Report for Periodic Monitoring of Emissions to Atmosphere

Part 1:	**Executive Summary**
Permit Number:	**067, var 002**
Operator:	**TS Covrad Heat Transfer Ltd**
Installation:	**Coventry**
Emission Points:	**Assembly Shop Booth (LH, Middle, RH)** **Industrial Spray Booth 1 (LH, RH)** **Industrial Spray Booth 2 (LH, RH)**
Monitoring Dates:	**27th – 29th January 2014**

UKAS TESTING 1709

mCERTS

Contract Reference:	FTBS 29314
Operator:	TS Covrad Heat Transfer Ltd
Address:	Sir Henry Parkes Road Canley Coventry CV5 6BN
Monitoring Organisation:	RPS Consultants
Address:	Unit A1, Lowfields Business Park Old Power Way, Elland HX5 9DE
Report Date:	10th February 2013
Report Approved By:	Edwin Powell
Position:	Consultant
MCERTS Registration Number:	MM 05 621
MCERTS Certification Level:	Level 2
Technical Endorsements:	TE1,2,3,4
Signature:	[redacted]

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Monitoring Objectives

At the request of Bob Holmes of TS Covrad Heat Transfer Ltd, RPS Consultants conducted stack emission monitoring at the Coventry site in January 2014.

The monitoring programme at this installation was carried out to provide data on emissions to atmosphere for comparison with the limits specified in the air emission criteria for this site.

The following tables detail the parameters requested for monitoring at each emission point and the actual monitoring conducted.

Table 1.1

Parameters Requested to be Monitored	3 x Emission Points Assembly Shop LH Middle RHS
Total Particulate Matter	✓ ✓ ✓
Specific Requirements	Normal

Table 1.2

Parameters Requested to be Monitored	2 x Emission Points Industrial Spray Booth 1 LH & RH
Total Particulate Matter	✓ ✓
Specific Requirements	Normal

Table 1.3

Parameters Requested to be Monitored	2 x Emission Points Industrial Spray Booth 2 LH & RH
Total Particulate Matter	✓ ✓
Specific Requirements	Normal

Notes:
✓ *Represents pollutants sampled*

Total number of emission points sampled = 7

Monitoring Results

Table 2.1 Monitoring results for the Assembly Shop Spray Booth, Carried out on 28th & 29th January 2014

Substance Monitored	Emission Limit Value	Periodic Monitoring Result	Units	Uncertainty (Expressed expanded k=2)	Reference Conditions 273K, 101.3kPa	Sampling Date	Sampling Times	Monitoring Reference Method	Accreditation Status	Operating Status
Total Particulate Matter LHS	50	2.0	mg/m^3	+/-0.37	273K, 101.3kPa, Wet	28/01/14	13:35 – 14:37	BS EN 13284-1:2002	MCERTS	Normal
	N/a	0.021	kg/hr							
Total Particulate Matter MIDDLE	50	0.62	mg/m^3	+/-0.33	273K, 101.3kPa, Wet	29/01/14	10:17 - 11:19	BS EN 13284-1:2002	MCERTS	Normal
	N/a	0.0073	kg/hr							
Total Particulate Matter RHS	50	1.4	mg/m^3	+/-0.32	273K, 101.3kPa, Wet	29/01/14	11:31 - 12:33	BS EN 13284-1:2002	MCERTS	Normal
	N/a	0.016	kg/hr							

Monitoring Results - continued

Table 2.2 Monitoring results for the Industrial Spray Booth 1, Carried out on 27th January 2014

Substance Monitored	Emission Limit Value	Periodic Monitoring Result	Units	Uncertainty (Expressed expanded k=2)	Reference Conditions 273K, 101.3kPa	Sampling Date	Sampling Times	Monitoring Reference Method	Accreditation Status	Operating Status
Total Particulate Matter LHS	50	0.91	mg/m^3	+/-0.18	273K, 101.3kPa, Wet	27/01/14	13:40 - 14:42	BS EN 13284-1:2002	MCERTS	Normal
	N/a	0.010	kg/hr							
Total Particulate Matter RHS	50	2.2	mg/m^3	+/-0.21	273K, 101.3kPa, Wet	27/01/14	11:25 - 12:27	BS EN 13284-1:2002	MCERTS	Normal
	N/a	0.022	kg/hr							

Table 2.3 Monitoring results for the Industrial Spray Booth 2, Carried out on 28th January 2014

Substance Monitored	Emission Limit Value	Periodic Monitoring Result	Units	Uncertainty (Expressed expanded k=2)	Reference Conditions 273K, 101.3kPa	Sampling Date	Sampling Times	Monitoring Reference Method	Accreditation Status	Operating Status
Total Particulate Matter LHS	50	3.7	mg/m^3	+/-0.26	273K, 101.3kPa, Wet	28/01/14	11:44 - 12:47	BS EN 13284-1:2002	MCERTS	Normal
	N/a	0.035	kg/hr							
Total Particulate Matter RHS	50	6.2	mg/m^3	+/-0.39	273K, 101.3kPa, Wet	28/01/14	10:26 - 11:29	BS EN 13284-1:2002	MCERTS	Normal
	N/a	0.039	kg/hr							

Operating Information

Table 3.1 Operating conditions during the monitoring of the Assembly Shop LH emission point, carried out on 28th January 2014

Parameter	Result
Sample Date	28/01/2014
Process Type	Batch
Process Duration	60 Minutes
If 'Batch', was monitoring carried out over the whole batch?	Yes
Abatement/Operational?	Dry Filtration / Operational
Paint Ref. Number	Black Primer 395 P9003
Item Sprayed	6 x small cooler units, 1 x large cooler

Comparison of Operator CEM and Periodic Monitoring Results		
Substance	**CEMs Results (mg/m^3)**	**Periodic Monitoring Results (mg/m^3)**
No CEMS Installed/Data Available		

Table 3.2 Operating conditions during the monitoring of the Assembly Shop Middle emission point, carried out on 29th January 2014

Parameter	Result
Sample Date	29/01/2014
Process Type	Batch
Process Duration	60 Minutes
If 'Batch', was monitoring carried out over the whole batch?	Yes
Abatement/Operational?	Dry Filtration / Operational
Paint Ref. Number	Black Primer 395 P9003
Item Sprayed	Large Cooler Units x 1

Comparison of Operator CEM and Periodic Monitoring Results		
Substance	**CEMs Results (mg/m^3)**	**Periodic Monitoring Results (mg/m^3)**
No CEMS Installed/Data Available		

Table 3.3 Operating conditions during the monitoring of the Assembly Shop RH emission point, carried out on 29th January 2014

Parameter	Result
Sample Date	29/01/2014
Process Type	Batch
Process Duration	60 Minutes
If 'Batch', was monitoring carried out over the whole batch?	Yes
Abatement/Operational?	Dry Filtration / Operational
Paint Ref. Number	Black primer 395 P9003
Item Sprayed	6 x small cooler units

Comparison of Operator CEM and Periodic Monitoring Results		
Substance	**CEMs Results (mg/m^3)**	**Periodic Monitoring Results (mg/m^3)**
No CEMS Installed/Data Available		

Table 3.4 Operating conditions during the monitoring of the Industrial Spray Booth 1 LH emission point, carried out on 27th January 2014

Parameter	Result
Sample Date	27/01/2014
Process Type	Batch
Process Duration	60 Minutes
If 'Batch', was monitoring carried out over the whole batch?	Yes
Abatement/Operational?	Not Installed
Paint Ref. Number	Black primer 395 P9003
Item Sprayed	2 x beams, 4 x cooler pipes, 1 x fan housing

Comparison of Operator CEM and Periodic Monitoring Results		
Substance	**CEMs Results (mg/m^3)**	**Periodic Monitoring Results (mg/m^3)**
No CEMS Installed/Data Available		

Table 3.5 Operating conditions during the monitoring of the Industrial Spray Booth 1 RH emission point, carried out on 27th January 2014

Parameter	Result
Sample Date	27/01/2014
Process Type	Batch
Process Duration	60 Minutes
If 'Batch', was monitoring carried out over the whole batch?	Yes
Abatement/Operational?	Dry Filtration / Operational
Paint Ref. Number	Black primer 395 P9003
Item Sprayed	2 x small coolers, 1 x medium cooler

Comparison of Operator CEM and Periodic Monitoring Results		
Substance	**CEMs Results (mg/m^3)**	**Periodic Monitoring Results (mg/m^3)**
No CEMS Installed/Data Available		

Table 3.6 Operating conditions during the monitoring of the Industrial Spray Booth 2 LH emission point, carried out on 28th January 2014

Parameter	Result
Sample Date	28/01/2014
Process Type	Batch
Process Duration	60 Minutes
If 'Batch', was monitoring carried out over the whole batch?	Yes
Abatement/Operational?	Dry Filtration / Operational
Paint Ref. Number	2 Pack Grey Etch Primer 903P3003
Item Sprayed	6 x Side Panels 2 x full stillages of radiator brackets

Comparison of Operator CEM and Periodic Monitoring Results		
Substance	**CEMs Results (mg/m^3)**	**Periodic Monitoring Results (mg/m^3)**
No CEMS Installed/Data Available		

