Sonja Smith

From: Marie O'Connor
Sent: 21 December 2009 16:55
To: Sonja Smith
Subject: FW: Rilta Environmental Ltd. (W0192-03) Additional Information
Attachments: Additional Info 0 5 Ash limit Dec09.docx; Oil Combustion Emissions Report Signed Front Page.pdf; Rilta Oil Combustion Report.pdf; Ashphalt Batching Plant.pdf

Sonja
Can you process this as unsolicitated information.

Thanks
Marie

Telephone :
+353 21 4875540

From: Hussey, Colm [mailto:Colm.Hussey@rilta.ie]
Sent: 21 December 2009 16:50
To: Marie O'Connor
Subject: Rilta Environmental Ltd. (W0192-03) Additional Information

Marie,

Subsequent to our meeting last Friday (Dec 18th), I hereby furnish the following information in relation to what we believe to be a suitable limit for maximum ash content for a re-processed oil product to be used in the hot road surfacing industry.
The documents included are:

- Ash limit.docx – Our criteria for the choice of a maximum 0.5% ash content.
- Oil Combustion Emissions Signed Front Page.pdf
- Rilta Oil Combustion Report.pdf – Main body of the report (As requested at Friday's meeting)
- Asphalt Batching Plant.pdf – schematic view of a HRS Plant.

I trust the information contained is of benefit to the application, but if you have any questions, by all means contact me at 087 9176264.

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Sampling identified as UKAS accredited was conducted in accordance with REC Ltd accredited Methods.
Subcontract analyses identified as UKAS accredited were conducted in accordance with SAL Ltd SOPs.

EMISSION MONITORING OF THE WASTE OIL BURNING PROCESS 10 & 13 January, 2009

For Trident Waste Oil Solutions Ltd

Prepared for:

Trident Waste Oil Solutions Ltd
Stockpit Road
Knowsley Industrial Park North
Liverpool
EL33 7TQ

Prepared by:

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Issued : 6 February, 2009
Reference : 32352p1r0

Prepared by : _____
J. Tate, Env Technician, MM 08 917, MCERTS L1

Reviewed by : _____
B. Jacob, Ops Manager, MM 06 693, MCERTS L2 TE1-4

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CONTENTS

APPENDICES (FOR EACH STACK)

1 Site Worksheets and Diagrams (15 Additional Pages)
2 Flow Data (1 Additional Pages)
3 Tables of Results & Figures (10 Additional Pages)
4 Laboratory Submission Sheet (2 Additional Pages) & Analytical Results (28 Additional Pages)
5 Calculations (1 Additional Page)

PART 1: EXECUTIVE SUMMARY

Objectives of Monitoring

Resource & Environmental Consultants (REC) Ltd was commissioned by Trident Waste Oil Solutions Ltd to monitor emissions of pollutants released from a waste oil burning process at their site in Liverpool.

The operations at Trident Waste Oil Solutions are not authorised under an IPPC permit issued by the EA or Local Authority under the Pollution Prevention & Control Regs 2000.

The monitoring which was carried out was a 'one off' test to assess potential emissions from a particular batch of waste oil imported form Ireland.

Monitoring has been undertaken for the following parameters:-

Emission Parameter	Emission Point Identification
	Steam Generator
Total Particulate Matter	✓
Hydrogen Chloride (as HCl)	✓
Hydrogen Fluoride (as HF)	✓
Nitrogen Oxides (NO_x)	✓
Carbon Monoxide (CO)	✓
Carbon Dioxide (CO_2)	✓
Sulphur Dioxide (SO_2)	✓
PCDDs & PCDFs (i-TE)	✓
PCBs (WHO 12)	✓
PAHs (US EPA 16)	✓
Heavy Metals (suite including As, Co, Cu, Cr, Pb, Mn, Cd, Tl, V, Ni, Sb)	✓
Mercury (Hg)	✓
Total VOCs as C	✓

Monitoring Results – 10 January, 2009

Emission Point Reference	Parameter	Emission Limit	Monitoring Result	Uncertainty	Units	Reference conditions	Date of Sampling	Start & End Times	Reference Method	Accreditation Status[1]	Operating Status
Steam Generator	TPM	None Set	248.4	±10%	mg/m^3	STP	10/01/09	11:30-12:30	BS EN 13284	A	4 l/min waste oil
Steam Generator	HCl	None Set	12.0	±15%	mg/m^3	STP	10/01/09	11:30-12:30	BS EN 1911	B	4 l/min waste oil
Steam Generator	NOx	None Set	123	±10%	mg/m^3	STP	10/01/09	11:26-17:00	BS EN 14792	A	4 l/min waste oil
Steam Generator	O_2	None Set	14.6	±10%	%vol	STP	10/01/09	11:26-17:00	BS EN 14789	A	4 l/min waste oil
Steam Generator	CO	None Set	81	±10%	mg/m^3	STP	10/01/09	11:26-17:00	BS EN 15058	A	4 l/min waste oil
Steam Generator	CO_2	None Set	4.3	±10%	%vol	STP	10/01/09	11:26-17:00	ISO 12039	A	4 l/min waste oil
Steam Generator	SO_2	None Set	2	±10%	mg/m^3	STP	10/01/09	12:40-14:40	ISO 7935	A	4 l/min waste oil
Steam Generator	Heavy Metals	None Set	<2.12	±15%	mg/m^3	STP	10/01/09	13:00-15:00	BS EN 14385	B	4 l/min waste oil
Steam Generator	Cd & Tl	None Set	<0.01	±15%	mg/m^3	STP	10/01/09	13:00-15:00	BS EN 14385	B	4 l/min waste oil
Steam Generator	Hg	None Set	<0.005	±15%	mg/m^3	STP	10/01/09	15:30-17:30	BS EN 13211	B	4 l/min waste oil

NOTE (1) : UKAS/MCERTS status:- (A) REC Ltd accredited for sampling and analysis. (B) REC Ltd accredited for sampling only, UKAS accredited analysis conducted by SAL Ltd or AES Ltd. (C) REC Ltd accredited for sampling, analysis not UKAS accredited (D) REC Ltd not accredited for sampling, UKAS accredited analysis conducted by SAL Ltd. (E) REC Ltd not accredited for sampling, analysis not UKAS accredited.

