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**ROUND 2-MONITORING OF VOC CONCENTRATIONS AT RILTA LTD, BLOCK 402,
GREENOGUE BUSINESS PARK, RATHCOOLE, CO. DUBLIN**

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TABLE OF CONTENTS

Section	Page number
TABLE OF CONTENTS	i
DOCUMENT AMENDMENT RECORD	ii
EXECUTIVE SUMMARY	iii
1. Introduction	1
2. Material and Methods	1
2.1 Monitoring locations	1
2.2 Airflow and temperature measurement	1
2.3 VOC monitoring of emission points A1, A2 and A3.	1
2.3.1 Sampling of VOC's for emission points A1, A2 and A3	1
2.3.2 Sorbent tube pre-concentration	2
3. Results	2
3.1 Assessment criteria	2
3.2 Results of airflow and temperature measurement	2
3.3 Results of Volatile Organic Compound (VOC) measurement	3
4. Discussion of results	4
5. Conclusions	4

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EXECUTIVE SUMMARY

Odour Monitoring Ireland were commissioned by Rilta Ltd to perform Volatile Organic Compound (VOC) monitoring of the three licensed emission points located within their facility in Block 402, Greenogue Business Park, Rathcoole, Co. Dublin.

Monitoring was performed using pre-concentration upon sorbent tubes and analysis via gas chromatography mass spectrometry (GCMS).

It was concluded from the study that:

- The mass emission rate of VOCs (as Carbon) from monitoring locations A1 and A3 were found to be in compliance with the emission limit values stated in Schedule C.3.1 to C3.3 of Waste Licence No. 192-02.
- The Mass flow of VOCs (as Carbon) was not in compliance for emission point A2. However the total concentration of VOCs (as Carbon) was in compliance. If the airflow rate is brought into compliance the mass flow of VOCs (as Carbon) should become compliant with limit values stated in Waste Licence Number 192-02.
- Volumetric airflow rate measurements performed on emission points A1 and A3 demonstrated compliance but monitoring location A2 was not in compliance with set limit values.

1. Introduction

Odour Monitoring Ireland was commissioned by Tobin consulting Engineers to perform monitoring of Volatile Organic Compound (VOC) concentrations emissions from a series of three licensed emission points at the Rilta Ltd, Block 402, Greenogue Business Park, Rathcoole, Co. Dublin. The monitoring was carried out to determine compliance with the emission limit values stated within Schedule C3 of Waste Licence 192-02.

2. Material and Methods

This section describes the materials and methods used throughout the study period carried out in December 2007 and February 2008.

2.1 Monitoring locations

Table 2.1 outlines the three monitoring points where VOC monitoring was performed on the 14th December 2007 and 14th February 2008.

Table 2.1. Monitoring points for emissions to atmosphere.

Analysis Monitoring Code	EPA location code	Location
A1	A1	Drum Washer Stack
A2	A2	Paint Spray Booth Stack
A3	A3	Drying Tunnel Stack

2.2 Airflow and temperature measurement

Airflow rate measurement was performed in accordance with ISO10780:1994-Stationary source emissions-Measurement of velocity and volume flowrate of gas streams in ducts. The following equipment was used through the airflow rate assessment. These included:

- Testo 400 and 350/454 MXL handheld and differential pressure sensors,
- L type pitot probe,
- PT100 temperature probe,

The following control procedure was used through the measurement sequence:

1. Approximately 5 duct diameters were available between the measurement point and the nearest constriction,
2. The temperature profile across the stack was verified and did not differ by more than 5% from the average absolute temperature of the duct cross section,
3. Eight individual samples points excluding the duct centre point was used to determine the average flow at specified locations across the duct diameter. No sample point was located within 20 mm of the duct wall.
4. The difference in the average airflow velocity across each diameter did not exceed 5% of the mean for all the diameters (2 in total).
5. The L type pitot was checked for any burrs and obstructions in the pitot orifices,
6. The absence of swirling flow was determined in accordance with Section 7.2 and Annex C-ISO10780:1994.

The airflow rate measurement was used to ascertain the volumetric airflow in accordance with Schedule C.3 of licence 192-1 (Emissions to atmosphere).

2.3. VOC monitoring of emission points A1, A2 and A3.

2.3.1 Sampling of VOC's for emission points A1, A2 and A3

In order to obtain air samples for VOC assessment, a dynamic sampling method was used where air samples were directly placed in the airstream for sampling. A charcoal/anasorb

sorbent was chosen to efficiently bind and pre-concentrate speciated VOC for analysis by GCFID/GCMS in accordance with established and accredited methodologies. Sealed sorbent tubes were used throughout the study to maintain repeatability and integrity. In addition, the sorbent tube has a second plug to detect any breakthrough. Each tube contained a minimum of 200 mg of sorbent. All sampling for speciated VOC's was performed in accordance with EN13649:2002.

2.3.2 Sorbent tube pre-concentration

In order to pre-concentrate VOC upon each sorbent, a pre-calibrated controlled volume of sample air was drawn through each tube by a SKC pump for a time period greater than 5 minutes (Active sampling/pumped sampling). Each SKC pump was pre-calibrated with their specific sorbent using a Bios Primary flow calibrator (NIST traceable certified). Each pump was calibrated to a flow rate of less than 200 ml min⁻¹ depending on the sample, sample pump and sorbent tube as recommended by the sorbent manufacturer, analysing laboratory and sampling/test methodology. When sampling was completed all tubes were sealed and stored in flexible air tight containers and transported to the gas chromatography laboratory and analysed by means of thermal desorption/solvent extraction GCFID/GCMS in a UKAS accredited laboratory (RPS Laboratories, Manchester). All sample blanks were handled in the same manner to the sample tubes with the exception of being exposed to the flue gas.