Table 3.7 Operating conditions during the monitoring of the Industrial Spray Booth 2 RH emission point, carried out on 28th January 2014

Parameter	Result
Sample Date	28/01/2014
Process Type	Batch
Process Duration	60 Minutes
If 'Batch', was monitoring carried out over the whole batch?	Yes
Abatement/Operational?	Dry Filtration / Operational
Paint Ref. Number	2 Pack Grey Etch Primer 903P3003
Item Sprayed	18 x brackets 2 x full stillages of radiator bracing straps

Comparison of Operator CEM and Periodic Monitoring Results		
Substance	**CEMs Results (mg/m^3)**	**Periodic Monitoring Results (mg/m^3)**
No CEMS Installed/Data Available		

Monitoring Deviations

Table 4.1 Monitoring Deviations for Assembly Shop LH Emission Point

Pollutant	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Total Particulate Matter	None	None	None

Table 4.2 Monitoring Deviations for Assembly Shop Middle Emission Point

Pollutant	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Total Particulate Matter	None	None	None

Table 4.3 Monitoring Deviations for Assembly Shop RH Emission Point

Pollutant	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Total Particulate Matter	None	None	None

Monitoring Deviations - continued

Table 4.4 Monitoring Deviations for Industrial Spray Booth 1 LH Emission Point

Pollutant	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Total Particulate Matter	None	None	None

Table 4.5 Monitoring Deviations for Industrial Spray Booth 1 RH Emission Point

Pollutant	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Total Particulate Matter	None	None	None

Monitoring Deviations - continued

Table 4.6 Monitoring Deviations for Industrial Spray Booth 2 LH Emission Point

Pollutant	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Total Particulate Matter	None	• Full traverses not possible due to scaffold obstruction	Non ideal sample location

Table 4.7 Monitoring Deviations for Industrial Spray Booth 2 RH Emission Point

Pollutant	Substance Deviations	Monitoring Deviations	Other Relevant Issues
Total Particulate Matter	None	• Full traverses not possible due to scaffold obstruction	Non-ideal sample location

Report for Periodic Monitoring of Emissions to Atmosphere	
Part 2:	**Supporting Information**
Permit Number:	**067, var 002**
Operator:	**TS Covrad Heat Transfer Ltd**
Installation:	**Coventry**
Emission Points:	**Assembly Shop Booth (LH, Middle, RH)** **Industrial Spray Booth 1 (LH, RH)** **Industrial Spray Booth 2 (LH, RH)**
Monitoring Dates:	**27th – 29th January 2014**

UKAS TESTING 1709

MCERTS

Contract Reference:	FTBS 29314
Operator:	TS Covrad Heat Transfer Ltd
Address:	Sir Henry Parkes Road Canley Coventry CV5 6BN
Monitoring Organisation:	RPS Consultants
Address:	Unit A1, Lowfields Business Park Old Power Way, Elland HX5 9DE
Report Date:	10th February 2013
Report Approved By:	Edwin Powell
Position:	Consultant
MCERTS Registration Number:	MM 05 621
MCERTS Certification Level:	Level 2
Technical Endorsements:	TE1,2,3,4
Signature:	[redacted]

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APPENDIX 1: General Information

Monitoring Organisation Staff Details

Table 5.1 Sampling Personnel

Sampling Personnel	Position	MCERTS Level	Technical Endorsements	MCERTS Registration Number
Ian Baggley	Consultant	Level 2	TE1, TE2, TE3, TE4	MM 05 653
Chris Davies	Consultant	Level 1	TE1, TE2, TE3, TE4	MM 03 252

Table 5.2 Report Author

Report Author	Position	MCERTS Level	Technical Endorsements	MCERTS Registration Number
Ian Baggley	Consultant	Level 2	TE1, TE2, TE3, TE4	MM 05 653

Table 5.3 Report Reviewer

Report Reviewer	Position	MCERTS Level	Technical Endorsements	MCERTS Registration Number
Edwin Powell	Consultant	Level 2	TE1, TE2, TE3, TE4	MM 05 621

Monitoring Organisation Method Details

Table 6.1 Monitoring Methods

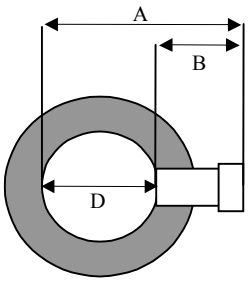
Emission Parameter	Standard Method	Monitoring Procedure No.	Monitoring Accreditation	Analysis	Analysis Procedure No.	Analytical Laboratory	Analysis Accreditation
Practical Considerations Prior to Monitoring	N/A	RPSCE/1/1	UKAS	N/A	N/A	N/A	N/A
Gas Flows	BS-EN 13284-1:2001	RPSCE/1/2	MCERTS	N/A	N/A	N/A	N/A
Gas Temperatures	BS-EN 13284-1:2001	RPSCE/1/2	MCERTS	N/A	N/A	N/A	N/A
Low Concentration Total Particulate Matter	BS EN 13284-1:2002	RPSCE/1/7c	MCERTS	Gravimetric	D9	RPS Laboratories	UKAS

Table 7.1 – Checklist Used

Equipment Checklist Used	File Location Address
FTBS 29314 Checklist	FTBS 29314 Electronic & Work File

APPENDIX 2:
Assembly Shop LH Sampling, Analysis & Uncertainty Data

Diagrams of Assembly Shop Stacks LH , MIDDLE & RH



Access in front of ports adequate for each stack.

Each stack has 2 x sample ports correctly located.

Platform width approx 1m

A = 0.69m

B = 0.09m

D = 0.60m

Each of the stacks are identical in dimensions and accessed from a common temporary platform - shown

Company Name:	TS COVRAD Heat Transfer	Date:	28/01/14
Site Name:	Canley	Run:	Total Particulate Matter
Sampling Point Ref:	Assembly Shop Booth - LH		
Project Reference:	FTBS 29314		

Stack Static press.mm H_2O:	4.8	Stack Diamter (m)	0.80
		Stack Area (m2):	0.503

Traverse Point No.	Port A			Port B		
	Δ p, mm H_2O	Root Δ p	Stack Temp °C	Δ p, mm H_2O	Root Δ p	Stack Temp °C
1	3	1.732	13	3.2	1.789	13
2	3	1.732	13	3.2	1.789	13
3	3.2	1.789	13	3.4	1.844	13
4	3.2	1.789	13	3.4	1.844	13
Minimum	3.0	1.732	13	3.2	1.789	13
Maximum	3.2	1.789	13	3.4	1.844	13
Mean	**3.1**	**1.760**	**13.0**	**3.3**	**1.816**	**13.0**
Sum	12.4	7.042	52	13.2	7.266	52
Total Sum						

Max. pitot press. =	3.4
Min. pitot press. =	3.0
Ratio Max:Min =	1.1 :1

Gas Data

Oxygen %	21.0
CO_2 %	0.04
CO %	

Oxygen Correction

Required Correction Value	0
Actual Oxygen Factor	1
Enter 0 if correction is not required	0

BS EN 13284-1 & M1 Sample Point Requirements	Requirement Met?
Duct gas Flow: angle with regard to duct access <15°?	Y
Duct Gas Flow Negative Velocity: Not Permitted	Y
Duct Gas Flow: Ratio of max to min velocity <3:1?	Y
Working Area > 5m²?	Y
Handrails with removable chains / self closing gates across the top of the ladder?	Y
Handrails (approx 0,5 and 1,0 m high) and vertical baseboards (approx 0,25m high)?	Y
Scaffold Built to 'Heavy Duty' Scafftag Rating or at least 2.5kN/m2 loading	Y
Handrails not restricting access to ports?	Y
Room opposite sampling port equal or greater than the length of the sampling probe plus 1 metre?	Y
Sufficient Power (Waterproof 110V BS4343 Standard) close or on the platform?	Y

Company Name:	TS COVRAD Heat Transfer	In-stack Filter?	Y	Bar. Press.mm Hg	756.06	K Factor	5.14	Ambient Temp.	10	Leak Rate (fin / %)	0.3
Site Name:	Canley										
Sampling Point Ref:	Assembly Shop Booth - LH	Outstack Filter?	N	Cp	0.834	Dn used	6.86	Start Time	13:35	Leak Rate (start / %)	0.5
Date:	28/01/14										
Run:	Total Particulate Matter	Operators	IB CD	Bws%	1	Nozzle No.	FYS367-7	Stop Time	14:37	Probe setting	160 +/- 5 °C
Project Reference:	FTBS 29314										
						Meter Correction Yd	0.984				

Sample Filter Weights

	Reference	Laboratory	Increase, mg
Filter	104152	RPS	0.08
Probe Washings	20006562	RPS	1.5

Sample Filter Blank Weighings

	Reference	Laboratory	Increase, mg
Filter	104159	RPS	**0.04**
Probe Wash	20006559	RPS	**0.5**

Note: Results in Bold are reported at the L.O.D.

