins)	40	Volume Sampled (l)	795
Filter No	8750		
Volume Sampled (m ³)	Meter 0.795		

Corrected Volume = 0.73 Nm³ (at NTP)

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8749	58.69	58.80	0.00	0.11
2	8750	57.76	57.83	0.00	0.07

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.17	0.10	0.13
Mass Emission (g/hr)	0.12	0.07	0.09

Plant Type **LEV 3 - North Site**
 Job Number **OEH 32889**
 Client Name **Sandvik**
 Date **24th August 2004**

Stack Area (m²) 0.165
 MeterTemp (C) 27
 Stack Dimensions (cm) 55 x 30
 Pitot Factor 1.00
 Pitot Factor (sqrt) 1.00
 Stack Pressure (Pa) 140
 Ambient Pressure (kPa) 101.3
 Nozzle Size (mm) 6.00

Vent 7

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)	30	33	35	45	50	50	48	42	31	30
Temperature (°C)	28	28	28	28	28	28	28	28	28	28
Duct Velocity (m/s)	7.2	7.5	7.7	8.8	9.2	9.2	9.1	8.5	7.3	7.2
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)	31	33	37	43	48	52	47	41	33	28
Temperature (°C)	28	28	28	28	28	28	28	28	28	28
Duct Velocity (m/s)	7.3	7.5	7.9	8.6	9.1	9.4	9.0	8.4	7.5	6.9

Absolute Mean Duct Velocity (m/s) 8.2
Absolute Flow Rate (m³/hr) 4843
Normalised Flow Rate (Nm³/hr) 4399

Sampling Run 1 Time: 11:50 - 12:25

Sampling Point	A3	A8	B3	B8	Initial Meter Reading (l)	255401
Sampling Rate (l/min)	12	13	12	13	Final Meter Reading (l)	255835
Sampling Duration (mins)	9	9	9	8	Volume Sampled (l)	434
Filter No	8705	8705	8705	8705	Isokineticity Error (%)	-0.8
Volume Sampled (m ³)	Meter	0.434	Expected	0.438		

Corrected Volume = 0.39 Nm³ (at NTP)

Sampling Run 2 Time: 12:27 - 13:13

Sampling Point	B3	B8	A3	A8	Initial Meter Reading (l)	255835
Sampling Rate (l/min)	12	13	12	13	Final Meter Reading (l)	256385
Sampling Duration (mins)	11.5	11.5	11.5	11.5	Volume Sampled (l)	550
Filter No	8706	8706	8706	8706	Isokineticity Error (%)	-4.3
Volume Sampled (m ³)	Meter	0.550	Expected	0.575		

Corrected Volume = 0.50 Nm³ (at NTP)

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8705	58.75	58.77	0.00	0.02
2	8706	57.55	57.57	0.00	0.02

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm ³)	0.05	0.04	0.05
Mass Emission (g/hr)	0.22	0.18	0.20

Plant Type **LEV 8 (Vent 3) - North Site**
 Job Number **OEH 32889** Meter Temp (C) 29
 Client Name **Sandvik**
 Date **24th August 2004**

Ambient Pressure (kPa) 101.3
 Nozzle Size (mm) 5.00

Flow readings not possible due to grille configuration

Sampling Run 1 Time: 08:43 - 09:33

Sampling Point	LHS
Sampling Rate (l/min)	19
Sampling Duration (mins)	50
Filter No	8703
Volume Sampled (m ³)	Meter 0.977

Initial Meter Reading (l) 253490
 Final Meter Reading (l) 254467
 Volume Sampled (l) 977

Corrected Volume = 0.88 Nm³ (at NTP)

Sampling Run 2 Time: 09:37 - 10:27

Sampling Point	RHS
Sampling Rate (l/min)	19
Sampling Duration (mins)	50
Filter No	8704
Volume Sampled (m ³)	Meter 0.930

Initial Meter Reading (l) 254470
 Final Meter Reading (l) 255400
 Volume Sampled (l) 930