3. Results

This section discusses the results obtained through the study.

3.1 Assessment criteria

The results obtained from the assessment have been compared with the emission limit values outlined within Waste licence 192-02.

Table 3.1. Emission Limit Values as stated in Waste Licence 192-02.

Emission Point	Emission limits	Total Organic Carbon (as C)	
		Nm ³ hr ⁻¹	mg Nm ⁻³
A1	5,292	-	1.0
A2	5,292	-	0.10
A3	2,520	-	0.30

3.2 Results of airflow and temperature measurement

The results of the airflow and temperature measurement are presented in *Table 3.1*.

Table 3.2. Airflow rate and temperature measurements at three emission points.

Emission Point	Temperature (Kelvin)	Limit Volumetric airflow rate (Nm ³ hr ⁻¹)	Measured Volumetric airflow rate (Nm ³ hr ⁻¹)
A1	293.15	5,292	3,456
A2	317.15	5,292	7,598
A3	294.15	2,520	1,359

3.3 Results of Volatile Organic Compound (VOC) measurement

The results of VOC measurements are presented in *Table 3.2*, *3.3* and *3.4*.

Table 3.2. Results of VOC Monitoring at Emission Point A1

Library/ID	Conc of Speciated VOC (mg Nm ⁻³ as C)	Mass Flow of Speciated VOC (kg/hr)
Acetonitrile	0.75	-
Pentane	0.13	-
Furan, tetrahydro-	0.46	-
Toluene	0.16	-
Ethylbenzene	0.49	-
p-Xylene	1.56	-
Benzene, 1,3-dimethyl-	0.23	-
E-14-Hexadecenal	0.35	-
1-Octadecene	0.49	-
Total Other Organics	1.34	-
Total Organics (as C)	5.95	0.020
Total Organics (as C) Limit	20 mg/m³	1 kg/hr

Table 3.3. Results of VOC Monitoring at Emission Point A2

Library/ID	Conc of Speciated VOC (mg Nm ⁻³ as C)	Mass Flow of Speciated VOC (kg/hr)
2-Propanone, 1-methoxy-	0.11	-
Butanoic acid	0.14	-
Ethylbenzene	1.22	-
Nonane	10.87	-
Benzene, propyl-	0.06	-
Benzene, 1-ethyl-3-methyl-	0.26	-
Benzene, 1,3,5-trimethyl-	0.08	-
Benzene, 1,2,3-trimethyl-	1.30	-
Benzene, 4-ethyl-1,2-dimethyl-	0.06	-
Total Other Organics	1.20	-
Total Organics (as C)	15.31	0.13
Total Organics (as C) Limit	20 mg/m³	0.10 kg/hr

Table 3.4. Results of VOC Monitoring at Emission Point A3

Library/ID	Conc of Speciated VOC (mg Nm ⁻³ as C)	Mass Flow of Speciated VOC (kg/hr)
Acetone	1.17	-
1-Butanol	3.64	-
Acetic acid	0.16	-
Benzene, 1,3-dimethyl-	7.66	-
Benzene, (1-methylethyl)-	0.30	-
Benzene, 1-ethyl-2-methyl-	0.70	-
Benzene, 1,3,5-trimethyl-	0.21	-
.alpha.-Methylstyrene	0.35	-
Benzaldehyde, 2-methyl-	0.16	-
Total Other Organics	2.53	-
Total Organics (as C)	16.88	0.020
Total Organics (as C) Limit	20 mg/m³	0.30 kg/hr

4. Discussion of results

The results of the VOC monitoring survey carried out on the 14th December 2007 and 14th February 2008 are presented in *Tables 3.2 to 3.4*. These results indicate that emissions to atmosphere of total organics (as carbon) from emission points A1 and A3 were in compliance with the emission limit values stated in the Waste Licence Number 192-02. Mass flow of VOC (as Carbon) was not in compliance for emission point A2 (see *Table 3.4*) however the total concentration of VOC (as Carbon) was in compliance. If the airflow rate (see *Table 3.1*) is brought into compliance the mass flow of VOC should become compliant with limit values stated in Waste Licence Number 192-02.

The volumetric airflow rate measurements performed on emission points A1 and A3 demonstrated compliance but monitoring location A2 was not in compliance with set limit values.

5. Conclusions

The following conclusions were drawn from the study:

- The mass emission rate of VOCs (as Carbon) from monitoring locations A1 and A3 were found to be in compliance with the emission limit values stated in Schedule C.3.1 to C3.3 of Waste Licence No. 192-02.
- The Mass flow of VOCs (as Carbon) was not in compliance for emission point A2. However the total concentration of VOCs (as Carbon) was in compliance. If the airflow rate is brought into compliance the mass flow of VOCs (as Carbon) should become compliant with limit values stated in Waste Licence Number 192-02.
- Volumetric airflow rate measurements performed on emission points A1 and A3 demonstrated compliance but monitoring location A2 was not in compliance with set limit values.