Monitoring Results – 13 January, 2009

Emission Point Reference	Parameter	Emission Limit	Monitoring Result	Uncertainty	Units	Reference conditions	Date of Sampling	Start & End Times	Reference Method	Accreditation Status[1]	Operating Status
Steam Generator	PCDDs & PCDFs (i-TE)	None Set	0.01	±100%	ng/m^3	STP	13/01/09	08:08-12:08	BS EN 1948	B	4 l/min waste oil
Steam Generator	PCBs (WHO 12)	None Set	0.2	±100%	ng/m^3	STP	13/01/09	08:08-12:08	BS EN 1948	B	4 l/min waste oil
Steam Generator	PAHs (US EPA 16)	None Set	10.3	±100%	$\mu g/m^3$	STP	13/01/09	12:32-14:32	ISO 11338	B	4 l/min waste oil
Steam Generator	HF	None Set	<0.2	±20%	mg/m^3	STP	13/01/09	12:40-14:40	BS ISO 15713	B	4 l/min waste oil
Steam Generator	O_2	None Set	15	±10%	% Vol	STP	13/01/09	09:03-15:29	BS EN 14789	A	4 l/min waste oil
Steam Generator	NOx	None Set	102	±10%	mg/m^3	STP	13/01/09	09:03-15:29	BS EN 14792	A	4 l/min waste oil
Steam Generator	CO	None Set	40	±10%	mg/m^3	STP	13/01/09	09:03-15:29	BS EN 15058	A	4 l/min waste oil
Steam Generator	CO_2	None Set	4.0	±10%	% Vol	STP	13/01/09	09:03-15:29	ISO 12039	A	4 l/min waste oil
Steam Generator	SO_2	None Set	2	±10%	mg/m^3	STP	13/01/09	09:03-15:29	ISO 7935	A	4 l/min waste oil
Steam Generator	Total VOCs	None Set	<1	±10%	mg/m^3	STP	13/01/09	10:20-14:20	BS EN 13526	A	4 l/min waste oil

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Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Fuel Type	Feedstock	Abatement Plant	Load	Comparison of Operator CEMS and Periodic Monitoring Results			
								Substance	CEMS Results	Monitoring Results	Units
Steam Generator	10/01/09	Waste oil burning	Continuous	Waste oil REL 210	N/A	None	4 litres/min	N/A	N/A	N/A	N/A
Steam Generator	13/01/09	Waste oil burning	Continuous	Waste oil REL 210	N/A	None	4 litres/min	N/A	N/A	N/A	N/A

Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Steam Generator	None	None	On the stack, 2 x 4" BSP sampling ports were installed. The sampling points provided were 5 x hydraulic diameters from potential flow disturbance both downstream and upstream. Data has been taken from periods when the Generator was operating normally – coil over-heating problems caused fresh air intake and obvious potential dilution of emissions (see Figures 1 & 2).

PART 2 SUPPORTING INFORMATION

General Information

Trident Waste Oil Solutions Ltd commissioned REC Ltd to conduct an emission monitoring survey on their waste oil burning process, at their site in Liverpool.

The waste oil was burnt using a steam generator belonging to Trident. The reference number for the waste oil used was REL210.

As the steam generator used had undertaken many hundreds of hours use prior to testing, and was very difficult to clean, there was a heavy build up of carbon deposits on the coil clearly visible before testing. During sampling it became clear that these carbon deposits were present in the exhaust gas, and therefore may have had a negative influence on the results obtained.

Scope of the Survey

An emission monitoring survey was required to determine the release concentrations of various pollutants from the oil burning process. Concentrations of the following pollutants were quantified during the survey:

- Combustion Gases including O_2, CO, CO_2, NO_x, and SO_2
- Polychlorinated dibenzodioxins (PCDD) and polychlorinated dibenzofurans (PCDF)
- Polychlorinated biphenyls (PCBs)
- Poly Aromatic Hydrocarbons (PAHs)
- Total Particulate Matter
- Hydrogen Chloride (HCl)
- Hydrogen Fluoride
- Heavy Metals including Pb, Cr, Cu, Mn, As, Sb, Co, V, Sn, Hg, Cd & Tl
- Total Volatile Organic Compounds (VOCs) expressed as Carbon (C)

Ancillary measurements of stack dimensions, temperature and velocity were also made to assist in the calculation of isokinetic sampling rates.

Sampling for combustion gases and VOCs was carried out on a continuous basis with measured concentrations being data-logged at 1 minute intervals over the sampling period. All other pollutants were sampled in duplicate.

All results were to be reported at 273K, 101.3kPa, wet gas, without correction for oxygen.

