A REPORT ON ISOCYANATE EMISSIONS MONITORING AT TRELLEBORG LIMITED, COVENTRY

Prepared for

TRELLEBORG LIMITED

by

ALcontrol Laboratories

Sampling Dates: 17th October 2002 Report Date: 11th November 2002 Issue Number: 1

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CLIENT

: Trelleborg Limited Holbrook Lane Coventry West Midlands CV6 4QX

CONTACT

: Mr John Davenport

REPORT SUBJECT

: Emissions Monitoring for Isocyanates

REPORT NUMBER

: ALR/977/TRE/02

SAMPLE DATES

: 17th October 2002

REPORT DATE

: 11th November 2002

PROJECT CONTACT

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VELOCITY MEASUREMENTS		

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1. INTRODUCTION

Alcontrol Laboratories were contracted to undertake an emissions investigation at Trelleborg Ltd. The monitoring was undertaken to assess compliance with the limits set for Diphenyl methane di-isocyanates within the site's Authorisation. The monitoring was undertaken for two from local ventilation systems that release emissions to atmosphere

The test work was performed on 17th October 2002.

2. SAMPLING METHODS

2.1. Isocyanates were sampled according to MDHS method 49. A measured volume of flue gas is drawn through a glass impinger containing dimethylformamide and dilute hydrochloric acid. The amount of isocyanate in the sample is determined by spectrophotometric methods.

2.2. Flue Gas Velocity

The flue gas velocity is determined by measurement of the differential pressure and temperature within the stack according to BS3405 (ALcontrol Laboratories, Method Number NAM/8.3/2.1.1).

3. RESULTS

- The results for all the determinands are given in the Tables 1-4.
- All results are averaged and expressed on a wet basis, to STP (273k, 101.3kPa) without correction for oxygen.
- Atmospheric pressure values are obtained from a digital barometer.

3.1. Plant Conditions

DESMA M/C No.1/2

Both production units served by the extraction system were operating under typical conditions on the day of monitoring.

DESMA M/C No.3

The production unit served by the extraction system was operating under typical conditions on the day of monitoring.

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3.2. Isocyanates as total NCO Diphenyl methane di-isocyanate

Table 1

DESMA M/C No. 1 & 2

Run Number	Run 1	Run 2
Date	17/10/02	17/10/02
Start Time	10:29	10:59
Stop Time	11:05	11:35
Stack Temperature, °C	25	25
Sample Rate, I/min	1	1
Sample Volume, m ³	0.034	0.034
Stack Velocity, m/s	4.811	4.811
Stack Flow Rate, m ³ /s	1.646	1.646
Mass of Isocyanates (as total NCO), μg	<0.2	<0.2
Isocyanates (as total NCO), mg/m ³	< 0.01	< 0.01
Isocyanates (as total NCO), Kg/hr	< 0.001	< 0.001

Table 2

DESMA M/C No. 3

Run Number	Run 1	Run 2
Date	17/10/02	17/10/02
Start Time	13:05	13:35
Stop Time	13:40	14:10
Stack Temperature, °C	24	24
Sample Rate, l/min	0.4547	0.4631
Sample Volume, m ³	0.016	0.016
Stack Velocity, m/s	7.588	7.588
Stack Flow Rate, m ³ /s	2.596	2.596
Mass of Isocyanates (as total NCO), μg	<0.2	<0.2
Isocyanates (as total NCO), mg/m ³	< 0.01	< 0.01
Isocyanates (as total NCO), Kg/hr	< 0.001	< 0.001

4. QUALITY CONTROL

4.1. Equipment used

<u>UNIT</u>	<u>ID N</u>	umber
Airflow PVM Micromanomete	P.	103
Pitot Tube	P7	Г45
Temperature Indicator	TI	444
Stack Thermocouple No.	TP	144
Barometer	j Pi	108
Timer No.	400	0634

5. SAMPLING PERSONNEL

Sampling Team:

Sunil Salpekar

6. RESULTS SUMMARY

Comparison with Authorisation Limits, mg/m³, STP, without correction for moisture and oxygen.

