4 July 2008

Report No: 070345r

Report prepared for:
Neal Scholer Incineration
Welshpool, WA

Emission Testing – June 2008
Turbo-Burn

Dear Mr Neal Scholer,

Tests were performed 17 June 2008 to determine emissions to air from the Turbo-Burn portable incineration unit.

Yours faithfully
Emission Testing Consultants

Stephen Pereira
Manager – Western Australia

sp@emission.com.au

NATA
NATA Accredited
Labratory Number: 14601
This document is issued in accordance with NATA's accreditation requirements.

DEFINITIONS

The following symbols and abbreviations are used in this test report:

NTP	Normal temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
Nm^3/min	Flow rate (m^3/min) at NTP conditions
Disturbance	A flow obstruction or instability in the direction of the flow that may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
BSP	British standard pipe.
VOC	wAny chemical compound based on carbon in the boiling range 36 to 126°C, with a vapour pressure of at least 0.010kPa at 25°C (or having a corresponding volatility under the particular conditions of use) that adsorb onto activated charcoal and desorb into CS_2, or that can be collected in a tedlar bag and be quantitatively recovered, and that are detected by GCMS. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are CO, CO_2, carbonic acid, metallic carbides and carbonate salts.
D	Duct diameter or equivalent duct diameter for rectangular ducts.
>	Greater than
<	Less than the minimum limit of detection using the specified method.
~	Approximately
NA	Not applicable

PLANT OPERATING CONDITIONS

The Turbo-Burn was operated in accordance with the 'Information and Service Manual' supplied with the unit.

WASTE COMPOSITION

The waste composition was carefully measured and recorded.

Waste	Mass (kg)
Oil filters	11.1
Oily rags (and absorbants)	13.5
Plastics	2.35
Oil	5
Paper, cardboard & wood	9.45
TOTAL WASTE	41.4

Oil filters – 11.1kg

Oily rags – 13.5kg

Plastics – 2.35kg

Waste oil – 5kg

Paper, cardboard & wood – 9.45

Total – 41.4kg

BURN-DOWN

The unit was extinguished when the burn cycle was deemed complete by the operator. The ash and non-combustibles were carefully weighed once cool.

Final weights	Mass (kg)
Ash	2.1
Filter canisters	7.15
TOTAL	9.25

SAMPLING PLANE REQUIREMENTS

Criteria for Sampling Planes for compliance to Australian Standard (AS 4323.1-1995)

Table 1

Type of flow disturbance	*Minimum distance upstream from disturbance, diameters (D)*	*Minimum distance downstream from disturbance, diameters (D)*
Bend, connection, junction, direction change, exit	*> 2D*	*>6D*
Louvre, butterfly damper (partially closed or closed)	*>3D*	*>6D*
Axial fan	*>3D*	*>8D (see note)*
Centrifugal fan	*>3D*	*>6D*

Note: The plane should be selected as far as practicable from a fan. Flow straighteners may be required to ensure the position chosen meets the check criteria listed in items (a) to (f) below.

(a) The gas flow is basically in the same direction at all points along each sampling traverse.

(b) The gas velocity at all sampling points is greater than 3 m/sec.

(c) The gas flow profile at the sampling plane shall be steady, evenly distributed and not have a cyclonic component which exceeds an angle of 15° to the duct axis, when measured near the periphery of a circular sampling plane.

(d) The temperature difference between adjacent points of the survey along each sampling traverse is less than 10% of the absolute temperature, and the temperature at any point differs by less than 10% from the mean.

(e) The ratio of the highest to lowest pitot pressure difference shall not exceed 9:1 and the ratio of the highest to lowest gas velocities shall not exceed 3:1. For isokinetic testing with the use of impingers, the gas velocity ratio across the sampling plane shall not exceed 1.6:1.

(f) The gas temperature at the sampling plane should preferably be above the dewpoint.

SAMPLING PLANE OBSERVATIONS

As the sample was taken at the stack exit, the sampling plane was not in accordance with ***Table 1*** of **AS4323.1** but the conditions of checklist ***(a)*** to ***(f)*** of ***AS 4323.1*** were met.