Sampling Personnel

Monitoring was conducted by the following REC Ltd permanent staff:-

- Brian Jacob - Team Leader, MM06 693, MCERTS Level 2, TE 1-4
- Jeff Tate - Assistant, MM08 917., MCERTS Level 1

Method Details

The following table shows the reference methods used for the emission monitoring survey:

Species	UKAS/ MCERTS Status	Method	Uncertainty ±%	Limit of Detection
Moisture	A	In house method MM0010 based on BS EN 14790	20	0.1%vol
Particulates	A	In house method MM0004 based on BS EN 13284	10	1 mg/m^3
Hydrogen Chloride	B	In house method MM0006 based on BS EN 1911	20	0.1 mg/m^3
Hydrogen Fluoride	B	In house method MM0004 based on BS ISO 15713	20	0.1 mg/m^3
Metals	B	In house method MM0007 based on BS EN 14385	15	0.01 - 0.1 mg/m^3
Mercury	B	In house method MM0008 based on BS EN 13211	15	0.005 mg/m^3
Dioxins / furans	B	In house method MM0005 based on BS EN 1948 Pt 1	100	0.01 ng/m^3
PCBs	B	In house method MM0005 based on BS EN 1948 Pt 1	100	0.01 ng/m^3
PAHs	B	In house method MM0005 based on ISO 11338	100	0.01 ug/m^3
Sulphur Dioxide	A	In house method MM0002 based on ISO 7935	10	1 mg/m^3
Nitrogen Oxides (NO_x)	A	In house method MM0002 based on BS EN 14792	10	1 mg/m^3
Carbon Monoxide	A	In house method MM0002 based on BS EN 15058	10	1 mg/m^3
Carbon Dioxide	A	In house method MM0002 based on ISO 12039	10	1 mg/m^3
Oxygen	A	In house method MM0002 based on BS EN 14789	10	0.1%vol
Total VOCs (as C)	A	In house method MM0002 based on BS EN 13526	10	1 mg/m^3

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Monitoring Equipment

All monitoring equipment used at Trident Waste Oil Solutions was calibrated before use in accordance with in house procedures. The equipment used is recorded on the field workbook(s). Copies of Sampling Worksheets are included in Appendix 1.

Sampling Positions

On the stack, 2 x 4" BSP sampling ports were installed. The sampling points provided were 5 x hydraulic diameters from potential flow disturbance both downstream and upstream.

The sample port size does not fully comply with the positional requirements of Environment Agency Technical Guidance Note M1 (TGN M1). TGN M1 requires 5" BSP sockets. The sampling location and the initial temperature and velocity traverse conducted along the sample plane showed that the flow requirements of TGN M1 were met.

Uncertainty

All the methods were fully complied with and therefore the stated uncertainties apply.

REC has calculated uncertainty budgets for all of the pollutants listed in the Method Details Table above in accordance with calculations and methodology supplied by the Source Testing Association (STA).

RESULTS AND DISCUSSION

Initial Velocity and Temperature Traverse

An initial pitot-static pressure and temperature traverse was carried out. From these data stack velocity, expressed in metres per second (m/s), and volumetric flowrates expressed in cubic metre per hour (m^3/hr) have been calculated.

The results are reported at actual stack conditions and the volumetric flowrate is further expressed at the standard reference conditions of 273K, 101.3kPa i.e. standard temperature and pressure (STP). The results are summarised in Table 1.

Particulates

The results of the particulate sampling runs are summarised in Table 2. From the mass of particulate matter on the filter and in the acetone/water wash residue and volume sampled an emission concentration and mass emission was calculated.

The results are expressed in mg/m^3 at 273K, 101.3kPa, on a wet gas basis, without correction for oxygen content.

Hydrogen Chloride

The results of the volatile chloride sampling runs are summarised in Table 2. From the concentration of Cl^- and the measured volume of absorbing solution a total mass of HCl in microgram (µg) was determined. From the measured sample volume, an emission concentration has then been calculated.

The results are expressed in mg/m^3 at 273K, 101.3kPa, on a wet gas basis, without correction for oxygen content.

Hydrogen Fluoride

The results of the volatile fluoride sampling runs are summarised in Table 3. From the concentration of F^- and the measured volume of absorbing solution a total mass of HF in microgram (µg) was determined. From the measured sample volume, an emission concentration has then been calculated.

The results are expressed in mg/m^3 at 273K, 101.3kPa, on a wet gas basis, without correction for oxygen content.

Heavy Metals

The results of the heavy metal sampling runs are summarised in Tables 4 and 5. The total mass of each metal in µg was calculated from the filter/probe wash and impinger solution contributions.

The results are expressed in mg/m^3 at 273K, 101.3kPa, on a wet gas basis, without correction for oxygen content.

Mercury

The results of the mercury sampling runs are summarised in Table 6. The total mass of Hg in µg was calculated from the filter/probe wash and impinger solution contributions.

The results are expressed in mg/m^3 at 273K, 101.3kPa, on a wet gas basis, without correction for oxygen content.

PCDDs, PCDFs & PCBs

The results of the PCDD, PCDF & PCB sampling run are presented in Table 7. The PCDD and PCDF concentrations are expressed in terms of nanogrammes per cubic metre (ng/m^3) at the standard reference conditions of 273K, 101.3kPa, wet gas, without oxygen correction.

PCDDs and PCDFs are chlorinated tricyclic aromatic compounds with similar chemical properties. The chlorine content is indicated by a prefix thus: tetra (T), penta (Pe), hexa (Hx), hepta (Hp) and octa (O). The position at which the chlorine atoms are substituted is indicated by the preceding numerals. Thus, 2,3,7,8 - tetrachlorodibenzo-para-dioxin is abbreviated to 2,3,7,8 -TCDD.

A large number of positions of substitution and number of chlorine atoms are possible and, as a result, there are 75 different PCDDs and 135 PCDFs. The groups of compounds having the same basic structure and the same number of chlorine atoms (regardless of the position of substitution) are referred to as homologues or as homologue groups.

