



**MONITORING OF MICROBIAL CONDITIONS
IN THE EXHAUST VENTILATION AIR OF THE
SHREDDER UNIT AND HEAT DISINFECTANT SYSTEM
AT SITA(UK) LTD., WREXHAM
2ND QUARTER MONITORING; 12TH AUGUST 2014.**

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27th August 2014

Report Ref: 24846

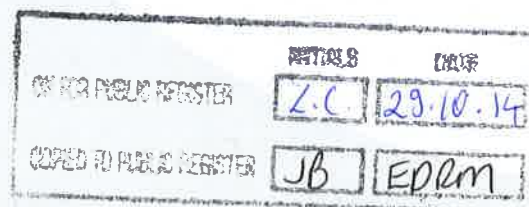
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Site Operator	SITA (UK) Ltd.
Site Location	Wrexham
Permit No.	RP3637SY
Monitoring Date	12 th August 2014
Monitoring Frequency	Quarterly
Monitoring Period	2 nd Quarter 2014
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Introduction

TTS Environmental was commissioned by SITA (UK) Ltd. to carry out monitoring of atmospheric emissions from the waste shredder unit and the heat disinfectant system process at their Wrexham Premises. The process is used to disinfect low-grade medical waste.

Monitoring of environmental emissions to air is required as part of the conditions of authorisation under the Pollution Prevention and Control (England and Wales) Regulations 2000.

Summary of Results.

The monitoring results are summarised as follows:

Parameter	Cfus/m ³	Emission Limit, cfus/m ³
Shredder Unit		
Total Aerobic Bacteria	68	1000
Total Coliform Bacteria	< 1	300
Total Fungi	72	1000
Holoflite		
Total Aerobic Bacteria	176	1000
Total Coliform Bacteria	16	300
Total Fungi	520	1000

Three samples for each parameter were taken from each discharge point. Blank reference samples were also analysed. Emissions were all within the specified limits. No organisms were detected on the blank samples.

Full monitoring data is presented in the tables on pages 8 and 9.

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Discussion and Recommendations

Microbiological emissions from the shredder and Holoflite unit were within the Emission Limit Values.

Process Description and Operating Conditions

The heat disinfectant system processes low grade medical waste, such as swabs, dressings, incontinence pads etc. for disposal at landfill sites. The process involves the shredding of waste, followed by thermal disinfection at 110° C. Both stages are carried out under controlled conditions, i.e. under negative pressure. The treated waste is compacted for disposal.

The exhaust ventilation system for the shredder comprises a coarse pre-filter and a high-efficiency particle arrestor (HEPA) filter. The main heat disinfection unit is fitted with a small condenser unit followed by a wet scrubber, two biofilters (bark) and an activated carbon filter. All sampling was carried out downstream of the filter systems.

Sampling Methods

Exhaust Gas Velocity Measurements

Preliminary measurements of the flue gas velocities were made in order to determine the rate of flue exhaust air emission and to identify the gas flow profile before sampling (to identify any stagnant or void areas).

This was carried out using a Testo 510 digital manometer and a Tepcal 714 thermo-anemometer. Copies of the recorded data are included in the appendices at the end of this report.

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Microbiological Sampling

Samples were collected by drawing measured volumes of air through a "Micro Bio" air sampling system onto specific agar culture media, i.e.

- o Tryptone Soya Agar for total aerobic bacteria
- o Violet Red Bile Agar for total coliform bacteria
- o Sabouraud Dextrose Agar for total fungi

Air was drawn onto the agar plates mounted within the sampler, at a pre-set rate. An in-built timer was set to sample 250 litres of air for each sample. Internal surfaces of the sampling device were sterilised before use to prevent the possibility of cross-contamination. Similarly, vinyl gloves were worn during the handling and cleaning of the sampling components.

The samples were stored in a refrigerator and delivered to the laboratory in a maximum of three days.

The agar media were then cultivated and the bacteria and fungi colonies enumerated. The results are expressed as colony counts per plate. These were multiplied as necessary to express the results as colonies per cubic metre.

Quality System and Standards

TTS Environmental operates a quality system to BS EN ISO 9001; the system includes the calibration of sampling and test equipment. The company is accredited by BSI.

In addition, Iain Thomson is an accredited Level 2 Team leader for Manual Stack Monitoring under the Environment Agency's MCERTS scheme. The accreditation includes the following technical endorsements:

- o Particulates Monitoring by Isokinetic Sampling Techniques
- o Gases/Vapours by Instrumental Techniques

TTS Environmental is a member of the Source Testing Association, which is developing a programme of endorsements for the various classes of industrial emissions testing.