Impinger Weights

Weights	Initial	Final	Increase, g
Impinger 1	696.7	697.1	0.4
Impinger 2	724.9	725.8	0.9
Impinger 3	590.6	592	1.4
Impinger 4			
Impinger 5			
Silica Gel	858.5	866.7	8.2
		Total	10.9

Sample Point	Clock Time min	Pitot Δ p, mm H_2O	Stack Temp, °C	Orifice Δ H, mm H_2O		Gas Meter Reading m^3	Temp at Gas Meter Outlet °C	Condenser Temp, °C	Filter Box Temp °C	Probe Temp °C	Pump Vacuum Inches Hg	Impinger Stem Temp. °C	Root Δ p,
				Desired	Actual								
A1	0	3	13	15.42	15.5	30099	15	.	.	160	1	9	1.732
	5	3	13	15.42	15.5		16	.	.	160	1	9	1.732
	10	3	13	15.42	15.5		16	.	.	160	1	8	1.732
A2	15	3.2	13	16.448	16.5		16	.	.	160	1	9	1.789
	20	3.2	13	16.448	16.5		16	.	.	160	1	10	1.789
	25	3.2	13	16.448	16.5		17	.	.	160	1	11	1.789
Endpoint	30							.	.				
B1	0	3.2	13	16.448	16.5		16	.	.	160	1.5	12	1.789
	5	3.2	13	16.448	16.5		17	.	.	160	1.5	12	1.789
	10	3.2	13	16.448	16.5		17	.	.	160	1.5	12	1.789
B2	15	3.4	13	17.476	17.5		17	.	.	160	1.5	12	1.844
	20	3.4	13	17.476	17.5		17	.	.	160	2	13	1.844
	25	3.4	13	17.476	17.5		17	.	.	160	2	13	1.844
Endpoint	30					30920		.	.				
	60.00	**3.200**	**13.0**	**16.4**	**16.5**	**0.821**	**16.4**	**.**	**.**	**160.0**	**1.3**	**10.8**	**1.8**

Company Name: TS COVRAD Heat Transfer
Site Name: Canley **Date:** 28/01/14
Project Reference: FTBS 29314

Sampling Point Ref: **Assembly Shop Booth - LH**	**Total Particulate Matter**
Meter Volume Sampled, acm	0.821
Sample Run Start Time	13:35
Sample Run End Time	14:37
Total Actual Sampling Time, min	60.0
Barometric Pressure, mm Hg	756.06
Stack Pressure, mm Hg	756.42
Average Stack Temp, °C	13.0
Meter Volume at Wet STP, scm	0.772
Stack Moisture Content, %	1.8
Average Stack Velocity, m/sec	5.990
Stack Flow Rate, scms wet, STP	2.859
Nozzle Diameter, mm	6.86
% Isokinetic Variation	**101.9**
Total Mass of Particulate, mg	1.6
Percentage of Total Particulate Collected on Filter	5.1
Stack Particulate Concentration, mg/m^3	**2.0**
Particulate Mass rate, kg/hour	0.021
Emission Limit value mg/m3	**50**

Sample Train Blank Results	
Sample Blank Particulate Concentration, mg/m^3	0.7
Total Weight Gain, mg (Sample Train Blank)	0.5
Blank Result Less than 10% of Limit Value	Y

Uncertainty Calculation for Total Particulate Matter to BS EN 13284-1

Determined Concentration	2.0	mg/m3 (at Reference Cond)

Measured Values

Sampled Volume	0.821	m^3
Sampled gas Temperature	289.4166667	k
Sampled gas Pressure	100.85	kPa
Sampled gas Humidity	0	% by volume
Oxygen content	21	% by volume
Mass	1.58	mg

Leak	0.05	%
Uncollected Mass	0	mg

Standard Uncertainties for Measured Values

Sampled Volume	0.001	m3
Sampled gas Temperature	2	k
Sampled gas Pressure	1	kPa
Sampled gas Humidity	1	% by volume
Oxygen content	0.1	% by volume
Mass	0.14152385	mg

Uncertainty Calculation for Volume Correction

Volume Correction Factor	0.939		
	Sensitivity Coefficient		**Uncertainty, Uv**
Sampled gas Temperature	0.0032		0.0065
Sampled gas Pressure	0.0093		0.0093
Sampled gas Humidity	0.0094		0.0094
		Sqrt (Uv)^2	0.0147
		Total Uv	**0.012**

Uncertainty Calculation for Oxygen Correction

Oxygen Correction Factor	1.0000		
	Sensitivity Coefficient		**Uncertainty, Uo**
Oxygen Measurement	N/A		N/A
		Total Uo	**N/A**

Uncertainty Contributions (Itemised)

	Value		Sensitivity coefficient	Uncertainty Contribution Concentration		Uncertainty Contribution %	
Volume Correction	0.759	m3	2.70	0.03	$mg.m^{-3}$	1.60	%
Mass (weighing)	1.58	mg	1.29	0.18	$mg.m^{-3}$	8.96	%
Oxygen Correction	N/A		0.00	0.00	$mg.m^{-3}$	0.00	%
System Leak	0.00	$mg.m^{-3}$	1.00	0.00	$mg.m^{-3}$	0.03	%
Uncollected Mass	0.00	mg	1.29	0.00	$mg.m^{-3}$	0.00	%
			Total Uncertainty	**0.19**	**$mg.m^{-3}$**		

Uncertainty Result (Uncertainty has been expanded with a coveragefactor of 2 (K=2))

Expanded Uncertainty =	**0.37**	**$mg.m^{-3}$**
=>	**18.20**	**% of Result**
=>	**0.00**	**% of ELV**

APPENDIX 3:
Assembly Shop Middle Sampling, Analysis & Uncertainty Data

Company Name:	TS COVRAD Heat Transfer	Date:	29/01/14
Site Name:	Canley	Run:	Total Particulate Matter
Sampling Point Ref:	Assembly Shop Booth - MID		
Project Reference:	FTBS 29314		
		Stack Diamter (m)	0.80
Stack Static press.mm H_2O:	4	Stack Area (m2):	0.503

Traverse Point No.	Port A			Port B		
	Δ p, mm H_2O	Root Δ p	Stack Temp °C	Δ p, mm H_2O	Root Δ p	Stack Temp °C
1	4	2.000	12	4	2.000	13
2	4.2	2.049	13	4	2.000	13
3	4.2	2.049	13	4	2.000	13
4	4.2	2.049	13	4.2	2.049	13
Minimum	4.0	2.000	12	4.0	2.000	13
Maximum	4.2	2.049	13	4.2	2.049	13
Mean	**4.2**	**2.037**	**12.8**	**4.1**	**2.012**	**13.0**
Sum	16.6	8.148	51	16.2	8.049	52
Total Sum						

Max. pitot press. =	4.2
Min. pitot press. =	4.0
Ratio Max:Min =	1.1 :1

Gas Data

Oxygen %	21.0
CO_2 %	0.04
CO %	

Oxygen Correction

Required Correction Value	0
Actual Oxygen Factor	1
Enter 0 if correction is not required	0

BS EN 13284-1 & M1 Sample Point Requirements	Requirement Met?
Duct gas Flow: angle with regard to duct access <15°?	Y
Duct Gas Flow Negative Velocity: Not Permitted	Y
Duct Gas Flow: Ratio of max to min velocity <3:1?	N
Working Area > 5m^2?	Y
Handrails with removable chains / self closing gates across the top of the ladder?	Y
Handrails (approx 0,5 and 1,0 m high) and vertical baseboards (approx 0,25m high)?	Y
Scaffold Built to 'Heavy Duty' Scafftag Rating or at least 2.5kN/m2 loading	Y
Handrails not restricting access to ports?	Y
Room opposite sampling port equal or greater than the length of the sampling probe plus 1 metre?	Y
Sufficient Power (Waterproof 110V BS4343 Standard) close or on the platform?	Y

For detailed stack geometry see Appendix 2

Company Name:	TS COVRAD Heat Transfer	In-stack Filter?	Y	Bar. Press.mm Hg	765.1	K Factor	5.15	Ambient Temp.	12	Leak Rate (fin / %)	0.2
Site Name:	Canley										
Sampling Point Ref:	Assembly Shop Booth - MID	Outstack Filter?	N	Cp	0.834	Dn used	6.86	Start Time	10:17	Leak Rate (start / %)	0.3
Date:	29/01/14										
Run:	Total Particulate Matter	Operators	IB CD	Bws%	1	Nozzle No.	FYS367-7	Stop Time	11:19	Probe setting	160 +/- 5 °C
Project Reference:	FTBS 29314										
						Meter Correction Yd	0.984				

Sample Filter Weights

	Reference	Laboratory	Increase, mg
Filter	104151	RPS	**0.04**
Probe Washings	20006564	RPS	**0.5**

Note: Results in Bold are reported at the L.O.D.

Sample Filter Blank Weighings

	Reference	Laboratory	Increase, mg
Filter	104159	RPS	**0.04**
Probe Wash	20006559	RPS	**0.5**

Note: Results in Bold are reported at the L.O.D.

