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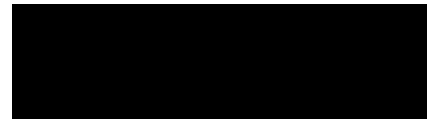
Date:

29th August 2013

Report reviewed by:

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Signature:



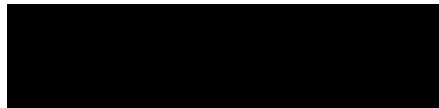
Date:

2nd September 2013

Report authorised by:

Philip Butler

Signature:



Date:

3rd September 2013



**AUGUST 2013
EMISSIONS MONITORING REPORT
Nationwide Crash Repair Centre Ltd**

Report N°: P-RED13-072/EB/R1/Rev0

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EXECUTIVE SUMMARY (Page 1 of 1)

The following document details the emissions to air monitoring survey undertaken by Elena Berek & Tony Berek of Redwing Environmental Ltd at Nationwide Crash Repair Centre Ltd, Coventry on the 6th August 2013.

All results pertain to the dates monitored only; a summary of the results is listed below:

Emission point reference Stack N ^o	Particulate Concentration at reference conditions (mg/m ³)	Uncertainty expressed at 95% Confidence (mg/m ³)	Velocity corrected to reference conditions (m/s)	Volume flow corrected to reference conditions (m ³ /hour)
Spray Booth 1	3.4	± 0.31	10.3	18,592
Spray Booth 2	1.6	± 0.30	9.8	17,755
Spray Booth 3	3.8	± 0.30	9.8	17,700
Emission Limit Value			10mg/m³	

NOTE 1: Reference conditions are standard temperature (273K) and pressure (101.3kPa) and no correction for water vapour



1.0 INTRODUCTION

- 1.1 Nationwide Crash Repair Centre Ltd operates a car body repair process at their site in Coventry. Monitoring of the exhausts were carried out with respect to quotation **Q-RED13-072EBv0** for the compliance check monitoring of emissions to air.
- 1.2 The objective of the monitoring survey was to determine emission concentrations in order to evaluate performance against the emission limits set in the process authorisation.

The substances requested for monitoring at each emission point are listed below:

Monitoring Programme

Substances to be monitored	Emission Point Identification		
	<i>Spray Booth 1</i>	<i>Spray Booth 2</i>	<i>Spray Booth 3</i>
Total Particulate Matter	✓	✓	✓

- 1.3 The velocity and temperature profiles were within the required parameters of 3:1 metres/second and $\pm 5\%$ for the temperature profile. This information indicates that the sample ports are in ideal positions to collect the samples under representative conditions.



1.4 Monitoring Results

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Uncertainty expressed at 95% confidence	Units	Reference Conditions 273 K, 101.3 kPa	Date of Sampling	Start and End Times	Monitoring Method Reference	Operating Status
Spray Booth 1	Total Particulate Matter	10	3.4	± 0.31	mg/m ³	273, 101.3kPa	08/05/13	0840 – 0913	BS EN 13284-1	Bumper, boot, driver door and rear wing Corsa
Spray Booth 2	Total Particulate Matter	10	1.6	± 0.30	mg/m ³	273, 101.3kPa	08/05/13	0840 – 0913	BS EN 13284-1	Bumpers, Boot and door Fiat Punto
Spray Booth 3	Total Particulate Matter	10	3.8	± 0.30	mg/m ³	273, 101.3kPa	08/05/13	0840 – 0913	BS EN 13284-1	Near side rear quarter Ford Fiesta



2 Supporting Information (Held by Redwing Environmental Ltd)

2.1 General Information

2.1.1 Redwing Environmental Ltd staff details

Elena Berek & Tony Berek

2.2 Redwing Environmental Ltd method details

2.2.1 Stack Velocity, Pressure and Temperature Measurements

2.2.2 The stack velocity, pressure and temperature will be measured by full pitot traverses of the duct using the points provided. Measurements will be taken at the relevant positions based on the particulate standard followed.

2.3 Leak tests for extractive techniques

2.3.1 All extractive-sampling techniques were tested for leaks before sampling proceeded. Any leaks present were eliminated prior to sampling and will be reported.

2.4 Data standardisation

2.4.1 Pollutant concentrations are expressed at reference conditions 273 K and 101.3 kPa.

2.4.2 The following formulae have been used to convert the measured values to reference conditions:

Temperature and pressure correction:-

$$C_r = C_d \times (T_d/273) \times (101.3/P_d)$$

C_r = Concentration at reference conditions (mg/m^3)

C_d = Concentration at discharge conditions (mg/m^3)

T_d = Temperature at discharge conditions (K)

P_d = Pressure at discharge conditions (kPa)

3.0 Particulate matter BS EN 13284-1 – Total Particulate Matter

3.1.1 Total particulate matter was sampled using a Zambelli 6000 plus isokinetic sampling system in accordance with BS EN 13284-1.