The accuracy of results should not be affected.

TEST METHODS

The following methods are accredited with National Association of Testing Authorities (NATA).

All parameters will be reported adjusted to dry NTP conditions unless otherwise stated.

On site sampling guidelines: according to ETC method 1.

Sampling plane criteria: according to AS 4323.1-1995. Selection of sampling positions.

Flow rate and velocity: according to USEPA Method 2, using a pitot tube and differential manometer. Temperature determined using a calibrated thermocouple and digital pyrometer.

Moisture content: according to USEPA method Alt008, by gravimetry.

Particulate matter: according to USEPA method 17. Determination of total particulate matter - Isokinetic manual sampling - Gravimetric method, using the quartz thimble holder, in the in-stack configuration.

Oxygen: according to US EPA method 3A, using an electrochemical cell O_2 analyser in conjunction with an electronic cooler unit. Calibration against NATA certified gas standard of O_2 in nitrogen.

Carbon dioxide: according to US EPA method 3A, using a NDIR CO_2 analyser in conjunction with an electronic cooler unit. Calibration against NATA certified gas standard of CO_2 in N_2.

Carbon monoxide: according to US EPA method 10, using an NDIR CO analyser in conjunction with an electronic cooler unit. Calibration against NATA certified gas standard of CO in N_2.

Sulphur dioxide: according to USEPA method 6C, using an NDIR SO_2 analyser in conjunction with an electronic cooler unit. Calibration against NATA certified gas standard of SO_2 in N_2.

Nitrogen oxides (NO and NO_2) as NO_2: according to US EPA method 7E, using a chemiluminescence NOx analyser in conjunction with an electronic cooler unit. Calibration against NATA certified gas standard NO/NO_2 in N_2

Total (gaseous and particulate) metals and metallic compounds: according to USEPA method 29, by on site isokinetic sampling into a sampling train consisting of a heated filter followed by impingers. Subsequent analysis by atomic absorption spectrometry (AAS) or inductive coupled plasma (ICP) spectrometry. *Analysis under subcontract by National Measurement Institute in report number RN686898, dated 3 July 2008.*

Hydrogen chloride: according to USEPA Method 26, by on site sampling into an impinger train with subsequent analysis by ion chromatography. *Analysis performed under subcontract by SGS Environmental in report number 61926, dated 1 July 2008 (NATA accreditation number 2562).*

Volatile organic compounds: according too USEPA method 18, by on site sampling into sorbent tube, with subsequent laboratory analysis by solvent desorption and GC-FID. *Analysis performed under subcontract by MGT Environmental Consulting in report number 229271, dated 2 July 2008 (NATA accreditation number 1261).*

DEVIATIONS FROM TEST METHODS

USEPA Methods 2 & 17

Flow measurements and isokinetic sampling was conducted at a single representative point throughout the burn cycle.

A flow measurement and temperature was taken at the same position as the isokinetic nozzle every 10 minutes. Isokinetic rate was adjusted accordingly.

Particulate matter and heavy metals were tested for the duration of the burn.

OBSERVATIONS – VISIBLE EMISSION

There was no significant visible emission. There were short periods of visible emission during startup and burnout. The thickest / densest visible emission could be rated against the Ringelmann Chart as between 0 and 1 (zero and one).

RESULTS

Turbo-Burn

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Sampling Plane Details	Turbo Burn070345
Distance upstream from disturbance:	Sampled at exit
Distance downstream from disturbance:	> 6 D from Connection
Discharge to air:	Vertical
Size and number of ports:	nil
Access to ports:	Portable step ladder
Conformance with AS 4323.1 Table 1:	No*
Non conformance with these items of AS 4323.1:	Conforms with all items