Corrected Volume = 0.84 Nm³ (at NTP)

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8703	58.39	58.41	0.00	0.02
2	8704	57.40	57.42	0.00	0.02

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm ³)	0.02	0.02	0.02

Plant Type	LEV 9 - North Site	Stack Area (m ²)	0.100
Job Number	OEH 32889	Meter Temp (C)	25
Client Name	Sandvik	Stack Dimensions (cm)	20 x 50
Date	16th September 2004	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	0
Vent 5		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	55	60	65	70	65	60	55	50
Temperature (°C)	30	30	30	30	30	30	30	30	30	30
Duct Velocity (m/s)	9.3	9.3	9.7	10.2	10.6	11.0	10.6	10.2	9.7	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)	45	50	55	55	60	65	60	55	45	35
Temperature (°C)	30	30	30	30	30	30	30	30	30	30
Duct Velocity (m/s)	8.8	9.3	9.7	9.7	10.2	10.6	10.2	9.7	8.8	7.8

Absolute Mean Duct Velocity (m/s) 9.7
Absolute Flow Rate (m³/hr) 3497
Normalised Flow Rate (Nm³/hr) 3151
No stack fitted, so flow measurements are indication only. (therefore so is mass emission)
Non-isokinetic sampling.

Sampling Run 1 Time: 08:49 - 09:34

Sampling Point	CP	Initial Meter Reading (l)	265071
Sampling Rate (l/min)	18	Final Meter Reading (l)	265875
Sampling Duration (mins)	45	Volume Sampled (l)	804
Filter No	8747		
Volume Sampled (m ³)	Meter 0.804		

Corrected Volume = 0.74 Nm³ (at NTP)

Sampling Run 2 Time: 09:35 - 10:20

Sampling Point	CP	Initial Meter Reading (l)	265876
Sampling Rate (l/min)	18	Final Meter Reading (l)	266676
Sampling Duration (mins)	45	Volume Sampled (l)	800
Filter No	8748		
Volume Sampled (m ³)	Meter 0.800		

Corrected Volume = 0.73 Nm³ (at NTP)

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8747	57.94	57.96	0.00	0.02
2	8748	59.02	59.12	0.00	0.10

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm ³)	0.03	0.14	0.08
Mass Emission (g/hr)	0.09	0.43	0.26

Plant Type	LEV 002 - South Site	Stack Area (m ²)	0.283
Job Number	OEH 32889	Meter Temp (C)	32
Client Name	Sandvik	Stack Diameter (cm)	60
Date	23rd August 2004	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	30
(Vent 30)		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)	18	43	52	111	115	110	37	52	36	22
Temperature (°C)	25	25	25	25	25	25	25	25	25	25
Duct Velocity (m/s)	5.5	8.5	9.4	13.7	13.9	13.6	7.9	9.4	7.8	6.1
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	55	75	85	100	77	56	40	32
Temperature (°C)	25	25	25	25	25	25	25	25	25	25
Duct Velocity (m/s)	8.2	8.7	9.6	11.3	12.0	13.0	11.4	9.7	8.2	7.4

Absolute Mean Duct Velocity (m/s) 9.8
Absolute Flow Rate (m³/hr) 9948
Normalised Flow Rate (Nm³/hr) 9116

Sampling Run 1 Time: 13:57 - 14:27

Sampling Point	A2	A9	B2	B9	Initial Meter Reading (l)	252411
Sampling Rate (l/min)	16	15	17	15	Final Meter Reading (l)	252911
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	500
Filter No	8917	8917	8917	8917	Isokineticity Error (%)	5.8
Volume Sampled (m ³)	Meter 0.500	Expected 0.473				
Corrected Volume =	0.45 Nm ³ (at NTP)					