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Calculation of Uncertainty

The degree of uncertainty of the monitoring of microbial conditions within exhaust ventilation systems has been estimated with reference to the Source Testing Association Quality Guidance Note, QGN 001-01 and the accompanying calculation spreadsheet.

$$\text{Total Uncertainty} = \sqrt{(u1)^2 + (u2)^2 + (u3)^2 + \text{etc}}$$

In order to calculate the total uncertainty the uncertainty for each factor has to be calculated. The factors for consideration are:

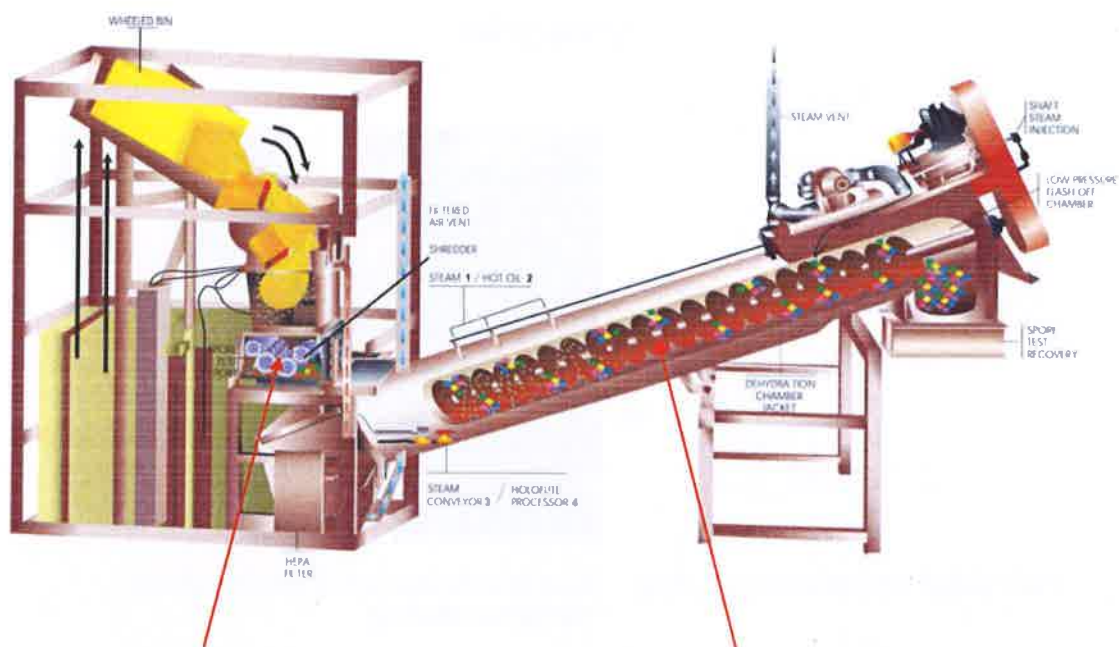
- o Accuracy of the pump used in the sampling
- o Possibility of cross contamination during transport and on site
- o Manufacture quality of the agar used in the sampling
- o The accuracy of the analysis equipment
- o Possibility of cross contamination during analysis

The calculation of uncertainty is presented in our report dated 1st September 2008, a copy of which has been supplied.

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Diagram of the Waste Treatment System



Shredder

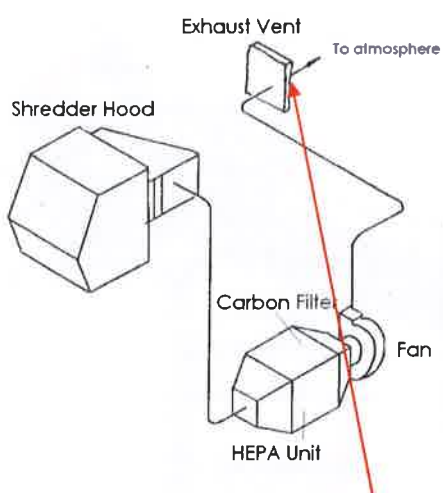
Holofilite

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Monitoring of Microbial Conditions Illustrations of Process Plant

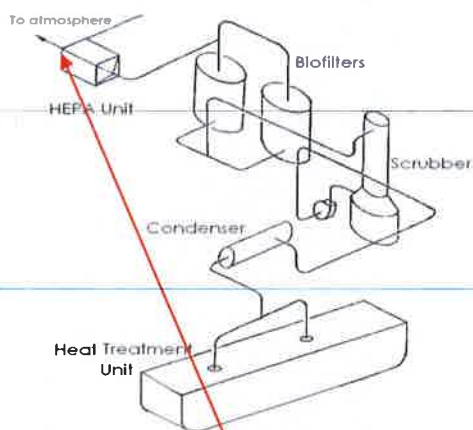
Shredder



Plant layout and sampling location.