3.1.2 The Zambelli sampling system monitors temperature, static pressure and velocities within the duct using an S-type pitot tube and K-type thermocouple. The sampling rate was continuously monitored and adjusted relative to the duct velocity to ensure isokinetic-sampling conditions are maintained throughout the monitoring period.



- 3.1.3 Exhaust gases were drawn under isokinetic conditions from the exhaust points using the Zambelli sampling probe, particulate matter was then collected on a pre-weighed glass fibre filter contained within the filter cassette holder, and the total particulate matter determined gravimetrically.
- 3.1.4 It was also necessary to wash the probe and nozzle out with water and then acetone between sampling and the weight of the probe washing added to that collected on the sample filter. Analysis of an acetone/water blank was carried out and the result corrected accordingly.
- 3.1.5 The sample positions were calculated with respect to BS EN 13284-1 – Stationary source emissions – Manual determination of mass concentration of particulate matter.
- 3.1.6 Sampling was carried out internally (in-stack monitoring), there were no reported deviations from the method therefore the uncertainty for the monitoring procedure was reported to be:

Uncertainty: $\pm 30\%$

4.0 Quality Assurance

- 4.1 Redwing Environmental Ltd is accredited to ISO 9001:2008 and ISO 14001:2004 and will always endeavour to follow the methods specified in the Environment Agency Technical Guidance M2.
- 4.2 Redwing Environmental Ltd is a member of the Source Testing Association (STA) and therefore operates under the STA's code of practice.

5.0 Disclaimer

- 5.1 Redwing Environmental Ltd confirms that in preparing this report all reasonable skill and care has been exercised.
- 5.1.1 Unless specifically assigned or transferred within the terms of the agreement, Redwing Environmental Ltd asserts and retains all copyright, and other Intellectual Property Rights, in and over the report and its contents.



APPENDIX A

Particulate & Velocity Results



Client	Nationwide Crash Repair								
Site Address	Coventry								
Job Number	P-RED13-072								
Date	6th August 2013								
Operator(s)	E Berek & T Berek								
Stack Reference	Spray Booth 1				Isokinetic Sample Positions (%) multiply by diameter to obtain sample points		Sampling Plane Diagram		
Number of Stacks	1				1	14.60			
Stack Configuration	Round				2	85.40			
Dimensions (mtrs)	0.80				3	N/A			
Outlet Diameter (if applicable) (metres)					4	N/A			
Number of Sample Ports	1				5	N/A			
Number of Samples per Axis / Port	2				6	N/A			
Nozzle Diameter (mm)	7.0				7	N/A			
Nozzle Area (m²)	0.00003847				8	N/A			
Stack Area (m²)	0.503				Average Isokinetic Flow Rate (ltrs/min)		Axis 1	Axis 2	
Pitot Coefficient	0.84	Pitot Calibration Due Date			15th March 2014			22.70	24.72
Position	Distance	Axis 1	Temperature	Swirl Test	Axis 2	Temperature	Swirl Test	Atmos. Pressure (kPa)	
No.	(cms)	(pa)	(C)	(°)	(pa)	(C)	(°)	100.0	
1	11.68	67	31.5	13.4	88	31.6	11.5	Static Pressure (pa)	
2	68.32	89	31.6	13.5	97	31.4	12.4	-31.0	
3	N/A							1 Axis	2 Axis
4	N/A							Velocity of flow (m/s)	
5	N/A							9.84	10.71
6	N/A							Volume Flow Rate (m³/s)	
7	N/A							4.94	5.38
8	N/A							Reduced Exit	
Averages		78	31.6		93	31.5		N/A	
Mean Flue Gas Temp (in K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2 + 273) =$					304.55				
Permitted Range of gas temperature readings (C) = $(0.95T_p - 273)$ to $(1.05T_p - 273) =$					16.32 to 46.78				
Highest Velocity Reading (m/s) =					11.3				
Lowest Velocity Reading (m/s) =					9.1				
Ratio Highest/Lowest (Max permitted = 3:1)					1.24 : 1				
On site Checklist									
Initial Leak Check	<0.2	End of first run	<0.2		Start of 2 nd run	N/A	End of 2 nd run	N/A	
Acceptable Leak Check < 2% Vol (l/min)	0.45				Manometer Leak Check			OK	
					Pitot Leak Check			OK	
Range of Gas Temps	OK				Overall Isokinetic Ratio (%) (must be 95 to 115%)			Run 1	Run 2
Passed minimum Velocity requirements (>5pa)	YES							101.2	N/A
Negative Local Flow Present, YES or NO (Yes = Fail)	NO				Are there sufficient rails and kick board? (YES, NO or N/A)			N/A	
Is the Platform area greater than 5m²? (YES, NO or N/A)	N/A				Is the area in front of the sample line the length of the probe + 1 metre? (YES or NO)			YES	
Passed Highest to lowest Velocity (3:1)	YES								
Site Equipment Used									
Pitot Reference	RED 0290				Manometer Reference			RED 0400	
Thermometer Reference	RED 0353/0354				Thermocouple Reference			RED 0362	
Balance Reference	N/A				Sampling Pump Reference			RED 0258	
Tape Measure Reference	RED 0123				Barometer Reference			RED 0402	
DGM Thermocouple	RED 0274				Impinger Outlet Thermocouple			N/A	
Calipers	RED 0301				Condenser Thermocouple			N/A	