Impinger Weights

Weights	Initial	Final	Increase, g
Impinger 1	693.7	693.9	0.2
Impinger 2	724.4	725.9	1.5
Impinger 3	590.5	593.7	3.2
Impinger 4			
Impinger 5			
Silica Gel	867.5	873.8	6.3
		Total	11.2

Sample Point	Clock Time min	Pitot Δ p, mm H_2O	Stack Temp, °C	Orifice Δ H, mm H_2O		Gas Meter Reading m^3	Temp at Gas Meter Outlet °C	Condenser Temp, °C	Filter Box Temp °C	Probe Temp °C	Pump Vacuum Inches Hg	Impinger Stem Temp. °C	Root Δ p,
				Desired	Actual								
A1	0	4	13	20.6	20.6	30923	12	.	.	160	1.5	12	2.000
	5	4	13	20.6	20.6		12	.	.	160	1.5	13	2.000
	10	4	14	20.6	20.6		13	.	.	160	1.5	13	2.000
A2	15	4.2	14	21.63	21.6		13	.	.	160	2	13	2.049
	20	4.2	14	21.63	21.6		13	.	.	160	2	14	2.049
	25	4.2	14	21.63	21.6		14	.	.	160	2	15	2.049
Endpoint	30							.	.				
B1	0	4	14	20.6	20.6		14	.	.	160	2	15	2.000
	5	4	14	20.6	20.6		14	.	.	160	2	15	2.000
	10	4	14	20.6	20.6		14	.	.	160	2	15	2.000
B2	15	4.2	14	21.63	21.6		14	.	.	160	2	16	2.049
	20	4.2	14	21.63	21.6		15	.	.	160	2	16	2.049
	25	4.2	14	21.63	21.6		16	.	.	160	2	17	2.049
Endpoint	30					31829		.	.				
	60.00	**4.100**	**13.8**	**21.1**	**21.1**	**0.906**	**13.7**	**.**	**.**	**160.0**	**1.9**	**14.5**	**2.0**

Company Name: TS COVRAD Heat Transfer
Site Name: Canley **Date:** 29/01/14
Project Reference: FTBS 29314

Sampling Point Ref: Assembly Shop Booth - MID	Total Particulate Matter
Meter Volume Sampled, acm	0.906
Sample Run Start Time	10:17
Sample Run End Time	11:19
Total Actual Sampling Time, min	60.0
Barometric Pressure, mm Hg	765.10
Stack Pressure, mm Hg	765.39
Average Stack Temp, °C	13.8
Meter Volume at Wet STP, scm	0.870
Stack Moisture Content, %	1.6
Average Stack Velocity, m/sec	6.749
Stack Flow Rate, scms wet, STP	3.250
Nozzle Diameter, mm	6.86
% Isokinetic Variation	**100.9**
Total Mass of Particulate, mg	0.5
Percentage of Total Particulate Collected on Filter	7.4
Stack Particulate Concentration, mg/m^3	**0.6**
Particulate Mass rate, kg/hour	0.007
Emission Limit value mg/m3	**50**

Sample Train Blank Results	
Sample Blank Particulate Concentration, mg/m^3	0.6
Total Weight Gain, mg (Sample Train Blank)	0.5
Blank Result Less than 10% of Limit Value	Y

Uncertainty Calculation for Total Particulate Matter to BS EN 13284-1

Determined Concentration	0.6	mg/m3 (at Reference Cond)

Measured Values

Sampled Volume	0.906	m^3
Sampled gas Temperature	286.6666667	k
Sampled gas Pressure	102.05	kPa
Sampled gas Humidity	0	% by volume
Oxygen content	21	% by volume
Mass	0.54	mg

Leak	0.05	%
Uncollected Mass	0	mg

Standard Uncertainties for Measured Values

Sampled Volume	0.001	m3
Sampled gas Temperature	2	k
Sampled gas Pressure	1	kPa
Sampled gas Humidity	1	% by volume
Oxygen content	0.1	% by volume
Mass	0.14152385	mg

Uncertainty Calculation for Volume Correction

Volume Correction Factor	0.959		
	Sensitivity Coefficient		**Uncertainty, Uv**
Sampled gas Temperature	0.0033		0.0067
Sampled gas Pressure	0.0094		0.0094
Sampled gas Humidity	0.0096		0.0096
		Sqrt (Uv)^2	0.0150
		Total Uv	**0.014**

Uncertainty Calculation for Oxygen Correction

Oxygen Correction Factor	1.0000		
	Sensitivity Coefficient		**Uncertainty, Uo**
Oxygen Measurement	N/A		N/A
		Total Uo	**N/A**

Uncertainty Contributions (Itemised)

	Value		Sensitivity coefficient	Uncertainty Contribution		
				Concentration		%
Volume Correction	0.856	m3	0.73	0.01	$mg.m^{-3}$	1.59 %
Mass (weighing)	0.54	mg	1.15	0.16	$mg.m^{-3}$	26.21 %
Oxygen Correction	N/A		0.00	0.00	$mg.m^{-3}$	0.00 %
System Leak	0.00	$mg.m^{-3}$	1.00	0.00	$mg.m^{-3}$	0.03 %
Uncollected Mass	0.00	mg	1.15	0.00	$mg.m^{-3}$	0.00 %
			Total Uncertainty	**0.16**	$mg.m^{-3}$	

Uncertainty Result (Uncertainty has been expanded with a coveragefactor of 2 (K=2))

Expanded Uncertainty =	**0.33**	$mg.m^{-3}$
=>	**52.51**	**% of Result**
=>	**0.00**	**% of ELV**

APPENDIX 4:
Assembly Shop RH Sampling, Analysis & Uncertainty Data

Company Name:	TS COVRAD Heat Transfer	Date:	29/01/14
Site Name:	Canley	Run:	Total Particulate Matter
Sampling Point Ref:	Assembly Shop Booth - RH		
Project Reference:	FTBS 29314		
		Stack Diamter (m)	0.80
Stack Static press.mm H_2O:	3.8	Stack Area (m2):	0.503

Traverse Point No.	Port A			Port B		
	Δ p, mm H_2O	Root Δ p	Stack Temp °C	Δ p, mm H_2O	Root Δ p	Stack Temp °C
1	4	2.000	13	4.2	2.049	13
2	4	2.000	13	4.2	2.049	13
3	4	2.000	13	4.2	2.049	13
4	4	2.000	13	4.2	2.049	13
Minimum	4.0	2.000	13	4.2	2.049	13
Maximum	4.0	2.000	13	4.2	2.049	13
Mean	**4.0**	**2.000**	**13.0**	**4.2**	**2.049**	**13.0**
Sum	16	8.000	52	16.8	8.198	52
Total Sum						

Max. pitot press. =	4.2
Min. pitot press. =	4.0
Ratio Max:Min =	1.1 :1

Gas Data

Oxygen %	21.0
CO_2 %	0.04
CO %	

Oxygen Correction

Required Correction Value	0
Actual Oxygen Factor	1
Enter 0 if correction is not required	0

BS EN 13284-1 & M1 Sample Point Requirements	Requirement Met?
Duct gas Flow: angle with regard to duct access <15°?	Y
Duct Gas Flow Negative Velocity: Not Permitted	Y
Duct Gas Flow: Ratio of max to min velocity <3:1?	y
Working Area > 5m²?	Y
Handrails with removable chains / self closing gates across the top of the ladder?	Y
Handrails (approx 0,5 and 1,0 m high) and vertical baseboards (approx 0,25m high)?	Y
Scaffold Built to 'Heavy Duty' Scafftag Rating or at least 2.5kN/m2 loading	Y
Handrails not restricting access to ports?	Y
Room opposite sampling port equal or greater than the length of the sampling probe plus 1 metre?	Y
Sufficient Power (Waterproof 110V BS4343 Standard) close or on the platform?	Y

For detailed stack geometry see Appendix 2

Company Name:	TS COVRAD Heat Transfer	In-stack Filter?	Y	Bar. Press.mm Hg	765.1	K Factor	5.14	Ambient Temp.	12	Leak Rate (fin / %)	0.2
Site Name:	Canley										
Sampling Point Ref:	Assembly Shop Booth - RH	Outstack Filter?	N	Cp	0.834	Dn used	6.86	Start Time	11:31	Leak Rate (start / %)	0.4
Date:	29/01/14										
Run:	Total Particulate Matter	Operators	IB CD	Bws%	1	Nozzle No.	FYS367-7	Stop Time	12:33	Probe setting	160 +/- 5 °C
Project Reference:	FTBS 29314										
						Meter Correction Yd	0.984				

Sample Filter Weights

	Reference	Laboratory	Increase, mg
Filter	103157	RPS	0.63
Probe Washings	20006565	RPS	0.6

Sample Filter Blank Weighings

	Reference	Laboratory	Increase, mg
Filter	104159	RPS	**0.04**
Probe Wash	20006559	RPS	**0.5**

Note: Results in Bold are reported at the L.O.D.