The OCDD and OCDF homologues consist of only one compound each, but all other homologues are made up of a number of different compounds which are referred to as isomers. For example, 1,2,3,4-TCDD and 2,3,7,8-TCDD are isomers in the TCDD homologue.

Most toxicological studies on PCDDs and PCDFs have been carried out on the most toxic compound 2,3,7,8-TCDD. Few studies have been carried out on the other PCDDs and PCDFs, although the available data indicates that only those with chlorine atoms in the 2,3,7 and 8 position are likely to be important toxicologically, with increasing substitution from four (tetra) to eight (octa) atoms, generally resulting in a marked decrease in potency.

As the PCDDs and PCDFs occur as complex mixtures, an assessment of the toxicity of such mixtures is necessary and the concept of Toxic Equivalents was developed. This method uses the available toxicological and in-vitro biological data to generate a set of weighting factors, each of which express the toxicity of a particular PCDD or PCDF isomer, in terms of an equivalent amount of 2,3,7,8-TCDD.

Multiplication of the concentration of the isomer by this toxic equivalent factor (TEF) gives a 2,3,7,8-TCDD toxic equivalence (TEQ). The toxicity of any mixture relative to 2,3,7,8-TCDD is thus taken to be the sum of the individual TEQs.

A number of different weighting schemes are available. The PCDD and PCDF concentrations quoted in the tables are based on European Community (EC)/NATO TEFs. A summary of the TEFs for all PCDD and PCDF isomers is given in the SAL report.

The individual TEFs of the 17, 2,3,7,8 substituted isomers, also referred to as the 2,3,7,8 congener group are used to produce a total PCDD and PCDF equivalent amount for all homologues. EC/NATO standards assign no TEFs to the 193 non-2,3,7,8 substituted *isomers.*

Details of the surrogate recovery experiment are enclosed on page 5 of the SAL analytical report with recoveries ranging from 77 to 115%.

The dioxin and furan values reported in the tables include those calculated with "none detects" reported as zero values (lower band) and those derived using individual congener detection limits based upon recovery experiments rather than zero values (higher band).

An aliquot of the dioxin sample extract was also analysed for the WHO suite of twelve polychlorinated biphenyls (PCBs) and the results of this also shown in Table 7. Nearly all were less than the limit of detection of the methodology employed with only BZ#77 reporting above the LOD of 0.5 ng/sample at 1.0 ng/sample.

PAHs

The results of the PAH sampling run are summarised in Table 8. To determine the concentration of PAHs in emissions, isokinetic stack sampling equipment satisfying the requirements of BS EN 13284 was employed. The equipment also satisfies the requirements of ISO 11338 (in house method MM0005).

The sampling protocol used follows the same procedure as for PCDDs, PCDFs. However the probe and all glassware were rinsed with acetone, dichloromethane and toluene and all the washings collected in a clean, labelled container for transport back to the laboratory.

The PAH suite includes: Naphthalene, acenaphthylene, acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)Anthracene, Chrysene, Benzo(b/k)Fluoranthene, Benzo(a)Pyrene, indeno(123-cd)Pyrene, Dibenzo(ah)Anthracene, & Benzo(ghi)Perylene.

The mass of PAHs was determined on an aliquot of solvent extract by high resolution GC/MS and laboratory data is reported expressed in ug/sample.

Concentrations are expressed in mg/m^3 at the standard reference conditions of 273K 101.3kPa wet gas without oxygen correction.

Combustion Gases

The results of the combustion gas monitoring tests are summarised in Table 9 and Figures 1 & 2. The table presents the averages of concentrations measured throughout each sample period.

Concentrations are expressed in mg/m^3 at the standard reference conditions of 273K 101.3kPa wet gas without oxygen correction.

Total VOC Emission Data

The results of the VOC monitoring tests are summarised in Table 9. The table presents the averages of concentrations measured throughout each sample period.

Concentrations are expressed in mg/m^3 as carbon at the standard reference conditions of 273K 101.3kPa wet gas without oxygen correction.

======= END OF REPORT =======

APPENDIX 1
STEAM GENERATOR

SITE WORKBOOKS, INCLUDING DIAGRAMS

APPENDIX 2
STEAM GENERATOR
FLOW DATA

TABLE 1

FLOW DATA

Stack Ref.	Stack Temp	Av Pitot ΔP	X-Sect. Area	Velocity (actual)	Volume Flow (m^3/hr)	
	(^{0}C)	(Pa)	(m^2)	(m/s)	(actual)	(@ ntp)
10/01/09	445	247	0.023	31.6	2,580	982
13/01/09	264	107	0.023	18.2	1,487	756

APPENDIX 3
STEAM GENERATOR

TABLES OF RESULTS & FIGURES

TABLE 2

PARTICULATES & HCL EMISSION DATA

DATE: 10/1/09 11:30-12:30

Sampling Data	
Run Time (min)	60
Total mass H_2O collected (g)	74.9
Pitot tube constant, Cp	0.81
Dry gas meter (DGM) volume (litres)	1640.00
Temperature DGM (°C)	10
Temperature stack (°C)	491
Mean pitot tube pressure drop, delta P (cm H_2O)	2.78
Orifice meter pressure drop, delta H (cm H_2O)	12.25
Barometric Pressure (kPa)	102.1
X-sectional area of stack (m^2)	0.023
Nozzle size (mm)	7.90
Flow Data	
Velocity, actual (m/s)	28.0
Velocity, ntp (m/s)	10.1
Vol. Flow, actual (m^3/hr)	2292
Vol. Flow, ntp (m^3/hr)	822
Volume sampled, ntp, dry gas (m^3)	1.795
Volume sampled, ntp, wet gas (m^3)	1.889
Analytical Data	
Filter Weight Gain (mg)	291.4
Acetone Wash Residue Weight (mg)	177.7
Total Particulates (mg)	469.1
Mass HCl Impingers 1+2 (ug)	22065
Mass HCl Impinger 3 (ug)	629
Partics Field Blank (mg)	1.7
Blank %ELV	1.8
HCl in Impingers 1+2 (%)	97
Emission Data	
H_2O (% vol)	4.9
Percentage Isokinetic	106.4
Particulates (mg/m^3)	248.4
HCl (mg/m^3)	12.0