Stack Reference ID		Spray Booth 1		
		Nationwide Crash Repair		
		RUN 1		
Filter Reference No	G47-050813-05			
Date	6th August 2013			
Sample Period	13:55	to	14:58	
Velocity (m/s)	10.27			
Volume flow rate of Stack gas (m ³ /hr)	18592			
Average Stack Temp (°C)	31.6			
Temp Range ± 5% (°C)	16.32	to	46.78	
Lowest Velocity Reading (m/s)	9.09			
Highest Velocity Reading (m/s)	11.28			
Ratio (less than 3:1)	1.24	:	1	
Pre-conditioning temperature of Filter (°C)	180			
Instack sampling - Max Filter temperature (°C)	31.8			
Post-conditioning temperature Filter/Wash (°C)	160			
Oxygen %	19.5			
Carbon Dioxide %	0.30			
Moisture (%)	1.10			
Litres sampled	1402			
Corrected volume sampled - STP (m ³)	1.271			
Blank Filter Run weight gain (mg)	0.000	Blank Concentration (mg/m ³)	0.000	
Blank Wash Run weight gain (mg)	0.060		0.047	
Weighing uncertainty of balance (mg)	0.079	This must be <5% of ELV	ELV = 10	0.5
Overall Blank value (mg/m ³)	0.047	This must be <10% of ELV	ELV = 10	1.0
Particulate weight collected on filter (mg)	0.35			
Particulate weight collected in Wash (mg)	3.95			
Total Particulate weight collected (mg)	4.30			
Total Particulate Concentration, dry gas at STP (mg/m ³)	3.38			
Total Particulate Concentration, wet gas at STP (mg/m ³)	3.35			
Total Particulate Concentration corrected for 11% Oxygen, dry gas (mg/m ³)	N/A			
Total Particulate Mass Emission (kg/hour)	0.06			