Impinger Weights

Weights	Initial	Final	Increase, g
Impinger 1	693.9	694	0.1
Impinger 2	725.9	726.2	0.3
Impinger 3	593.7	594	0.3
Impinger 4			
Impinger 5			
Silica Gel	873.8	887.7	13.9
		Total	14.6

Sample Point	Clock Time min	Pitot Δ p, mm H_2O	Stack Temp, °C	Orifice Δ H, mm H_2O		Gas Meter Reading m^3	Temp at Gas Meter Outlet °C	Condenser Temp, °C	Filter Box Temp °C	Probe Temp °C	Pump Vacuum Inches Hg	Impinger Stem Temp. °C	Root Δ p,
				Desired	Actual								
A1	0	4	14	20.56	20.6	1842	14	.	.	160	1.5	13	2.000
	5	4	14	20.56	20.6		15	.	.	160	1.5	14	2.000
	10	4	14	20.56	20.6		15	.	.	160	1.5	14	2.000
A2	15	4.2	14	21.588	21.6		15	.	.	160	2	14	2.049
	20	4.2	14	21.588	21.6		15	.	.	160	2	14	2.049
	25	4.2	14	21.588	21.6		16	.	.	160	2	15	2.049
Endpoint	30							.	.				
B1	0	4	14	20.56	20.6		16	.	.	160	2	15	2.000
	5	4	14	20.56	20.6		16	.	.	160	2	15	2.000
	10	4	14	20.56	20.6		17	.	.	160	2	15	2.000
B2	15	4.2	14	21.588	21.6		17	.	.	160	2	15	2.049
	20	4.2	14	21.588	21.6		18	.	.	160	2	16	2.049
	25	4.2	14	21.588	21.6		18	.	.	160	2	16	2.049
Endpoint	30					2762.4		.	.				
	60.00	**4.100**	**14.0**	**21.1**	**21.1**	**0.920**	**16.0**	**.**	**.**	**160.0**	**1.9**	**14.7**	**2.0**

Company Name: TS COVRAD Heat Transfer
Site Name: Canley
Project Reference: FTBS 29314

Date: 29/01/14

Sampling Point Ref:	**Assembly Shop Booth - RH**	**Total Particulate Matter**
Meter Volume Sampled, acm		0.920
Sample Run Start Time		11:31
Sample Run End Time		12:33
Total Actual Sampling Time, min		60.0
Barometric Pressure, mm Hg		765.10
Stack Pressure, mm Hg		765.38
Average Stack Temp, °C		14.0
Meter Volume at Wet STP, scm		0.881
Stack Moisture Content, %		2.1
Average Stack Velocity, m/sec		6.757
Stack Flow Rate, scms wet, STP		3.252
Nozzle Diameter, mm		6.86
% Isokinetic Variation		**102.1**
Total Mass of Particulate, mg		1.2
Percentage of Total Particulate Collected on Filter		51.2
Stack Particulate Concentration, mg/m^3		**1.4**
Particulate Mass rate, kg/hour		0.016
Emission Limit value mg/m3		**50**

Sample Train Blank Results	
Sample Blank Particulate Concentration, mg/m^3	0.6
Total Weight Gain, mg (Sample Train Blank)	0.5
Blank Result Less than 10% of Limit Value	Y

Uncertainty Calculation for Total Particulate Matter to BS EN 13284-1

Determined Concentration	1.4	mg/m3 (at Reference Cond)

Measured Values

Sampled Volume	0.9204	m^3
Sampled gas Temperature	289	k
Sampled gas Pressure	102.05	kPa
Sampled gas Humidity	2.06557548	% by volume
Oxygen content	21	% by volume
Mass	1.23	mg

Leak	0.05	%
Uncollected Mass	0	mg

Standard Uncertainties for Measured Values

Sampled Volume	0.001	m3
Sampled gas Temperature	2	k
Sampled gas Pressure	1	kPa
Sampled gas Humidity	1	% by volume
Oxygen content	21	% by volume
Mass	0.14152385	mg

Uncertainty Calculation for Volume Correction

Volume Correction Factor	0.932		
	Sensitivity Coefficient		**Uncertainty, Uv**
Sampled gas Temperature	0.0032		0.0064
Sampled gas Pressure	0.0091		0.0091
Sampled gas Humidity	0.0095		0.0095
		Sqrt (Uv)^2	0.0147
		Total Uv	**0.014**

Uncertainty Calculation for Oxygen Correction

Oxygen Correction Factor	1.0000		
	Sensitivity Coefficient		**Uncertainty, Uo**
Oxygen Measurement	N/A		N/A
		Total Uo	**N/A**

Uncertainty Contributions (Itemised)

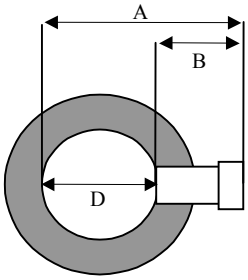
	Value		Sensitivity coefficient	Uncertainty Contribution			
				Concentration		%	
Volume Correction	0.863	m3	1.62	0.02	$mg.m^{-3}$	1.57	%
Mass (weighing)	1.23	mg	1.14	0.16	$mg.m^{-3}$	11.51	%
Oxygen Correction	N/A		0.00	0.00	$mg.m^{-3}$	0.00	%
System Leak	0.00	$mg.m^{-3}$	1.00	0.00	$mg.m^{-3}$	0.03	%
Uncollected Mass	0.00	mg	1.14	0.00	$mg.m^{-3}$	0.00	%
			Total Uncertainty	**0.16**	$mg.m^{-3}$		

Uncertainty Result (Uncertainty has been expanded with a coveragefactor of 2 (K=2))

Expanded Uncertainty =	**0.32**	$mg.m^{-3}$
=>	**23.23**	**% of Result**
=>	**0.00**	**% of ELV**

APPENDIX 5:
Industrial Spray Booth 1 LH Sampling, Analysis & Uncertainty Data

Diagrams of Industrial Spray Booth 1 Stacks



Access in front of ports adequate for each stack.

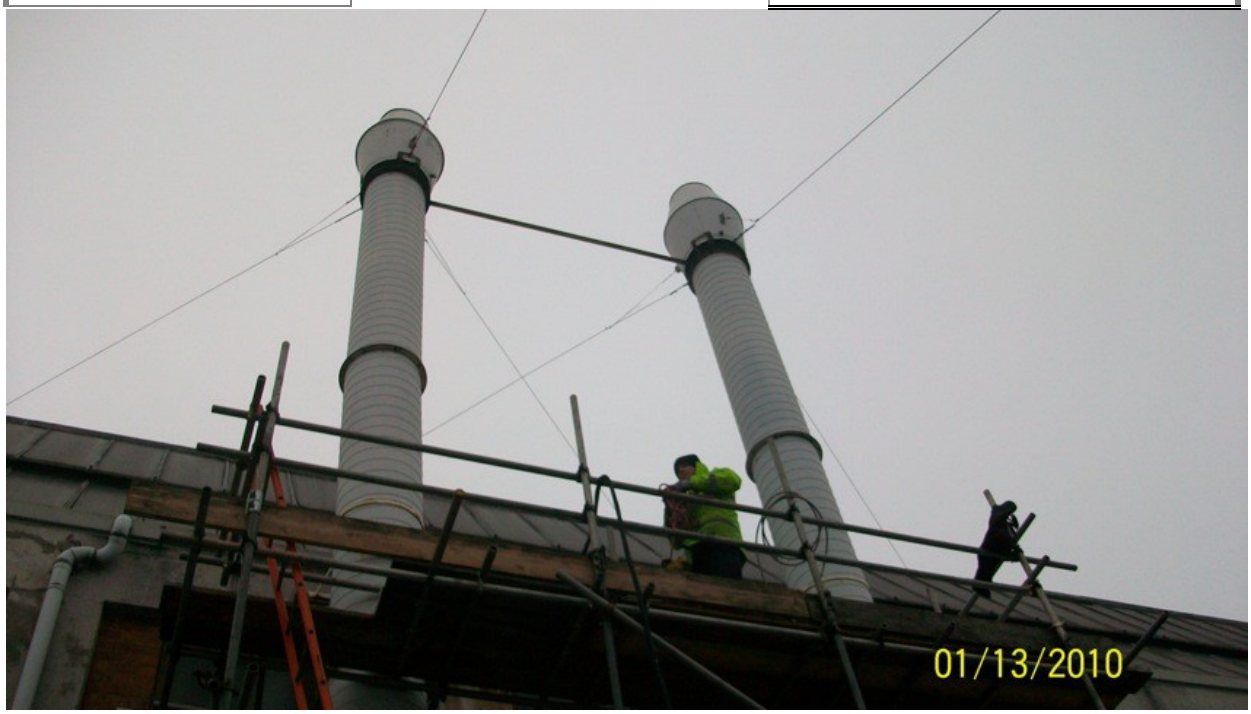
Each stack has 2 x sample ports correctly located.

Platform width approx 2m

A = 0.68m

B = 0.09m

D = 0.59m



Each of the stacks are identical with common temporary platform access shown.