TABLE 3

HF EMISSION DATA

Sampling Data	Steam Generator
Sampling Date	13/01/2009
Sampling Period	12:40-14:40
DGM Start (m^3)	462.1156
DGM End (m^3)	462.4790
DGM Temp (^oC)	13
Ambient Pressure (kPa)	99.6
Volume Sampled (m^3, STP, dry)	0.341
Analytical Data	
HF in NaOH soln (mg/l)	<0.5
HF in NaOH blank soln (mg/l)	<0.5
Volume of NaOH Imp Soln (ml)	<160
Total Mass HF (µg)	<80
Emission Data	
HF (mg/Nm^3)	<0.2

TABLE 4

HEAVY METALS EMISSION DATA

DATE: 10/01/09 13:00-15:00

Sampling Data	
Run Time (min)	120
Total mass H_2O collected (g)	109.0
Pitot tube constant, Cp	0.81
Dry gas meter (DGM) volume (litres)	2833.00
Temperature DGM (°C)	14
Temperature stack (°C)	449
Mean pitot tube pressure drop, delta P (cm H_2O)	1.90
Orifice meter pressure drop, delta H (cm H_2O)	8.36
Barometric Pressure (kPa)	102.0
X-sectional area of stack (m^2)	0.023
Nozzle size (cm)	7.90
Flow Data	
Velocity, actual (m/s)	22.5
Velocity, ntp (m/s)	8.6
Vol. Flow, actual (m^3/hr)	1842
Vol. Flow, ntp (m^3/hr)	699
Volume sampled, ntp, dry gas (m^3)	3.055
Volume sampled, ntp, wet gas (m^3)	3.201
Analytical Data	
Total Heavy Metals (total ug in suite of 9)	6779.1
Total Cd & Tl (total ug)	<4.5
Total Heavy Metals Field Blank (total ug in suite of 9)	<7.8
% of ELV	<1
Total Cd & Tl Field Blank (total ug)	<1
% of ELV	<1
% Metals in Imps 1+2	63-91
Emission Data	
H_2O (% vol)	4.5
Percentage Isokinetic	106.1
Total Heavy Metals, suite of 9 (mg/m^3)	2.12
Total Cd & Tl (mg/m^3)	<0.01

TABLE 5

HEAVY METALS EMISSION DATA BREAKDOWN

Mass Sb	Sb (Measd)	Mass As	As (Measd)	Mass Tl	Tl (Measd)
total ug	(mg/m^3)	total ug	(mg/m^3)	total ug	(mg/m^3)
224	0.0700	23.38	0.0073	<0.4	<0.0001
Mass Cr	**Cr (Measd)**	**Mass Co**	**Co (Measd)**	**Mass Cu**	**Cu (Measd)**
total ug	(mg/m^3)	total ug	(mg/m^3)	total ug	(mg/m^3)
397.4	0.1242	293.2	0.0916	1958	0.6118
Mass Pb	**Pb (Measd)**	**Mass Mn**	**Mn (Measd)**	**Mass Ni**	**Ni (Measd)**
total ug	(mg/m^3)	total ug	(mg/m^3)	total ug	(mg/m^3)
821	0.2565	1660	0.5187	598.2	0.1869
Mass V	**V (Measd)**	**Mass Cd**	**Cd (Measd)**		
total ug	(mg/m^3)	total ug	(mg/m^3)		
803.9	0.2512	4.12	0.0013		

TABLE 6

MERCURY EMISSION DATA

DATE: 10/1/09 15:30-17:30

Sampling Data	
Run Time (min)	120
Total mass H_2O collected (g)	98.6
Pitot tube constant, Cp	0.81
Dry gas meter (DGM) volume (litres)	2253.00
Temperature DGM (°C)	27
Temperature stack (°C)	252
Mean pitot tube pressure drop, delta P (cm H_2O)	0.96
Orifice meter pressure drop, delta H (cm H_2O)	4.22
Barometric Pressure (kPa)	102.0
X-sectional area of stack (m^2)	0.023
Nozzle size (cm)	7.90
Flow Data	
Velocity, actual (m/s)	13.7
Velocity, ntp (m/s)	7.1
Vol. Flow, actual (m^3/hr)	1117
Vol. Flow, ntp (m^3/hr)	583
Volume sampled, ntp, dry gas (m^3)	2.325
Volume sampled, ntp, wet gas (m^3)	2.456
Analytical Data	
Total Hg (ug)	<8
Total Hg Field Blank (ug)	<6
Blank %ELV	4.5
%Hg in Imps 1+2	100.0
Emission Data	
H_2O (% vol)	5.4
Percentage Isokinetic	97.6
Total Hg (mg/m^3)	<0.005