Sampling Run 2 Time: 14:40 - 15:10

Sampling Point	B2	B9	A2	A9	Initial Meter Reading (l)	253010
Sampling Rate (l/min)	17	15	16	15	Final Meter Reading (l)	253490
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	480
Filter No	8918	8918	8918	8918	Isokineticity Error (%)	1.6
Volume Sampled (m ³)	Meter 0.480	Expected 0.473				
Corrected Volume =	0.43 Nm ³ (at NTP)					

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8917	57.47	57.52	0.00	0.05
2	8918	57.92	57.96	0.00	0.04

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration (mg/Nm³)	0.11	0.09	0.10
Mass Emission (g/hr)	1.0	0.8	0.9

Plant Type:	LEV 12 A - South Site	Stack Area (m ²)	0.488
Job Number	OEH 32889	Meter Temp (C)	29
Client Name	Sandvik	Stack Dimensions (cm)	65 x 75
Date	23rd August 2004	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)	10	15	25	25	35	35	30	25	15	10
Temperature (°C)	25	25	25	25	25	25	25	25	25	25
Duct Velocity (m/s)	4.1	5.0	6.5	6.5	7.7	7.7	7.1	6.5	5.0	4.1
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)	15	20	25	35	45	45	35	25	20	15
Temperature (°C)	25	25	25	25	25	25	25	25	25	25
Duct Velocity (m/s)	5.0	5.8	6.5	7.7	8.7	8.7	7.7	6.5	5.8	5.0

Absolute Mean Duct Velocity (m/s) **6.4**
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: 10:10 - 10:40

Sampling Point	CP	Initial Meter Reading (l)	250453
Sampling Rate (l/min)	15	Final Meter Reading (l)	250903
Sampling Duration (mins)	30	Volume Sampled (l)	450
Filter No	8907		
Volume Sampled (m ³)	Meter 0.450		
Corrected Volume =	0.41 Nm ³ (at NTP)		

Sampling Run 2 Time: 10:44 - 11:14

Sampling Point	CP	Initial Meter Reading (l)	250905
Sampling Rate (l/min)	15	Final Meter Reading (l)	251370
Sampling Duration (mins)	30	Volume Sampled (l)	465
Filter No	8908		
Volume Sampled (m ³)	Meter 0.465		
Corrected Volume =	0.42 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8907	57.65	57.68	0.00	0.03
2	8908	57.89	57.91	0.00	0.02

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.07	0.05	0.06
Mass Emission (g/hr)	0.76	0.49	0.62

Plant Type	LEV 15 - South Site	Stack Area (m ²)	0.126
Job Number	OEH 32889	Meter Temp (C)	25
Client Name	Sandvik	Stack Diameter (cm)	40
Date	23rd August 2004	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	10
		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)	6	5	5	6	5	4	5	5	5	4
Temperature (°C)	22	22	22	22	22	22	22	22	22	22
Duct Velocity (m/s)	3.2	2.9	2.9	3.2	2.9	2.6	2.9	2.9	2.9	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)	6	5	5	6	6	6	5	5	5	4
Temperature (°C)	20	20	20	20	20	20	20	20	20	20
Duct Velocity (m/s)	3.2	2.9	2.9	3.2	3.2	3.2	2.9	2.9	2.9	2.6

Absolute Mean Duct Velocity (m/s)	2.9
Absolute Flow Rate (m³/hr)	1323
Normalised Flow Rate (Nm³/hr)	1229

Sampling Run 1 Time: 14:20 - 14:50

Sampling Point	A2	A9	B2	B9	Initial Meter Reading (l)	834403
Sampling Rate (l/min)	8	8	8	8	Final Meter Reading (l)	834643
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	240
Filter No	8919	8919	8919	8919	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter	0.240	Expected	0.240		
Corrected Volume =						0.22 Nm ³ (at NTP)

Sampling Run 2 Time: 14:53 - 15:23

Sampling Point	B2	B9	A2	A9	Initial Meter Reading (l)	834644
Sampling Rate (l/min)	8	8	8	8	Final Meter Reading (l)	834884
Sampling Duration (mins)	7.5	7.5	7.5	7.5	Volume Sampled (l)	240
Filter No	8920	8920	8920	8920	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter	0.240	Expected	0.240		
Corrected Volume =						0.22 Nm ³ (at NTP)