Parameter	Test	Result	Mean	Limit
Diphenyl methane di-	1.	< 0.01	<0.01	100
isocyanate (MDI) as total NCO	2.	< 0.01		

APPENDIX 1

Velocity Measurements

Site Name: Trelleborg Limited Site Ref: Holbrook Lane, Coventry Stack Ref: DESMA M/C No. 1 & 2

Date: 17/10/02 Run: Isocyanates 1 & 2

Static Press	, mm H ₂ O:	-350	j			S	Stack Diameter, (m):	0.66
Barometric	press, mm Hg:	750	<u></u>	i		I	itot Tube Constant:	1
Traverse		Port A	-	i		Port B		
Point No.	Δp,	Conversion for	Root	Stack Temp	Δр,	Conversion for	Root	Stack Temp
	Pa	pitot coefficient	Δp.	°C	Pa	pitot coefficient	Δр,	°C
1	54.0	55.1	7.423	25	30.0	30.6	5.533	25
2	24.0	24.5	4.948	25	26.0	26.5	5.151	25
3	5.0	5.1	2.259	25	17.0	17.3	4.165	25
4	2.0	2.0	1.428	25	10.0	10.2	3.194	25
5	7.0	7.1	2.672	25	2.0	2.0	1.428	25
6∙	10.0	10.2	3.194	25 25	5.0	5.1	2.259	25
7	2.0	2.0	1.428	25	10.0	10.2	3.194	25
. 8	17.0	17.3	4.165	25	17.0	17.3	4.165	25
9	13.0	13.3	3.642	25	0.81	18.4	4.285	25
10	26.0	26.5	5.151	25	21.0	21.4	4.629	25
Minimum	2.0	2.0	1.428	25.0	2.0	2.0	1.428	25.0
Maximum	54.0	55.1	7.423	25.0	30.0	30.6	5.533	25.0
Average	16.0	16.3	3.631	25.0	15.6	15.9	3.800	25.0
Sum	160.0	163.2	36.311	250.0	160.0	163.2	36.311	250.0
Total Sum	、古人、今日	Company of the	第 神美	大学和大学	320.0	326.5	72.622	500.0
Max. pitot pre	ess. =	•	55.1			Max. Temp.=		5.0
Min. pitot pre	ss. =		2.0	i		Min. Temp.=	2	5.0
Ratio Max:Mi	in =		27.0	:1		Mean Temp.=	2	5.0
				1		Acceptable Temp. I	Range = 5	4.8
							10 -4	4.8

	•
Mean Root Δ p	3,716
Mean Stack Temperature, °C	25.00
Traverse Stack Velocity, m/s	4.811
Stack Area, m ²	0:34
Stack Gas Volume Flow Rate, m³/s (acms)	1.646
Stack Pressure, mm Hg	724.25
····	

Oxygen Correction

Required Correction Value	0
Oxygen Factor	1.000

Site Name: Trelleborg Limited Site Ref: Holbrook Lane, Coventry Stack Ref: DESMA M/C No. 3