TABLE 7

PCDD/PCDF & PCB (WHO 12) EMISSION DATA

DATE: 13/01/09 08:08-12:08

Sampling Data		
Run Time (min)	240	
Total mass H_2O collected (g)	240.7	
Dry gas meter (DGM) volume (litres)	6213.00	
Temperature DGM (°C)	15	
Temperature stack (°C)	309	
Mean pitot tube pressure drop, delta P (cm H_2O)	1.51	
Orifice meter pressure drop, delta H (cm H_2O)	9.04	
Barometric Pressure (kPa)	99.6	
X-sectional area of stack (m^2)	0.023	
Nozzle Size (cm)	7.90	
Flow Data		
Velocity, actual (m/s)	18.2	
Velocity, ntp (m/s)	8.5	
Vol. Flow, actual (m^3/hr)	1490.1	
Vol. Flow, ntp (m^3/hr)	693.1	
Volume sampled, ntp, dry gas (m^3)	6.520	
Volume sampled, ntp, wet gas (m^3)	6.841	
Analytical Data (in nanogram, ng)	**Lower Band**	**Upper Band**
Total PCDDs (TEQ)	0.004	0.006
Total PCDFs (TEQ)	0.047	0.047
Total PCDDs and PCDFs (TEQ)	0.051	0.053
Field Blank (TEQ)	0.000	0.005
PCBs (WHO 12)	1	-
Emission Data		
H_2O (% vol)	4.7	
Percentage Isokinetic	114.27	
Total PCDDs (ng/m^3 TEQ)	0.001	0.001
Total PCDFs (ng/m^3 TEQ)	0.007	0.007
Total PCDDs and PCDFs (ng/m^3 TEQ)	0.007	0.008
Total PCBs WHO 12 (ng/m^3)	0.2	-

TABLE 8

PAH EMISSION DATA

DATE: 13/01/09 12:32-14:32

Sampling Data	
Dry gas meter (DGM) volume (litres)	1966.00
Temperature DGM (°C)	18
Temperature stack (°C)	410
Mean pitot tube pressure drop, delta P (cm H_2O)	1.14
Orifice meter pressure drop, delta H (cm H_2O)	6.83
Barometric Pressure (kPa)	99.6
X-sectional area of stack (m^2)	0.023
Nozzle Size (cm)	7.90
Flow Data	
Velocity, actual (m/s)	17.2
Velocity, ntp (m/s)	6.8
Vol. Flow, actual (m^3/hr)	1407.3
Vol. Flow, ntp (m^3/hr)	557.8
Volume sampled, ntp, dry gas (m^3)	2.042
Volume sampled, ntp, wet gas (m^3)	2.180
Analytical Data (µg/sample)	
Total US EPA 16 PAHs	22.5
Field Blank	1.4
Emission Data	
H_2O (% vol)	6.3
Percentage Isokinetic	90.5
Total US EPA 16 PAHs (µg/m^3)	10.3

TABLE 9

COMBUSTION GAS EMISSION DATA SUMMARY

Emission Parameter	Average Emission Concentration, (10/1/09) Waste Oil REL210	Average Emission Concentration, (13/1/09) Waste Oil REL210	Typical Releases Gas Oil (Low S)
O_2 (%vol)	14.6	15.0	-
CO_2 (%vol)	4.3	4.0	-
CO (mg/m^3)	81	40	10 - 100
NOx as NO_2 (mg/m^3)	123	102	100 - 300
SO_2 (mg/m^3)	2	2	30 - 100
VOCs (mg/m^3)	-	<1	-

Fig 1: Combustion Gas Emission Data, Trident Waste Oil, Steam Generator (10/1/09)