Company Name:	TS COVRAD Heat Transfer	Date:	27/01/14
Site Name:	Canley	Run:	Total Particulate Matter
Sampling Point Ref:	Ind Spray Booth 1 - LH		
Project Reference:	FTBS 29314		

		Stack Diamter (m)	0.59
Stack Static press.mm H_2O:	2	Stack Area (m2):	0.273

Traverse Point No.	Port A			Port B		
	Δ p, mm H_2O	Root Δ p	Stack Temp °C	Δ p, mm H_2O	Root Δ p	Stack Temp °C
1	14.6	3.821	19	12.4	3.521	19
2	14.8	3.847	19	12.6	3.550	19
3	14.8	3.847	19	12.4	3.521	19
4	15	3.873	19	12.2	3.493	19
Minimum	14.6	3.821	19	12.2	3.493	19
Maximum	15.0	3.873	19	12.6	3.550	19
Mean	**14.8**	**3.847**	**19.0**	**12.4**	**3.521**	**19.0**
Sum	59.2	15.388	76	49.6	14.085	76
Total Sum						

Max. pitot press. =	15.0
Min. pitot press. =	12.2
Ratio Max:Min =	1.2 :1

Gas Data

Oxygen %	21.0
CO_2 %	0.04
CO %	

Oxygen Correction

Required Correction Value	0
Actual Oxygen Factor	1
Enter 0 if correction is not required	0

BS EN 13284-1 & M1 Sample Point Requirements	Requirement Met?
Duct gas Flow: angle with regard to duct access <15°?	Y
Duct Gas Flow Negative Velocity: Not Permitted	Y
Duct Gas Flow: Ratio of max to min velocity <3:1?	Y
Working Area > 5m²?	Y
Handrails with removable chains / self closing gates across the top of the ladder?	Y
Handrails (approx 0,5 and 1,0 m high) and vertical baseboards (approx 0,25m high)?	Y
Scaffold Built to 'Heavy Duty' Scafftag Rating or at least 2.5kN/m2 loading	Y
Handrails not restricting access to ports?	Y
Room opposite sampling port equal or greater than the length of the sampling probe plus 1 metre?	Y
Sufficient Power (Waterproof 110V BS4343 Standard) close or on the platform?	Y

Company Name:	TS COVRAD Heat Transfer	In-stack Filter?	Y	Bar. Press.mm Hg	765.10	K Factor	5.12	Ambient Temp.	2	Leak Rate (fin / %)	0.5
Site Name:	Canley										
Sampling Point Ref:	Ind Spray Booth 1 - LH	Outstack Filter?	N	Cp	0.834	Dn used	6.86	Start Time	13:40	Leak Rate (start / %)	0.5
Date:	27/01/14										
Run:	Total Particulate Matte	Operators	IB CD	Bws%	1	Nozzle No.	FYS367-7	Stop Time	14:42	Probe setting	160 +/- 5 °C
Project Reference:	FTBS 29314										
						Meter Correction Yd	0.984				

Sample Filter Weights

	Reference	Laboratory	Increase, mg
Filter	103156	RPS	0.77
Probe Washings	20006558	RPS	0.7

Sample Filter Blank Weighings

	Reference	Laboratory	Increase, mg
Filter	103170	RPS	**0.04**
Probe Wash	20006556	RPS	**0.5**

Note: Results in Bold are reported at the L.O.D.

Impinger Weights

Weights	Initial	Final	Increase, g
Impinger 1	709.8	710	0.2
Impinger 2	729.2	729.9	0.7
Impinger 3	592.2	594.2	2.0
Impinger 4			
Impinger 5			
Silica Gel	899.6	911.9	12.3
		Total	15.2

Sample Point	Clock Time min	Pitot Δ p, mm H_2O	Stack Temp, °C	Orifice Δ H, mm H_2O		Gas Meter Reading m^3	Temp at Gas Meter Outlet °C	Condenser Temp, °C	Filter Box Temp °C	Probe Temp °C	Pump Vacuum Inches Hg	Impinger Stem Temp. °C	Root Δ p,
				Desired	Actual								
A1	0	14.6	19	74.752	74.8	6228	6	.	.	160	4	6	3.821
	5	14.6	19	74.752	74.8		7	.	.	160	4	7	3.821
	10	14.6	19	74.752	74.8		8	.	.	160	4	7	3.821
A2	15	15	19	76.8	76.8		8	.	.	160	4.5	8	3.873
	20	15	19	76.8	76.8		9	.	.	160	4.5	8	3.873
	25	15	19	76.8	76.8		9	.	.	160	4.5	9	3.873
Endpoint	30							.	.				
B1	0	12.4	19	63.488	63.6		9	.	.	160	4	8	3.521
	5	12.4	19	63.488	63.6		10	.	.	160	4	9	3.521
	10	12.4	19	63.488	63.6		10	.	.	160	4	10	3.521
B2	15	12.6	19	64.512	64.6		10	.	.	160	4.5	11	3.550
	20	12.6	19	64.512	64.6		10	.	.	160	4.5	11	3.550
	25	12.6	19	64.512	64.6		11	.	.	160	4.5	12	3.550
Endpoint	30					7881		.	.				
	60.00	**13.650**	**19.0**	**69.9**	**70.0**	**1.653**	**8.9**	**.**	**.**	**160.0**	**4.3**	**8.8**	**3.7**

Company Name: TS COVRAD Heat Transfer
Site Name: Canley
Project Reference: FTBS 29314
Date: 27/01/14

Sampling Point Re Ind Spray Booth 1 - LH	Total Particulate Matter
Meter Volume Sampled, acm	1.653
Sample Run Start Time	13:40
Sample Run End Time	14:42
Total Actual Sampling Time, min	60.0
Barometric Pressure, mm Hg	765.10
Stack Pressure, mm Hg	765.25
Average Stack Temp, °C	19.0
Meter Volume at Wet STP, scm	1.614
Stack Moisture Content, %	1.2
Average Stack Velocity, m/sec	12.406
Stack Flow Rate, scms wet, STP	3.191
Nozzle Diameter, mm	6.86
% Isokinetic Variation	**103.7**
Total Mass of Particulate, mg	1.5
Percentage of Total Particulate Collected on Filter	52.4
Stack Particulate Concentration, mg/m^3	**0.9**
Particulate Mass rate, kg/hour	0.010
Emission Limit value mg/m3	**50**

Sample Train Blank Results	
Sample Blank Particulate Concentration, mg/m^3	0.3
Total Weight Gain, mg (Sample Train Blank)	0.5
Blank Result Less than 10% of Limit Value	Y

Uncertainty Calculation for Total Particulate Matter to BS EN 13284-1

Determined Concentration	0.9	mg/m3 (at Reference Cond)

Measured Values

Sampled Volume	1.653	m^3
Sampled gas Temperature	281.9166667	k
Sampled gas Pressure	102.03	kPa
Sampled gas Humidity	0	% by volume
Oxygen content	21	% by volume
Mass	1.47	mg

Leak	0.05	%
Uncollected Mass	0	mg

Standard Uncertainties for Measured Values

Sampled Volume	0.001	m3
Sampled gas Temperature	2	k
Sampled gas Pressure	1	kPa
Sampled gas Humidity	1	% by volume
Oxygen content	0.1	% by volume
Mass	0.14152385	mg

Uncertainty Calculation for Volume Correction

Volume Correction Factor	0.975		
	Sensitivity Coefficient		**Uncertainty, Uv**
Sampled gas Temperature	0.0035		0.0069
Sampled gas Pressure	0.0096		0.0096
Sampled gas Humidity	0.0098		0.0098
		Sqrt (Uv)^2	0.0153
		Total Uv	**0.025**

Uncertainty Calculation for Oxygen Correction

Oxygen Correction Factor	1.0000		
	Sensitivity Coefficient		**Uncertainty, Uo**
Oxygen Measurement	N/A		N/A
		Total Uo	**N/A**

Uncertainty Contributions (Itemised)

	Value		Sensitivity coefficient	Uncertainty Contribution			
				Concentration		%	
Volume Correction	1.595	m3	0.57	0.01	$mg.m^{-3}$	1.59	%
Mass (weighing)	1.47	mg	0.62	0.09	$mg.m^{-3}$	9.63	%
Oxygen Correction	N/A		0.00	0.00	$mg.m^{-3}$	0.00	%
System Leak	0.00	$mg.m^{-3}$	1.00	0.00	$mg.m^{-3}$	0.03	%
Uncollected Mass	0.00	mg	0.62	0.00	$mg.m^{-3}$	0.00	%
			Total Uncertainty	**0.09**	$mg.m^{-3}$		

Uncertainty Result (Uncertainty has been expanded with a coveragefactor of 2 (K=2))

Expanded Uncertainty =	**0.18**	$mg.m^{-3}$
=>	**19.52**	**% of Result**
=>	**0.00**	**% of ELV**

APPENDIX 6:
Industrial Spray Booth 1 RH Sampling, Analysis & Uncertainty Data

Company Name:	TS COVRAD Heat Transfer	Date:	27/01/14
Site Name:	Canley	Run:	Total Particulate Matter
Sampling Point Ref:	Ind Spray Booth 1 - RH		
Project Reference:	FTBS 29314		
		Stack Diamter (m)	0.59
Stack Static press.mm H_2O:	1.2	Stack Area (m2):	0.273