Rear of shredder unit, showing exhaust ventilation ducting

Holoflite



Plant layout and sampling location.

Biofilters.

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Monitoring of Microbial Conditions in the Exhaust Ventilation System for the Shredder.

Plant Details

Test Date	12 th August 2014
Type of Plant	Shredder Unit - waste material is shredded in preparation for passing through the heat disinfection system. The exhaust ventilation passes through a HEPA filter and carbon filter before discharge to atmosphere.
Operating Conditions	Normal conditions; i.e. continuous processing of waste throughout the monitoring period.
Sampling Location	Exhaust vent downstream of filtration devices.
Pressure Gauge Readings, mm Water	HEPA filter, 0.8 mm. Coarse filter, 0.2 mm.

Sampling Results

Parameter	Time	cfus/m ³	Emission Limit, cfus/m ³	Uncertainty
Total Aerobic Bacteria	12:24	68	1000	± 3.15%
	12:33	44		
	12:42	36		
Total Coliform Bacteria	12:27	< 1	300	± 13.35%
	12:36	< 1		
	12:45	< 1		
Total Fungi	12:30	24	1000	± 3.15%
	12:39	40		
	12:48	72		

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Monitoring of Microbial Conditions in the Exhaust Ventilation System for the Holoflite.

Sampling Results

Test Date	12 th August 2014
Type of Plant	Holoflite – The shredded waste is heat treated and the exhaust gases pass through a wet scrubber tower and two biofilters. There were no suitable sampling points within the ducting as the carbon filter was located immediately against the external wall.
Operating Conditions	Normal conditions; i.e. continuous processing of waste throughout the monitoring period.
Sampling Location	Exhaust vent downstream of filtration devices.
Pressure Gauge Readings, mm Water	Biofilter No. 1, <1, Biofilter No. 2, <1. Static pressure from scrubber, 53 mm.

Sampling Results

Parameter	Time	cfus/m ³	Emission Limit, cfus/m ³	Uncertainty
Total Aerobic Bacteria	12:54	176	1000	± 3.15%
	13:16	80		
	13:23	96		
Total Coliform Bacteria	13:10	16	300	± 13.35%
	13:18	12		
	13:25	4		
Total Fungi	13:13	520	1000	± 3.15%
	13:20	520		
	13:28	480		

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Exhaust Gas Velocity Measurements.

Shredder Exhaust.

Measurement	Value	Unit
Date	12/08/2014	
Barometric Pressure	100500	Pa
Pitot Tube K Factor	1.00	
Average Differential Pressure	19	Pa
Average Velocity	5.12	m/sec
Average Stack Temperature	25	C
Density	1.175	Kg/m ³
Stack Cross Section	CIRCULAR	
Stack Diameter	0.35	m
Stack Area	0.0962	m ²
Volume Flowrate at Stack Conditions	1773.8	m ³ /h
Volume Flowrate at 0° C	1625.0	m³/h
Volume Flowrate at 15° C	1714.3	m ³ /h
Volume Flowrate at 20° C	1744.1	m ³ /h
Volume Flowrate at 25° C	1773.8	m ³ /h

Terms

Pa	Pascals
m/sec	metres per second
Kg/m³	Kg per cubic metre, at the measured conditions
Kg/m³n	Kg per cubic metre, normalised
m³/h	cubic metres per hour

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Exhaust Gas Velocity Measurements.

Holoflite Exhaust.

Measurement	Value	Unit
Date	12/08/2014	
Barometric Pressure	100500	Pa
Pitot Tube K Factor	1.00	
Average Differential Pressure	1.5	Pa
Average Velocity	1.39	m/sec
Average Stack Temperature	35	C
Density	1.137	Kg/m ³
Stack Cross Section	CIRCULAR	
Stack Diameter	0.18	m
Stack Area	0.0254	m ²
Volume Flowrate at Stack Conditions	127.5	m ³ /h
Volume Flowrate at 0° C	113.0	m³/h
Volume Flowrate at 15° C	119.3	m ³ /h
Volume Flowrate at 20° C	121.3	m ³ /h
Volume Flowrate at 25° C	123.4	m ³ /h

Terms

Pa	Pascals
m/sec	metres per second
Kg/m³	Kg per cubic metre, at the measured conditions
Kg/m³n	Kg per cubic metre, normalised
m³/h	cubic metres per hour