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8919	58.80	58.82	0.00	0.02
2	8920	57.22	57.24	0.00	0.02

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm³)	0.09	0.09	0.09
Mass Emission (g/hr)	0.1	0.1	0.1

Plant Type	LEV 20 - South Site	Stack Area (m ²)	0.071
Job Number	OEH 32889	Meter Temp (C)	28
Client Name	Sandvik	Stack Diameter (cm)	30
Date	23rd August 2004	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	50
(Vent 19)		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)	135	75	45	45	42	40	55	65	90	130
Temperature (°C)	25	25	25	25	25	25	25	25	25	25
Duct Velocity (m/s)	15.1	11.3	8.7	8.7	8.4	8.2	9.6	10.5	12.3	14.8
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)	125	80	48	43	42	40	56	70	95	125
Temperature (°C)	25	25	25	25	25	25	25	25	25	25
Duct Velocity (m/s)	14.5	11.6	9.0	8.5	8.4	8.2	9.7	10.9	12.7	14.5

Absolute Mean Duct Velocity (m/s) 10.8
Absolute Flow Rate (m³/hr) 2748
Normalised Flow Rate (Nm³/hr) 2518

Sampling Run 1 Time: 12:58 - 13:28

Sampling Point	CP	Initial Meter Reading (l)	833433
Sampling Rate (l/min)	14	Final Meter Reading (l)	833853
Sampling Duration (mins)	30	Volume Sampled (l)	420
Filter No	8915	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.420	Expected 0.420	
Corrected Volume =	0.38 Nm ³ (at NTP)		

Sampling Run 2 Time: 11:30 - 14:10

Sampling Point	CP	Initial Meter Reading (l)	833855
Sampling Rate (l/min)	14	Final Meter Reading (l)	834403
Sampling Duration (mins)	40	Volume Sampled (l)	548
Filter No	8916	Isokineticity Error (%)	-2.1
Volume Sampled (m ³)	Meter 0.548	Expected 0.560	
Corrected Volume =	0.50 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8915	57.73	57.75	0.00	0.02
2	8916	56.70	56.72	0.00	0.02

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration (mg/Nm ³)	0.05	0.04	0.05
Mass Emission (g/hr)	0.1	0.1	0.1

Plant Type	LEV 22 - South Site	Stack Area (m ²)	0.031
Job Number	OEH 332889	Meter Temp (C)	25
Client Name	Sandvik	Stack Diameter (cm)	20
Date	23rd August 2004	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	400
		Ambient Pressure (kPa)	101.3
		Nozzle Size (mm)	4.00

PITOT SURVEY

Traversal 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)	280	275	255	250	250	245	190	175	155	150
Temperature (°C)	50	50	50	50	50	50	50	50	50	50
Duct Velocity (m/s)	22.6	22.4	21.6	21.4	21.4	21.2	18.7	17.9	16.8	16.6
Traversal 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)	280	275	260	255	250	250	255	265	275	285
Temperature (°C)	50	50	50	50	50	50	50	50	50	50
Duct Velocity (m/s)	22.6	22.4	21.8	21.6	21.4	21.4	21.6	22.0	22.4	22.8

Absolute Mean Duct Velocity (m/s) 21.0
Absolute Flow Rate (m³/hr) 2381
Normalised Flow Rate (Nm³/hr) 2020

Sampling Run 1 Time: 10:21 - 10:51

Sampling Point	CP	Initial Meter Reading (l)	831500
Sampling Rate (l/min)	16	Final Meter Reading (l)	831980
Sampling Duration (mins)	30	Volume Sampled (l)	480
Filter No	8909	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.480 Expected 0.480		
Corrected Volume =	0.44 Nm ³ (at NTP)		