Traverse Point No.	Port A			Port B		
	Δ p, mm H_2O	Root Δ p	Stack Temp °C	Δ p, mm H_2O	Root Δ p	Stack Temp °C
1	9	3.000	17	11	3.317	17
2	9	3.000	17	11	3.317	17
3	9.4	3.066	17	11.8	3.435	17
4	9.4	3.066	17	11.8	3.435	17
Minimum	9.0	3.000	17	11.0	3.317	17
Maximum	9.4	3.066	17	11.8	3.435	17
Mean	**9.2**	**3.033**	**17.0**	**11.4**	**3.376**	**17.0**
Sum	36.8	12.132	68	45.6	13.503	68
Total Sum						

Max. pitot press. =	11.8
Min. pitot press. =	9.0
Ratio Max:Min =	1.3 :1

Gas Data

Oxygen %	21.0
CO_2 %	0.04
CO %	

Oxygen Correction

Required Correction Value	0
Actual Oxygen Factor	1
Enter 0 if correction is not required	0

BS EN 13284-1 & M1 Sample Point Requirements	Requirement Met?
Duct gas Flow: angle with regard to duct access <15°?	Y
Duct Gas Flow Negative Velocity: Not Permitted	Y
Duct Gas Flow: Ratio of max to min velocity <3:1?	Y
Working Area > 5m²?	Y
Handrails with removable chains / self closing gates across the top of the ladder?	Y
Handrails (approx 0,5 and 1,0 m high) and vertical baseboards (approx 0,25m high)?	Y
Scaffold Built to 'Heavy Duty' Scafftag Rating or at least 2.5kN/m2 loading	Y
Handrails not restricting access to ports?	Y
Room opposite sampling port equal or greater than the length of the sampling probe plus 1 metre?	Y
Sufficient Power (Waterproof 110V BS4343 Standard) close or on the platform?	Y

For detailed stack geometry see Appendix 5

Company Name:	TS COVRAD Heat Transfer	In-stack Filter?	Y	Bar. Press.mm Hg	765.1	K Factor	5.12	Ambient Temp.	2	Leak Rate (fin / %)	0.5
Site Name:	Canley										
Sampling Point Ref:	Spray Booth 1 - F	Outstack Filter?	N	Cp	0.834	Dn used	6.86	Start Time	11:25	Leak Rate (start / %)	0.5
Date:	27/01/14										
Run:	tal Particulate Mat	Operators	IB CD	Bws%	1	Nozzle No.	FYS367-7	Stop Time	12:27	Probe setting	160 +/- 5 °C
Project Reference:	FTBS 29314										
						Meter Correction Yd	0.984				

Sample Filter Weights

	Reference	Laboratory	Increase, mg
Filter	103173	RPS	2.3
Probe Washings	20006557	RPS	0.9

Sample Filter Blank Weighings

	Reference	Laboratory	Increase, mg
Filter	103170	RPS	**0.04**
Probe Wash	20006556	RPS	**0.5**

Note: Results in Bold are reported at the L.O.D.

Impinger Weights

Weights	Initial	Final	Increase, g
Impinger 1	709.6	709.8	0.2
Impinger 2	728.4	729.2	0.8
Impinger 3	591.2	592.2	1.0
Impinger 4			
Impinger 5			
Silica Gel	890	899.6	9.6
		Total	11.6

Sample Point	Clock Time min	Pitot Δ p, mm H_2O	Stack Temp, °C	Orifice Δ H, mm H_2O		Gas Meter Reading m^3	Temp at Gas Meter Outlet °C	Condenser Temp, °C	Filter Box Temp °C	Probe Temp °C	Pump Vacuum Inches Hg	Impinger Stem Temp. °C	Root Δ p,
				Desired	Actual								
A1	0	11	15	56.32	56.4	4754.5	2	.	.	160	3.5	2	3.317
	5	11	16	56.32	56.4		3	.	.	160	3.5	2	3.317
	10	11	16	56.32	56.4		4	.	.	160	3.5	3	3.317
A2	15	11.8	16	60.416	60.4		5	.	.	160	4	3	3.435
	20	11.8	16	60.416	60.4		5	.	.	160	4	3	3.435
	25	11.8	16	60.416	60.4		6	.	.	160	4	4	3.435
Endpoint	30							.	.				
B1	0	9	15	46.08	46		7	.	.	160	3.5	3	3.000
	5	9	16	46.08	46		8	.	.	160	3.5	4	3.000
	10	9	16	46.08	46		8	.	.	160	3.5	4	3.000
B2	15	9.4	16	48.128	48		8	.	.	160	3.5	4	3.066
	20	9.4	16	48.128	48		9	.	.	160	3.5	5	3.066
	25	9.4	16	48.128	48		9	.	.	160	3.5	5	3.066
Endpoint	30					6220		.	.				
	60.00	**10.300**	**15.8**	**52.7**	**52.7**	**1.466**	**6.2**	**.**	**.**	**160.0**	**3.6**	**3.5**	**3.2**

Company Name: TS COVRAD Heat Transfer
Site Name: Canley
Project Reference: FTBS 29314
Date: 27/01/14

Sampling Point Re Ind Spray Booth 1 - RH	Total Particulate Matter
Meter Volume Sampled, acm	1.466
Sample Run Start Time	11:25
Sample Run End Time	12:27
Total Actual Sampling Time, min	60.0
Barometric Pressure, mm Hg	765.10
Stack Pressure, mm Hg	765.19
Average Stack Temp, °C	15.8
Meter Volume at Wet STP, scm	1.440
Stack Moisture Content, %	1.0
Average Stack Velocity, m/sec	10.708
Stack Flow Rate, scms wet, STP	2.784
Nozzle Diameter, mm	6.86
% Isokinetic Variation	**106.1**
Total Mass of Particulate, mg	3.2
Percentage of Total Particulate Collected on Filter	71.9
Stack Particulate Concentration, mg/m^3	**2.2**
Particulate Mass rate, kg/hour	0.022
Emission Limit value mg/m3	**50**

Sample Train Blank Results	
Sample Blank Particulate Concentration, mg/m^3	0.4
Total Weight Gain, mg (Sample Train Blank)	0.5
Blank Result Less than 10% of Limit Value	Y

Uncertainty Calculation for Total Particulate Matter to BS EN 13284-1

Determined Concentration	2.2	mg/m3 (at Reference Cond)

Measured Values

Sampled Volume	1.4655	m^3
Sampled gas Temperature	279.1666667	k
Sampled gas Pressure	102.02	kPa
Sampled gas Humidity	0	% by volume
Oxygen content	21	% by volume
Mass	3.2	mg

Leak	0.05	%
Uncollected Mass	0	mg

Standard Uncertainties for Measured Values

Sampled Volume	0.001	m3
Sampled gas Temperature	2	k
Sampled gas Pressure	1	kPa
Sampled gas Humidity	1	% by volume
Oxygen content	0.1	% by volume
Mass	0.14152385	mg

Uncertainty Calculation for Volume Correction

Volume Correction Factor	0.985		
	Sensitivity Coefficient		**Uncertainty, Uv**
Sampled gas Temperature	0.0035		0.0071
Sampled gas Pressure	0.0097		0.0097
Sampled gas Humidity	0.0098		0.0098
		Sqrt (Uv)^2	0.0155
		Total Uv	**0.023**

Uncertainty Calculation for Oxygen Correction

Oxygen Correction Factor	1.0000		
	Sensitivity Coefficient		**Uncertainty, Uo**
Oxygen Measurement	N/A		N/A
		Total Uo	**N/A**

Uncertainty Contributions (Itemised)

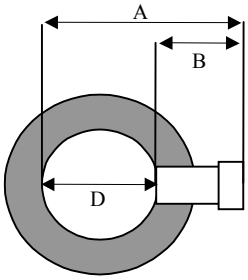
	Value		Sensitivity coefficient	Uncertainty Contribution			
				Concentration		%	
Volume Correction	1.426	m3	1.56	0.04	$mg.m^{-3}$	1.59	%
Mass (weighing)	3.20	mg	0.69	0.10	$mg.m^{-3}$	4.42	%
Oxygen Correction	N/A		0.00	0.00	$mg.m^{-3}$	0.00	%
System Leak	0.00	$mg.m^{-3}$	1.00	0.00	$mg.m^{-3}$	0.03	%
Uncollected Mass	0.00	mg	0.69	0.00	$mg.m^{-3}$	0.00	%
			Total Uncertainty	**0.10**	$mg.m^{-3}$		