Date: 17/09/02 Run: VOC Runs 1 & 2

Stack Diameter, (m): Pitot Tube Constant: 1	Pitot Tube Constant:	Port B Conversion for pitot coefficient	Δ p,]		press, mm Hg:	Barometric
Traverse Point No. Δ p. Pa Conversion for pitot coefficient Root Δ p. Pa Stack Temp pitot coefficient Δ p. Pa Pa pitot coefficient Δ p. Pa Pa pitot coefficient Δ p. Pa pitot coefficient No. Pa pitot coefficient Δ p. Pa pitot coefficient No. Pa pitot coefficient Δ p. Pa pitot coefficient	ort B rsion for Root S pefficient Δ p, 2.6 5.714	Port B Conversion for pitot coefficient	Δp,					
Point No. Δ p, Pa Conversion for pitot coefficient Root Δ p. Stack Temp or Pa Δ p. Conversion for Pa Root pitot coefficient Stack Temp or Pa Δ p. Conversion for Pa Root Pa Stack Temp pitot coefficient Δ p. Conversion for Pa Root Pa Stack Temp pitot coefficient Δ p. Conversion for Pa Root Pa Stack Temp pitot coefficient Δ p. Conversion for Pa Root Pa Stack Temp pitot coefficient Δ p. Conversion for Pa Root Pa Stack Temp pitot coefficient Δ p. Conversion for Pa Ap. Conversion for Pa Conversio	rsion for Root S pefficient Δ p, 2.6 5.714	Conversion for pitot coefficient	Δ p,	T		Port A		Traverse
Pa pitot coefficient Δ p. °C Pa pitot coefficient Δ p. °C 1 20.0 20.4 4.517 24 32.0 32.6 5.714 24 2 22.0 22.4 4.738 24 39.0 39.8 6.308 24 3 27.0 27.5 5.249 124 37.0 37.8 6.144 24 4 32.0 32.6 5.714 124 42.0 42.9 6.546 24 5 44.0 44.9 6.700 124 40.0 40.8 6.388 24 6 42.0 42.9 6.546 124 41.0 41.8 6.468 24 7 45.0 45.9 6.776 24 36.0 36.7 6.061 24 8 40.0 40.8 6.388 124 29.0 29.6 5.440 24 9 39.0 39.8 6.308 124 2	Defficient Δ p, 2.6 5.714		1	Stack Temp	Root	Conversion for	Δp,	Point No.
1 20.0 20.4 4.517 24 32.0 32.6 5.714 24 2 22.0 22.4 4.738 24 39.0 39.8 6.308 24 3 27.0 27.5 5.249 124 37.0 37.8 6.144 24 4 32.0 32.6 5.714 124 42.0 42.9 6.546 24 5 44.0 44.9 6.700 124 40.0 40.8 6.388 24 6 42.0 42.9 6.546 124 41.0 41.8 6.468 24 7 45.0 45.9 6.776 24 36.0 36.7 6.061 24 8 40.0 40.8 6.388 124 29.0 29.6 5.440 24 9 39.0 39.8 6.308 124 24.0 24.5 4.948 24 10 32.0 32.6 5.714 124 2	2.6 5.714	3 22.6	Pa	°C	Δp.	pitot coefficient	Pa	
2 22.0 22.4 4.738 24 39.0 39.8 6.308 24 3 27.0 27.5 5.249 24 37.0 37.8 6.144 24 4 32.0 32.6 5.714 24 42.0 42.9 6.546 24 5 44.0 44.9 6.700 24 40.0 40.8 6.388 24 6 42.0 42.9 6.546 24 41.0 41.8 6.468 24 7 45.0 45.9 6.776 24 36.0 36.7 6.061 24 8 40.0 40.8 6.388 24 29.0 29.6 5.440 24 9 39.0 39.8 6.308 24 24.0 24.5 4.948 24 10 32.0 32.6 5.714 24 22.0 22.4 4.738 24		3 32.0	32.0	24	4.517	20.4	20.0	1
3 27.0 27.5 5.249 24 37.0 37.8 6.144 24 4 32.0 32.6 5.714 24 42.0 42.9 6.546 24 5 44.0 44.9 6.700 24 40.0 40.8 6.388 24 6 42.0 42.9 6.546 24 41.0 41.8 6.468 24 7 45.0 45.9 6.776 24 36.0 36.7 6.061 24 8 40.0 40.8 6.388 24 29.0 29.6 5.440 24 9 39.0 39.8 6.308 24 24.0 24.5 4.948 24 10 32.0 32.6 5.714 24 22.0 22.4 4.738 24		39.8	39.0	24	4.738	22.4	22.0	2
4 32.0 32.6 5.714 124 42.0 42.9 6.546 24 5 44.0 44.9 6.700 124 40.0 40.8 6.388 24 6 42.0 42.9 6.546 124 41.0 41.8 6.468 24 7 45.0 45.9 6.776 24 36.0 36.7 6.061 24 8 40.0 40.8 6.388 124 29.0 29.6 5.440 24 9 39.0 39.8 6.308 24 24.0 24.5 4.948 24 10 32.0 32.6 5.714 24 22.0 22.4 4.738 24	7.8 6.144	37.8	37.0	124	5.249	27.5	27.0	3
5 44.0 44.9 6.700 24 40.0 40.8 6.388 24 6 42.0 42.9 6.546 24 41.0 41.8 6.468 24 7 45.0 45.9 6.776 24 36.0 36.7 6.061 24 8 40.0 40.8 6.388 24 29.0 29.6 5.440 24 9 39.0 39.8 6.308 24 24.0 24.5 4.948 24 10 32.0 32.6 5.714 24 22.0 22.4 4.738 24	1 1) 42.9	42.0	24	5.714	32.6	32.0	4
6 42.0 42.9 6.546 24 41.0 41.8 6.468 24 7 45.0 45.9 6.776 24 36.0 36.7 6.061 24 8 40.0 40.8 6.388 24 29.0 29.6 5.440 24 9 39.0 39.8 6.308 24 24.0 24.5 4.948 24 10 32.0 32.6 5.714 24 22.0 22.4 4.738 24		40.8	40.0	24	6.700	44.9	44.0	5
7 45.0 45.9 6.776 24 36.0 36.7 6.061 24 8 40.0 40.8 6.388 24 29.0 29.6 5.440 24 9 39.0 39.8 6.308 24 24.0 24.5 4.948 24 10 32.0 32.6 5.714 24 22.0 22.4 4.738 24	I I	41.8	41.0	24	6.546	42.9	42.0	6
8 40.0 40.8 6.388 24 29.0 29.6 5.440 24 9 39.0 39.8 6.308 24 24.0 24.5 4.948 24 10 32.0 32.6 5.714 24 22.0 22.4 4.738 24		I	36.0	24	6.776	45.9	45.0	7]
9 39.0 39.8 6.308 24 24.0 24.5 4.948 24 10 32.0 32.6 5.714 24 22.0 22.4 4.738 24	1	29.6	29.0	24	6.388	40.8	40.0	8
10 32.0 32.6 5.714 24 22.0 22.4 4.738 24	1	24.5	24.0	24	6.308	39.8	39.0	9
		22.4	22.0	24	5.714	32.6	32.0	10
24.000 22.0 22.4 4.738 24.000	2.4 4.738	22.4	22.0	24.000	4.5	20.4	20.0	Minimum
Maximum 45.0 45.9 6.8 24.000 42.0 42.9 6.546 24.0	 -	42.9	42.0	24.000	6.8	45.9	45.0	Maximum
Average 34.3 35.0 5.9 24.000 34.2 34.9 5.876 24.0		34.9	34.2	24.000	5.9	35.0		
Sum 343.0 343.0 350.0 58.651 240.0 350.0 58.651 240.0		350.0	240.0	58.651				
Total Sum 583.0 693.0 408.615 298.	3.0 408.615	693.0	583.0	Of Later	以图记 证	学者は		
Max. pitot press. = 45.9 Max. Temp. = 24.0		Max. Temp.=			45.9			
Min. pitot press. ≈ 20.4 Min. Temp.= 24.0		Min. Temp.=		i	20.4			
Ratio Max:Min = 2.3 :1 Mean Temp.= 24.0		•		:1	2.3		n =	Ratio Max:Mii
Acceptable Temp. Range = 53.7		-						
to -5.7								

