

Workplace noise
monitoring

Environmental
noise monitoring

LEV surveys to
HSG258

Hand arm and
whole body
vibration surveys

Indoor air quality

Biological agents

Hazmat surveys

COSHH
assessments

Training

General health,
safety &
environmental
support

Stack Emissions
Monitoring



industrial**safety**solutions

**AN ASSESSMENT OF EMISSIONS TO ATMOSPHERE
FROM A DISCHARGE STACK DURING A POLYURETHANE
MOULDING PROCESS**

**TPPL
TUFTHANE HOUSE
FALKLAND AVENUE
COVENTRY
CV4 8AU**

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EXECUTIVE SUMMARY

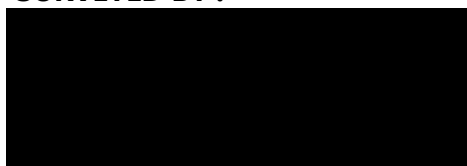
Emissions of total isocyanate and volatile organic compounds (VOC) to atmosphere were monitored on 9 December 2015 during a polyurethane moulding process. The monitoring was required to comply with the requirements stated in Local Authority Permit PPC 194. The results and information obtained during the visit indicated that:

- Levels of Isocyanates as methylene diphenyl diisocyanate (MDI) were under the LOD (Limit of Detection) and also under all pollution prevention control limits.
- Levels of VOC were all well under the PPC 194 limits given as 100mg/nm³
- The average concentration of total carbon from the moulding line exhaust stack was 11.6 mg.m⁻³ equating to 0.0116 kg/hr

Stack ID	Conc. mg.Nm ⁻³	Conc. mg.Nm ⁻³	Average Conc.	Mass Emission
	Run 1	Run 2	mg.Nm ⁻³	kg/hr
Polyurethane moulding	17.39	5.80	11.6	0.0116

- Concentrations of isocyanate were below the limits of detection
- The results were therefore under the authorised limits for Trelleborg PPL as stated within PPC 194

SURVEYED BY :



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Occupational Hygienist

VERIFIED BY:



Simon Skentelbery
General Manager

1. INTRODUCTION

The survey described in this report was carried out on 9 December 2015 by Geoff Waggett at the request of Chris Harris of TPPL Coventry, in accordance with our work specifications outlined in quotation reference ISS00195r1, in order to determine emissions to atmosphere to comply with the company's Local Authority authorisation.

The exhaust stack serves 3 moulding stations, ovens and a mould spraying process.

2. DESCRIPTION OF PROCESS

The TPPL facility in Coventry specialises in moulding components using a polyurethane compound based on MDI and a polyol. The process tested was the moulding of surface covers onto ticket hall paddles inside an extracted moulding unit. The hood above the process is ducted off to a common external duct, to a fan and then to a stack.

3. MONITORING

Isocyanate Monitoring

A sampling pump was connected to an impinger tube containing a solution of 1-(2-methoxyphenyl) piperazine in dry toluene, the method based on MDHS 25. Sampling is performed by extracting air from the stack or vent, and bubbling through the impinger solution at 1 litre per minute for 30 minutes. The process was repeated over a one hour period.

The sampling solution was sealed in glass jars and sent for analysis using High Performance Liquid Chromatography.

Volatile Organic Compound (VOC) Monitoring

The sampling system comprises of a sampling head containing a SKC Sorbent sample tube (226-01), connected to a portable precision pump, capable of running continuously for 8 hours at the recommended flow rate. The pump flow rate is stable to within 5% and the total volume of air sampled by the pump over the recommended sampling period is within 10% of the calculated volume.

The location, duration of sampling and flow rate are recorded. Following monitoring the 226-01 sorbent tube is capped and placed in a sealed inert container until analysis can be carried out. Analysis is by Gas Chromatography/Mass Spectrometry using specified procedures for the instrumentation.