Client	Nationwide Crash Repair								
Site Address	Coventry								
Job Number	P-RED13-072								
Date	6th August 2013								
Operator(s)	E Berek & T Berek								
Stack Reference	Spray Booth 2				Isokinetic Sample Positions (%) multiply by diameter to obtain sample points		Sampling Plane Diagram		
Number of Stacks	1				1	14.60			
Stack Configuration	Round				2	85.40			
Dimensions (mtrs)	0.80				3	N/A			
Outlet Diameter (if applicable) (metres)					4	N/A			
Number of Sample Ports	1				5	N/A			
Number of Samples per Axis / Port	2				6	N/A			
Nozzle Diameter (mm)	7.0				7	N/A			
Nozzle Area (m²)	0.00003847				8	N/A			
Stack Area (m²)	0.503				Average Isokinetic Flow Rate (ltrs/min)		Axis 1	Axis 2	
Pitot Coefficient	0.84		Pitot Calibration Due Date		15th March 2014			22.13	23.16
Position	Distance	Axis 1	Temperature	Swirl Test	Axis 2	Temperature	Swirl Test	Atmos. Pressure (kPa)	
No.	(cms)	(pa)	(C)	(°)	(pa)	(C)	(°)	100.0	
1	11.68	45	32.2	12.5	72	32.2	14.1	Static Pressure (pa)	
2	68.32	103	32.1	13.6	90	32.1	13.4	-21.0	
3	N/A							1 Axis	2 Axis
4	N/A							Velocity of flow (m/s)	
5	N/A							9.59	10.03
6	N/A							Volume Flow Rate (m³/s)	
7	N/A							4.82	5.04
8	N/A							Reduced Exit	
Averages		74	32.2		81	32.2		N/A	
Mean Flue Gas Temp (in K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2 + 273) =$					305.15				
Permitted Range of gas temperature readings (C) = $(0.95T_p - 273)$ to $(1.05T_p - 273) =$					16.89 to 47.41				
Highest Velocity Reading (m/s) =					11.6				
Lowest Velocity Reading (m/s) =					7.5				
Ratio Highest/Lowest (Max permitted = 3:1)					1.56 : 1				
On site Checklist									
Initial Leak Check	<0.2	End of first run	<0.2		Start of 2 nd run	N/A	End of 2 nd run	N/A	
Acceptable Leak Check < 2% Vol (l/min)	0.44				Manometer Leak Check			OK	
					Pitot Leak Check			OK	
Range of Gas Temps	OK				Overall Isokinetic Ratio (%) (must be 95 to 115%)			Run 1	Run 2
Passed minimum Velocity requirements (>5pa)	YES							100.1	N/A
Negative Local Flow Present, YES or NO (Yes = Fail)	NO				Are there sufficient rails and kick board? (YES, NO or N/A)			N/A	
Is the Platform area greater than 5m²? (YES, NO or N/A)	N/A				Is the area in front of the sample line the length of the probe + 1 metre? (YES or NO)			YES	
Passed Highest to lowest Velocity (3:1)	YES								
Site Equipment Used									
Pitot Reference	RED 0290			Manometer Reference			RED 0400		
Thermometer Reference	RED 0353/0354			Thermocouple Reference			RED 0362		
Balance Reference	N/A			Sampling Pump Reference			RED 0258		
Tape Measure Reference	RED 0123			Barometer Reference			RED 0402		
DGM Thermocouple	RED 0274			Impinger Outlet Thermocouple			N/A		
Calipers	RED 0301			Condenser Thermocouple			N/A		



Stack Reference ID		Spray Booth 2		
		Nationwide Crash Repair		
		RUN 1		
Filter Reference No	G47-050813-03			
Date	6th August 2013			
Sample Period	10:28	to	11:32	
Velocity (m/s)	9.81			
Volume flow rate of Stack gas (m ³ /hr)	17755			
Average Stack Temp (°C)	32.2			
Temp Range ± 5% (°C)	16.89	to	47.41	
Lowest Velocity Reading (m/s)	7.46			
Highest Velocity Reading (m/s)	11.64			
Ratio (less than 3:1)	1.56	:	1	
Pre-conditioning temperature of Filter (°C)	180			
Instack sampling - Max Filter temperature (°C)	32.4			
Post-conditioning temperature Filter/Wash (°C)	160			
Oxygen %	19.5			
Carbon Dioxide %	0.30			
Moisture (%)	1.10			
Litres sampled	1384			
Corrected volume sampled - STP (m ³)	1.260			
Blank Filter Run weight gain (mg)	0.000	Blank Concentration (mg/m ³)	0.000	
Blank Wash Run weight gain (mg)	0.450		0.357	
Weighing uncertainty of balance (mg)	0.075	This must be <5% of ELV	ELV = 10	0.5
Overall Blank value (mg/m ³)	0.357	This must be <10% of ELV	ELV = 10	1.0
Particulate weight collected on filter (mg)	0.25			
Particulate weight collected in Wash (mg)	1.81			
Total Particulate weight collected (mg)	2.06			
Total Particulate Concentration, dry gas at STP (mg/m ³)	1.63			
Total Particulate Concentration, wet gas at STP (mg/m ³)	1.62			
Total Particulate Concentration corrected for 11% Oxygen, dry gas (mg/m ³)	N/A			
Total Particulate Mass Emission (kg/hour)	0.03			