Меал Root Δ p	1
тал топ др	5.870
Mean Stack Temperature, °C	24.00
Traverse Stack Velocity, m/s	7!588
Stack Area, m ²	0.34
Stack Gas Volume Flow Rate, m³/s (acms)	2,596
0.10	
Stack Pressure, mm Hg	741.91

Oxygen	Correction
CAJECII	Correction

Required Correction Value	o
Oxygen Factor	1.000

Gas Calibration Data Sheet

Date: 11/3/03

Stack Ref: BILLET RALPA 5

Datalogger Filename: N)a

Site Ref: Feet NIA Site Name: TRILLEBORG Run No.: VOCS Analyser / Van : VCØ7 Laptop Reference: ~/p

Operators: 35

Pre Run Leak Sample System Leak check	Passy Fail
Post Run Leak Sample	Pass / Fail
System Leak check	

Calibration Gases

Gas	Cylinder ID	Value	Gas Species	Cylinder ID No.	Value
Species N ₂	No.		NO		
O ₂			NO ₂		
СО			NOx		
CO ₂	· ·		THC (C ₃ H ₈)/	D116332	16.8ppm
$ \overline{SO_2}$			(CH ₄) Fuel Gas (H ₂ He)	D116946	io fici.

Calibration Check (Pre - run)

		Low Check Time		
Į	Low Check	High Check	Low Check	Time
	1,50 % 0.10			
<u>O</u> 2				
CO				
<u>CO</u> 2				
NOx				
NO				
NO ₂	·			and the second s
$\overline{SO_2}$			0.0	11:30
THC	<u> -0.1</u>	tion Chack (Pos	t run)	

Calibration Check (Post - run)

	1	(D.		
	Low Check	High Check	Low Check	Time
CO				
CO ₂				
NOx				
NO				
NO ₂		<u> </u>		
SO ₂			-0.1	13 45
THC	-0,1	16.4	<u> </u>	

Sample Run Accepted: NES/ Signed:

Date: 1/3/03.

Heated Line I.D. Gas Sampling Probe L.D.