4. RESULTS

The detailed results are attached as Appendix 2. The results for the monitoring period are summarised below:-

Isocyanate

Stack ID	Conc. mg.Nm⁻³ Run 1	Conc. mg.Nm⁻³ Run 2	Average Conc. mg.Nm⁻³	Mass Emission kg/hr
Moulding Exhaust Stack	<0.0067	<0.0067	<0.0067	-

Volatile organic compounds

Stack ID	Conc. mg.Nm⁻³ Run 1	Conc. mg.Nm⁻³ Run 2	Average Conc. mg.Nm⁻³	Mass Emission kg/hr
Moulding Exhaust Stack	17.39	5.80	11.6	0.0116

**APPENDIX 1
IMAGE OF STACK**



Fig 1. Stack

**APPENDIX II
RESULTS TABLES**

NCO Emission Calculations run 1

Location: Main stack
Date of Sample: 09/12/15

Sampling Start: 11:34
Sampling Stop: 12:04

Absolute temperature in duct (Td)	<input type="text" value="294"/>	K
Total pressure in duct = barometric + static (Pd)	<input type="text" value="101.38"/>	
Flow rate for NCO sampling (f)	<input type="text" value="1000"/>	ml/min
Total period of sampling (t) = T1-T0	<input type="text" value="30"/>	mins
Total quantity of air samples = f x t (Q nco)	<input type="text" value="0.03"/>	m ³
Weight of NCO collected expressed as (W)	< <input type="text" value="0.0002"/>	ug
Concentration NCO = $\frac{W}{Q \text{ nco}}$	< <input type="text" value="0.007"/>	mg/m ³
Correction to STP = $\frac{W \times Td \times 101.3}{Q \text{ nco} \times 273 \times Pd}$	< <input type="text" value="0.0067"/>	mg/m ³

Code:- NCO = PMDI Isocyanate

Process at time of sampling
Moulding paddles

Note limit of detection is 0.0002 ug

NCO Emission Calculations run 2

Location: Main stack
Date of Sample: 09/12/15

Sampling Start: 12:07
Sampling Stop: 12:37

Absolute temperature in duct (Td)	<input type="text" value="294"/>	K
Total pressure in duct = barometric + static (Pd)	<input type="text" value="101.38"/>	
Flow rate for NCO sampling (f)	<input type="text" value="1000"/>	ml/min
Total period of sampling (t) = T1-T0	<input type="text" value="30"/>	mins
Total quantity of air samples = f x t (Q nco)	<input type="text" value="0.03"/>	m ³
Weight of NCO collected expressed as (W)	< <input type="text" value="0.0002"/>	ug
Concentration NCO = $\frac{W}{Q \text{ nco}}$	< <input type="text" value="0.007"/>	mg/m ³
Correction to STP = $\frac{W \times Td \times 101.3}{Q \text{ nco} \times 273 \times Pd}$	< <input type="text" value="0.067"/>	mg/m ³

Code:- NCO = PMDI Isocyanate

Process at time of sampling
Moulding paddles

Note limit of detection is 0.0002 ug

VOC Emission Calculations run 1

Location: Main stack
 Date of Sample: 09/12/15

Sampling Start: 11:34
 Sampling Stop: 12:04

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.38	
Flow rate for NCO sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	30	mins
Total quantity of air samples = f x t (Q voc)	0.003	m ³
Weight of VOC collected expressed as Carbon (Wc)	0.049	mg
Concentration VOC = $\frac{W}{Q \text{ voc}}$	16.00	mg/m ³
Correction to STP = $\frac{W \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	17.39	mg/m ³

Code:- VOC is volatile organic compounds

Process at time of sampling
 Moulding paddles

VOC Emission Calculations run 2

Location: Main stack
 Date of Sample: 09/12/15

Sampling Start: 12:07
 Sampling Stop: 12:37

Absolute temperature in duct (Td)	294	K
Total pressure in duct = barometric + static (Pd)	101.38	
Flow rate for NCO sampling (f)	100	ml/min
Total period of sampling (t) = T1-T0	30	mins
Total quantity of air samples = f x t (Q voc)	0.003	m ³
Weight of VOC collected expressed as Carbon (Wc)	0.016	mg
Concentration VOC = $\frac{W}{Q \text{ voc}}$	5.33	mg/m ³
Correction to STP = $\frac{W \times Td \times 101.3}{Q \text{ voc} \times 273 \times Pd}$	5.80	mg/m ³

Code:- VOC is volatile organic compounds

Process at time of sampling
 Moulding paddles