Sampling Run 2 Time: 10:53 - 11:23

Sampling Point	CP	Initial Meter Reading (l)	831985
Sampling Rate (l/min)	16	Final Meter Reading (l)	832465
Sampling Duration (mins)	30	Volume Sampled (l)	480
Filter No	8910	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.480 Expected 0.480		
Corrected Volume =	0.44 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8909	57.78	57.80	0.00	0.02
2	8910	56.68	56.74	0.00	0.06

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration (mg/Nm ³)	0.05	0.14	0.09
Mass Emission (g/hr)	0.09	0.28	0.18

Plant Type **LEV 24 (Vent 45) - South Site**
 Job Number **OEH 32889** Meter Temp (C) 32
 Client Name **Sandvik**
 Date **23rd August 2004**

Ambient Pressure (kPa) 101.3
 Nozzle Size (mm) 5.00

Flow readings not possible due to grille configuration

Sampling Run 1 Time: 11:34 - 12:04

Sampling Point	LHS
Sampling Rate (l/min)	12
Sampling Duration (mins)	30
Filter No	8913
Volume Sampled (m ³)	Meter 0.360

Initial Meter Reading (l) 251690
 Final Meter Reading (l) 252050
 Volume Sampled (l) 360

Corrected Volume = 0.32 Nm³ (at NTP)

Sampling Run 2 Time: 12:05 - 12:35

Sampling Point	RHS
Sampling Rate (l/min)	12
Sampling Duration (mins)	30
Filter No	8914
Volume Sampled (m ³)	Meter 0.360

Initial Meter Reading (l) 252051
 Final Meter Reading (l) 252411
 Volume Sampled (l) 360

Corrected Volume = 0.32 Nm³ (at NTP)

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8913	58.23	58.25	0.00	0.02
2	8914	56.81	56.83	0.00	0.02

TEST RESULTS

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

Plant Type	LEV 28 - South Site	Stack Area (m ²)	0.018
Job Number	OEH 32889	Meter Temp (C)	25
Client Name	Sandvik	Stack Diameter (cm)	15
Date	23rd August 2004	Pitot Factor	1.00
		Pitot Factor (sqrt)	1.00
		Stack Pressure (Pa)	1000
		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)	800	800	800	800	800	800	800	800	800	800
Temperature (°C)	40	40	40	40	40	40	40	40	40	40
Duct Velocity (m/s)	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7
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)	800	800	800	800	800	800	800	800	800	800
Temperature (°C)	40	40	40	40	40	40	40	40	40	40
Duct Velocity (m/s)	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7

Absolute Mean Duct Velocity (m/s) 37.7
Absolute Flow Rate (m³/hr) 2398
Normalised Flow Rate (Nm³/hr) 2112

Sampling Run 1 Time: 11:25 - 11:55

Sampling Point	CP	Initial Meter Reading (l)	832465
Sampling Rate (l/min)	16	Final Meter Reading (l)	832945
Sampling Duration (mins)	30	Volume Sampled (l)	480
Filter No	8911	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.480	Expected 0.480	
Corrected Volume =	0.44 Nm ³ (at NTP)		

Sampling Run 2 Time: 11:56 - 12:26

Sampling Point	CP	Initial Meter Reading (l)	832950
Sampling Rate (l/min)	16	Final Meter Reading (l)	833430
Sampling Duration (mins)	30	Volume Sampled (l)	480
Filter No	8912	Isokineticity Error (%)	0.0
Volume Sampled (m ³)	Meter 0.480	Expected 0.480	
Corrected Volume =	0.44 Nm ³ (at NTP)		

FILTER WEIGHTS

Test Number	Filter No	Pre-Weight (mg)	Post-Weight (mg)	Rinsings (mg)	Gain (mg)
1	8911	58.11	58.13	0.00	0.02
2	8912	58.14	58.23	0.00	0.09

TEST RESULTS

	Test 1	Test 2	Mean
Particulate Concentration(mg/Nm ³)	0.05	0.20	0.13
Mass Emission (g/hr)	0.10	0.43	0.26