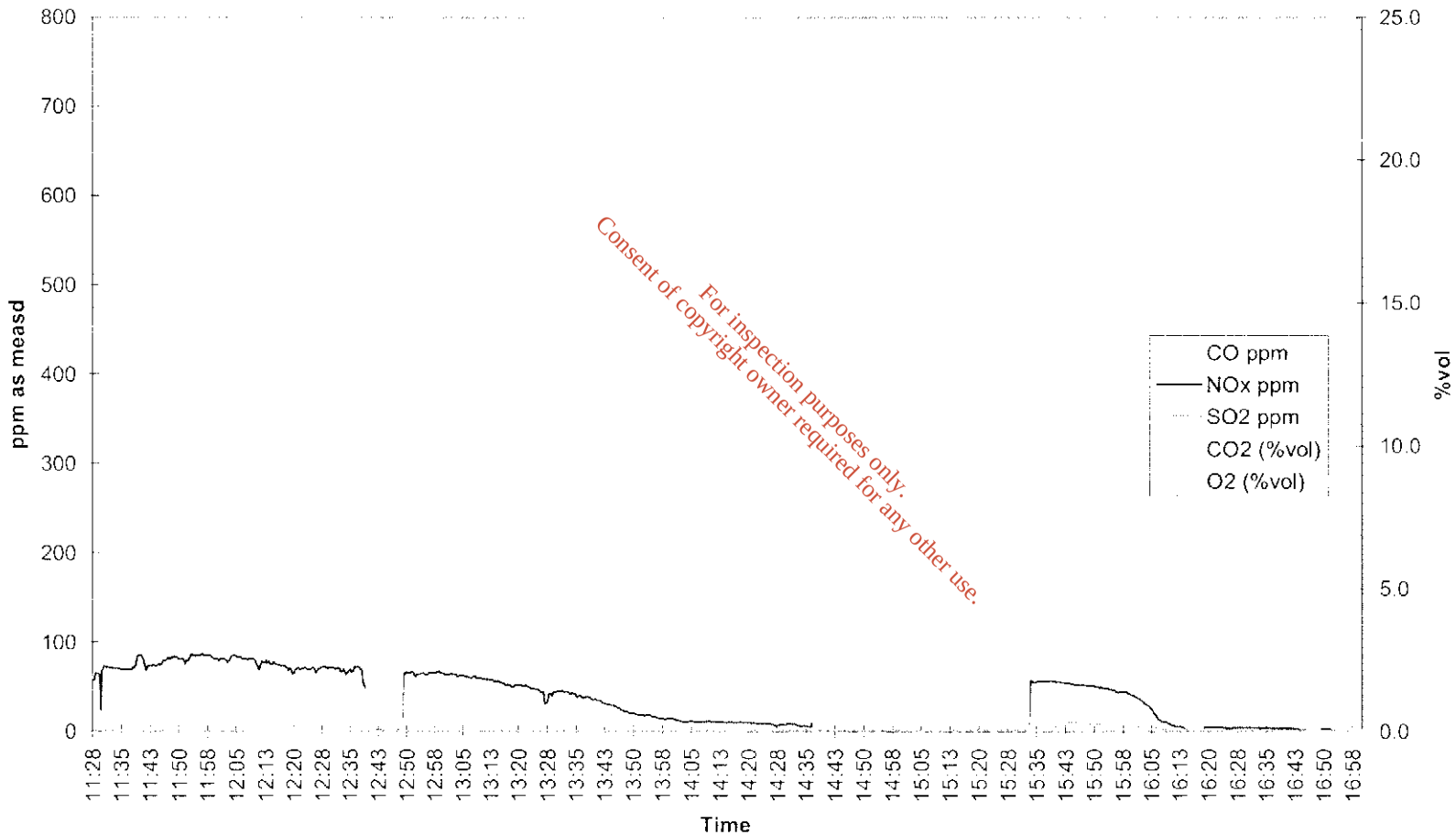
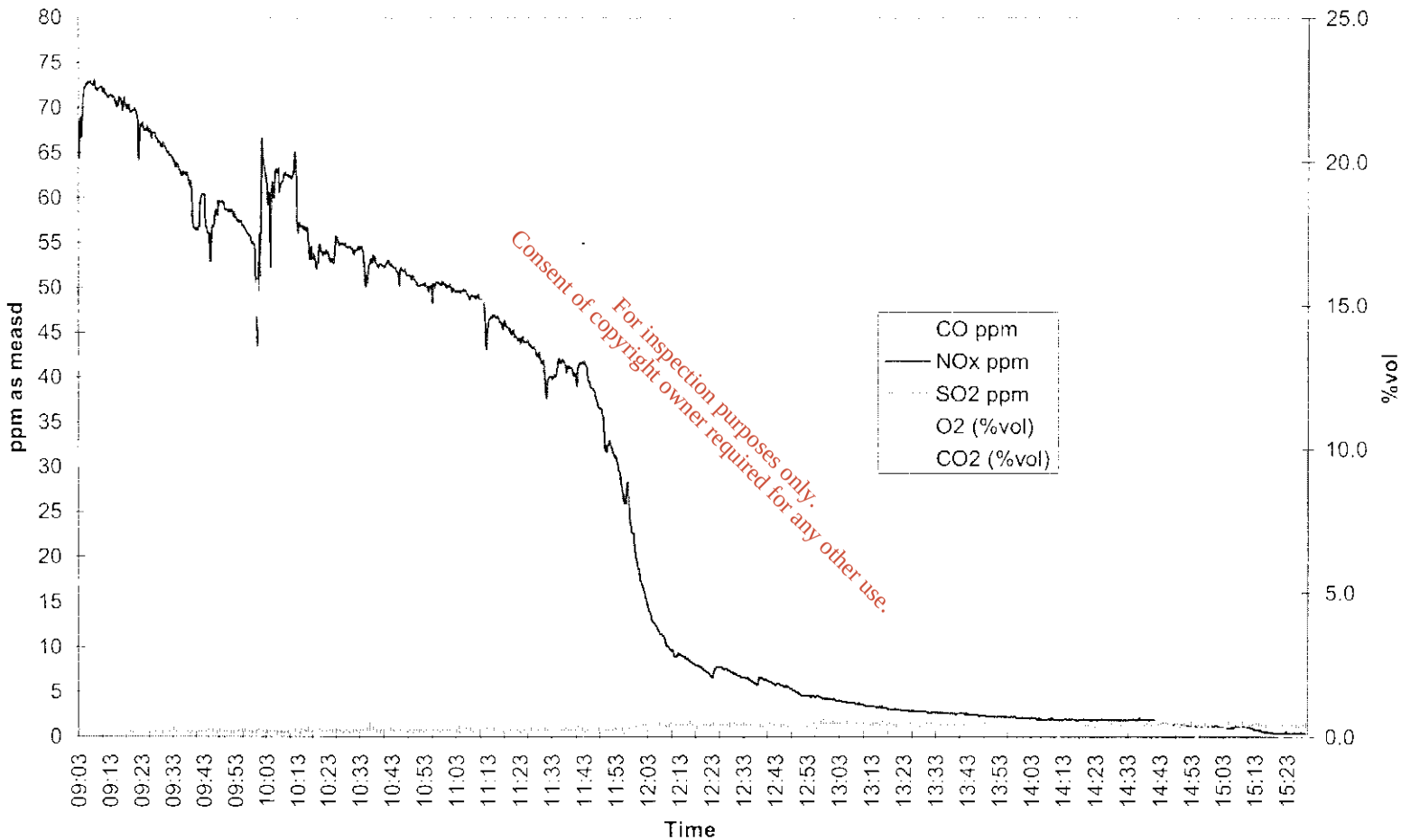


Fig 2: Combustion Gas Emission Data, Trident Waste Oil, Steam Generator (13/1/09)



APPENDIX 4
STEAM GENERATOR

LABORATORY SUBMISSION
SHEETS & ANALYTICAL RESULTS

APPENDIX 5

CALCULATIONS

Conversion Factors

ppm ® mg/Nm³ (at 273K, 101.3kPa: STP)

CO	X	1.25	
SO_2	X	2.86	
VOC's	X	0.53	(as total Carbon)
NO_x	X	2.05	(as NO_2)

Oxygen Correction to Reference Value

Concentration at (STP) -> Concentration at 273K, 101.3kPa, reference O_2 and Dry Gas, i.e.