Flow Results			Turbo Burn070345
Time of flow tests	12:40 to 14:40	hrs	
Stack dimensions at sampling plane	250	mm	
Velocity at sampling plane	8.7	m/s	
Average temperature	260	°C	
Average moisture content	3.1	%v/v	
Flow rate at discharge conditions	26	m³/min	
Flow rate at wet NTP conditions	12	m³/min	
Flow rate at dry NTP conditions	11	m³/min	

Manual Sampling Results	Turbo Burn070345	Sampling Times	Concentration at NTP		Mass rate	
Chloride as HCl		1235-1450	2.9	mg/m³	0.033	g/min

Volatile Organic Compound (VOC) Results	Turbo Burn070345	Sampling Times	Concentration at NTP		Mass rate	
Total VOC as n-hexane		1235-1450	10	mg/m³	0.11	g/min

Refer to "**SAMPLING PLANE OBSERVATIONS**" on page 3.

Refer to **"DEVIATIONS FROM TEST METHODS"** on page 7.

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Continuous Analyser Results (Turbo Burn070345)		Sampling Times	Concentration		Mass rate	
Oxygen (dry basis)		1245-1447	18.5	% v/v	-	
Carbon dioxide (dry basis)		1245-1447	2.3	% v/v	30	kg/hour
Dry gas density		1245-1447	1.3	kg/Nm^3	-	
Molecular weight of stack gas, dry basis		1245-1447	29	g/g-mole	-	
Nitrogen oxides as NO_2		1245-1447	39	mg/Nm^3	0.43	g/min
Nitrogen oxides as NO_2	(Minimum)	1245-1447	9.1	mg/Nm^3	0.10	g/min
Nitrogen oxides as NO_2	(Maximum)	1245-1447	87	mg/Nm^3	0.98	g/min
Sulphur dioxide as SO_2		1245-1447	34	mg/Nm^3	0.38	g/min
Sulphur dioxide as SO_2	(Minimum)	1245-1447	1.3	mg/Nm^3	0.015	g/min
Sulphur dioxide as SO_2	(Maximum)	1245-1447	65	mg/Nm^3	0.73	g/min
Carbon monoxide as CO		1245-1447	200	mg/Nm^3	2.3	g/min
Carbon monoxide as CO	(Minimum)	1245-1447	12	mg/Nm^3	0.13	g/min
Carbon monoxide as CO	(Maximum)	1245-1447	540	mg/Nm^3	6.1	g/min

Manual Sampling Results (Turbo Burn070345)	Sampling Times	Concentration at NTP		Mass rate	
Particulate matter	1240-1445	130	mg/m^3	1.4	g/min
Antimony	1240-1445	0.038	mg/m^3	0.00043	g/min
Arsenic	1240-1445	0.0036	mg/m^3	0.000040	g/min
Barium	1240-1445	0.032	mg/m^3	0.00036	g/min
Beryllium	1240-1445	< 0.0002	mg/m^3	< 0.000002	g/min
Cadmium	1240-1445	0.0025	mg/m^3	0.000028	g/min
Chromium	1240-1445	0.011	mg/m^3	0.00012	g/min
Cobalt	1240-1445	0.0011	mg/m^3	0.000012	g/min
Copper	1240-1445	0.050	mg/m^3	0.00056	g/min
Lead	1240-1445	0.42	mg/m^3	0.0047	g/min
Manganese	1240-1445	0.014	mg/m^3	0.00016	g/min
Mercury	1240-1445	0.0028	mg/m^3	0.000031	g/min
Nickel	1240-1445	0.034	mg/m^3	0.00038	g/min
Phosphorus	1240-1445	0.43	mg/m^3	0.0049	g/min
Selenium	1240-1445	0.0012	mg/m^3	0.000013	g/min
Silver	1240-1445	0.00060	mg/m^3	0.0000068	g/min
Thallium	1240-1445	< 0.0003	mg/m^3	< 0.000003	g/min
Tin	1240-1445	0.12	mg/m^3	0.0013	g/min
Vanadium	1240-1445	0.00078	mg/m^3	0.0000088	g/min
Zinc	1240-1445	4.3	mg/m^3	0.049	g/min