Client	Nationwide Crash Repair								
Site Address	Coventry								
Job Number	P-RED13-072								
Date	6th August 2013								
Operator(s)	E Berek & T Berek								
Stack Reference	Spray Booth 3				Isokinetic Sample Positions (%) multiply by diameter to obtain sample points		Sampling Plane Diagram		
Number of Stacks	1				1	14.60			
Stack Configuration	Round				2	85.40			
Dimensions (mtrs)	0.80				3	N/A			
Outlet Diameter (if applicable) (metres)					4	N/A			
Number of Sample Ports	1				5	N/A			
Number of Samples per Axis / Port	2				6	N/A			
Nozzle Diameter (mm)	7.0				7	N/A			
Nozzle Area (m ²)	0.00003847				8	N/A			
Stack Area (m ²)	0.503				Average Isokinetic Flow Rate (ltrs/min)		Axis 1	Axis 2	
Pitot Coefficient	0.84		Pitot Calibration Due Date			15th March 2014		22.50	22.65
Position	Distance	Axis 1	Temperature	Swirl Test	Axis 2	Temperature	Swirl Test	Atmos. Pressure (kPa)	
No.	(cms)	(pa)	(C)	(°)	(pa)	(C)	(°)	100.0	
1	11.68	100	30.1	11.5	67	30	12.7	Static Pressure (pa)	
2	68.32	54	30.0	13.5	89	30	13.2	-27.0	
3	N/A							1 Axis	2 Axis
4	N/A							Velocity of flow (m/s)	
5	N/A							9.75 9.81	
6	N/A							Volume Flow Rate (m ³ /s)	
7	N/A							4.90 4.93	
8	N/A							Reduced Exit	
Averages		77	30.1		78	30.0		N/A	
Mean Flue Gas Temp (in K) $T_p = ((\text{Mean } T_1 + \text{Mean } T_2)/2 + 273) =$					303.05				
Permitted Range of gas temperature readings (C) = $(0.95T_p - 273)$ to $(1.05T_p - 273) =$					14.90 to 45.20				
Highest Velocity Reading (m/s) =					11.4				
Lowest Velocity Reading (m/s) =					8.1				
Ratio Highest/Lowest (Max permitted = 3:1)					1.40 : 1				
On site Checklist									
Initial Leak Check	<0.2	End of first run	<0.2		Start of 2 nd run	N/A	End of 2 nd run	N/A	
Acceptable Leak Check < 2% Vol (l/min)	0.45				Manometer Leak Check			OK	
					Pitot Leak Check			OK	
Range of Gas Temps	OK				Overall Isokinetic Ratio (%) (must be 95 to 115%)			Run 1	Run 2
Passed minimum Velocity requirements (>5pa)	YES							100.1	N/A
Negative Local Flow Present, YES or NO (Yes = Fail)	NO				Are there sufficient rails and kick board? (YES, NO or N/A)			YES	
Is the Platform area greater than 5m ² ? (YES, NO or N/A)	N/A				Is the area in front of the sample line the length of the probe + 1 metre? (YES or NO)			YES	
Passed Highest to lowest Velocity (3:1)	YES								
Site Equipment Used									
Pitot Reference	RED 0290				Manometer Reference		RED 0400		
Thermometer Reference	RED 0353/0354				Thermocouple Reference		RED 0362		
Balance Reference	N/A				Sampling Pump Reference		RED 0258		
Tape Measure Reference	RED 0123				Barometer Reference		RED 0402		
DGM Thermocouple	RED 0274				Impinger Outlet Thermocouple		N/A		
Calipers	RED 0301				Condenser Thermocouple		N/A		



Stack Reference ID		Spray Booth 3		
		Nationwide Crash Repair		
		RUN 1		
Filter Reference No	G47-050813-01			
Date	6th August 2013			
Sample Period	08:50	to	09:52	
Velocity (m/s)	9.78			
Volume flow rate of Stack gas (m ³ /hr)	17700			
Average Stack Temp (°C)	30.1			
Temp Range ± 5% (°C)	14.90	to	45.20	
Lowest Velocity Reading (m/s)	8.14			
Highest Velocity Reading (m/s)	11.43			
Ratio (less than 3:1)	1.40	:	1	
Pre-conditioning temperature of Filter (°C)	180			
Instack sampling - Max Filter temperature (°C)	30.4			
Post-conditioning temperature Filter/Wash (°C)	160			
Oxygen %	19.4			
Carbon Dioxide %	0.30			
Moisture (%)	1.10			
Litres sampled	1378			
Corrected volume sampled - STP (m ³)	1.264			
Blank Filter Run weight gain (mg)	0.010	Blank Concentration (mg/m ³)	0.008	
Blank Wash Run weight gain (mg)	0.050		0.040	
Weighing uncertainty of balance (mg)	0.078	This must be <5% of ELV	ELV = 10	0.5
Overall Blank value (mg/m ³)	0.047	This must be <10% of ELV	ELV = 10	1.0
Particulate weight collected on filter (mg)	3.39			
Particulate weight collected in Wash (mg)	1.40			
Total Particulate weight collected (mg)	4.79			
Total Particulate Concentration, dry gas at STP (mg/m ³)	3.79			
Total Particulate Concentration, wet gas at STP (mg/m ³)	3.75			
Total Particulate Concentration corrected for 11% Oxygen, dry gas (mg/m ³)	N/A			
Total Particulate Mass Emission (kg/hour)	0.07			