Concentration X ((20.9-O_2 ref)/(20.9-O_2 measured)) = Concentration at ref Oxygen state.

Example Calculation

SO_2 concentration at STP	=	170.7 mg/Nm³
Oxygen percentage in gas stream	=	13.8%
Reference Oxygen	=	11%
SO_2 concentration at reference O_2 conditions	=	170.7 ((20.9-11)/(20.9-13.8))
	=	238 mg/Nm³ at 273K, 101.3kPa, 11% O_2 and Dry Gas

Moisture Correction (Wet to Dry)

Concentration of Gas Dry = Concentration of x 100/100-Bws Gas Wet

Concentration of Gas Wet = Concentration of x 100-Bws/100 Gas Dry

Where Bws = moisture content of gas stream in percent (Vol/Vol).

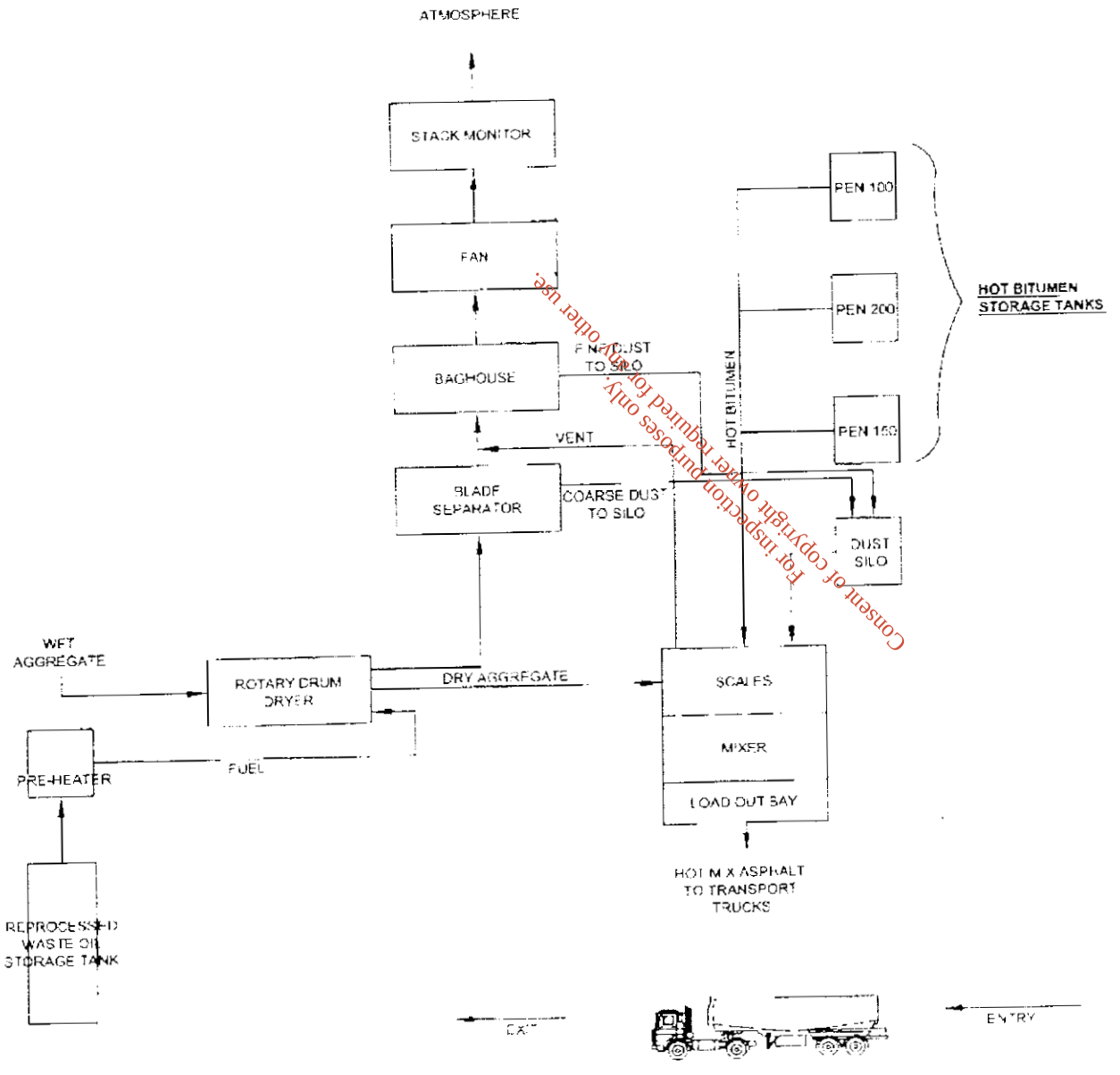
Example

VOC concentration	=	25 mg/Nm³ (Wet)
Moisture Content	=	27.1%
Concentration of VOC	=	25 (100/(100-27.1))

Carbon (C) to Trichloethylene (TCE)

ppm TCE = ppm C x 0.6715

TCE in mg/m³ = TCE ppm x 5.864 (Mol Wt/22.4)



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