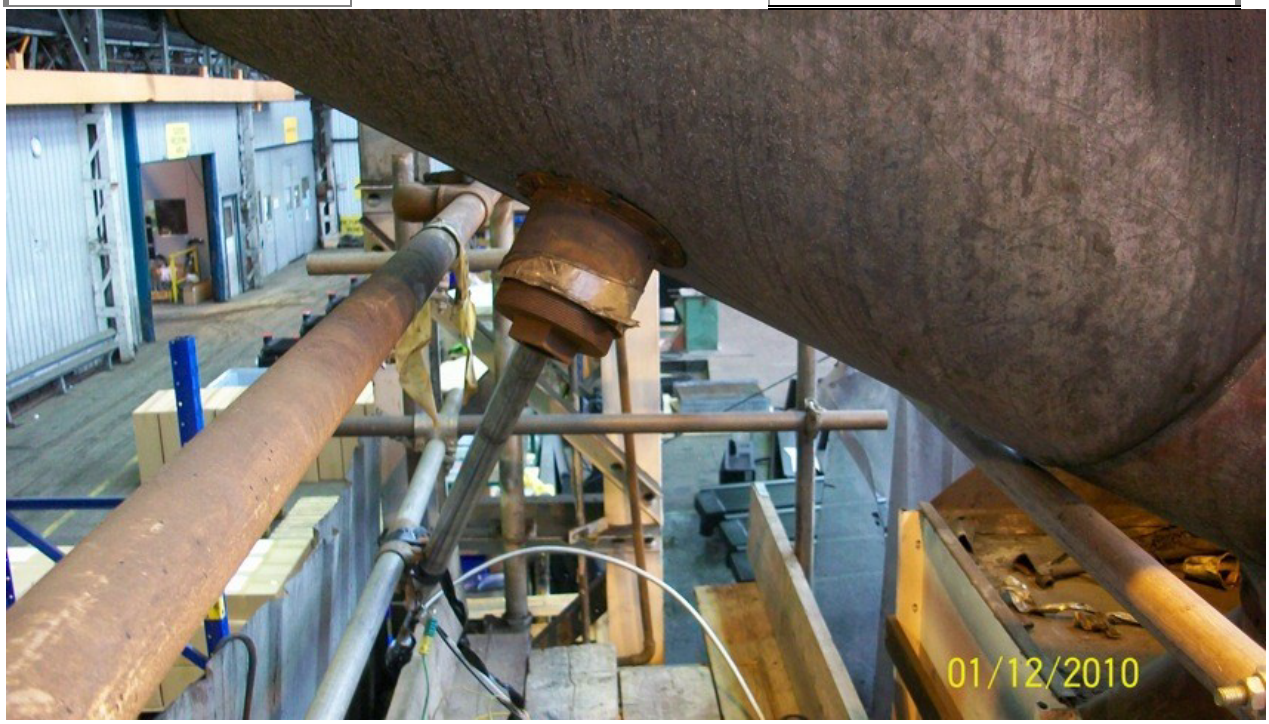
Uncertainty Result (Uncertainty has been expanded with a coveragefactor of 2 (K=2))

Expanded Uncertainty =	**0.21**	$mg.m^{-3}$
=>	**9.40**	**% of Result**
=>	**0.00**	**% of ELV**

APPENDIX 7:
Industrial Spray Booth 2 LH Sampling, Analysis & Uncertainty Data

Diagram of Industrial Spray Booth 2 LH stack

 D = A-B	Access in front of ports inadequate. Each stack has 2 x sample ports incorrectly located. Platform width approx 1.5m	**A = 0.69m** **B = 0.09m** **D = 0.60m**



Company Name:	TS COVRAD Heat Transfer	Date:	28/01/14
Site Name:	Canley	Run:	Total Particulate Matter
Sampling Point Ref:	Industrial Spray Booth 2 - LH		
Project Reference:	FTBS 29314		

Stack Diamter (m)	0.60		
Stack Static press.mm H_2O:	10.4	Stack Area (m2):	0.283

Traverse Point No.	Port A			Port B		
	Δ p, mm H_2O	Root Δ p	Stack Temp °C	Δ p, mm H_2O	Root Δ p	Stack Temp °C
1	11.4	3.376	15			
2	12	3.464	15		Port B	
3	6.2	2.490	15		scaffold	
4	5.8	2.408	15		obsrtuction	
Minimum	5.8	2.408	15			
Maximum	12.0	3.464	15			
Mean	**8.9**	**2.935**	**15.0**			
Sum	35.4	11.739	60			
Total Sum						

Max. pitot press. =	12.0
Min. pitot press. =	5.8
Ratio Max:Min =	2.1 :1

Gas Data

Oxygen %	21.0
CO_2 %	0.04
CO %	

Oxygen Correction

Required Correction Value	0
Actual Oxygen Factor	1
Enter 0 if correction is not required	0

BS EN 13284-1 & M1 Sample Point Requirements	Requirement Met?
Duct gas Flow: angle with regard to duct access <15°?	Y
Duct Gas Flow Negative Velocity: Not Permitted	Y
Duct Gas Flow: Ratio of max to min velocity <3:1?	y
Working Area > 5m²?	Y
Handrails with removable chains / self closing gates across the top of the ladder?	Y
Handrails (approx 0,5 and 1,0 m high) and vertical baseboards (approx 0,25m high)?	Y
Scaffold Built to 'Heavy Duty' Scafftag Rating or at least 2.5kN/m2 loading	Y
Handrails not restricting access to ports?	Y
Room opposite sampling port equal or greater than the length of the sampling probe plus 1 metre?	Y
Sufficient Power (Waterproof 110V BS4343 Standard) close or on the platform?	Y

Company Name:	TS COVRAD Heat Transfer	In-stack Filter?	Y	Bar. Press.mm Hg	766.6	K Factor	5.12	Ambient Temp.	16	Leak Rate (fin / %)	0.5
Site Name:	Canley										
Sampling Point Ref:	Industrial Spray Booth 2 - LH	Outstack Filter?	N	Cp	0.834	Dn used	6.86	Start Time	11:44	Leak Rate (start / %)	0.5
Date:	28/01/14										
Run:	Total Particulate Matter	Operators	IB CD	Bws%	1	Nozzle No.	FYS367-7	Stop Time	12:47	Probe setting	160 +/- 5 °C
Project Reference:	FTBS 29314										
						Meter Correction Yd	0.984				

Sample Filter Weights

	Reference	Laboratory	Increase, mg
Filter	103158	RPS	2.62
Probe Washings	20006561	RPS	1.9

Sample Filter Blank Weighings

	Reference	Laboratory	Increase, mg
Filter	104159	RPS	**0.04**
Probe Wash	20006559	RPS	**0.5**

Note: Results in Bold are reported at the L.O.D.

Impinger Weights

Weights	Initial	Final	Increase, g
Impinger 1	703.9	704.3	0.4
Impinger 2	728.8	730	1.2
Impinger 3	591	591.8	0.8
Impinger 4			
Impinger 5			
Silica Gel	921.3	929.5	8.2
		Total	10.6

Sample Point	Clock Time min	Pitot Δ p, mm H_2O	Stack Temp, °C	Orifice Δ H, mm H_2O		Gas Meter Reading m^3	Temp at Gas Meter Outlet °C	Condenser Temp, °C	Filter Box Temp °C	Probe Temp °C	Pump Vacuum Inches Hg	Impinger Stem Temp. °C	Root Δ p,
				Desired	Actual								
A1	0	11.4	15	58.368	58.4	28800	16	.	.	160	3.5	14	3.376
	5	11.4	15	58.368	58.4		17	.	.	160	3.5	14	3.376
	10	11.4	15	58.368	58.4		17	.	.	160	3.5	15	3.376
A2	15	12	15	61.44	61.4		18	.	.	160	4	15	3.464
	20	12	15	61.44	61.4		18	.	.	160	4	16	3.464
	25	12	15	61.44	61.4		19	.	.	160	4	16	3.464
Endpoint	30							.	.				
B1	0	6.2	15	31.744	31.8		18	.	.	160	3.5	16	2.490
	5	6.2	15	31.744	31.8		19	.	.	160	3.5	16	2.490
	10	6.2	15	31.744	31.8		20	.	.	160	3.5	16	2.490
B2	15	5.8	15	29.696	29.8		20	.	.	160	3.5	17	2.408
	20	5.8	15	29.696	29.8		21	.	.	160	3.5	17	2.408
	25	5.8	15	29.696	29.8		22	.	.	160	3.5	17	2.408
Endpoint	30					30088		.	.				
	60.00	**8.850**	**15.0**	**45.3**	**45.4**	**1.288**	**18.8**	**.**	**.**	**160.0**	**3.6**	**15.8**	**2.9**

Company Name: TS COVRAD Heat Transfer
Site Name: Canley
Project Reference: FTBS 29314
Date: 28/01/14

Sampling Point Re Industrial Spray Booth 2 - LH	Total Particulate Matter
Meter Volume Sampled, acm	1.288
Sample Run Start Time	11:44
Sample Run End Time	12:47
Total Actual Sampling Time, min	60.0
Barometric Pressure, mm Hg	766.56
Stack Pressure, mm Hg	767.33
Average Stack Temp, °C	15.0
Meter Volume at Wet STP, scm	1.214
Stack Moisture Content, %	1.1
Average Stack Velocity, m/sec	9.780
Stack Flow Rate, scms wet, STP	2.645
Nozzle Diameter, mm	6.86
% Isokinetic Variation	**97.3**
Total Mass of Particulate, mg	4.5
Percentage of Total Particulate Collected on Filter	58.0
Stack Particulate Concentration, mg/m^3	**3.7**
Particulate Mass rate, kg/hour	0.035
Emission Limit value mg/m3	**50**

Sample Train Blank Results	
Sample Blank Particulate Concentration, mg/m^3	0.4
Total Weight Gain, mg (Sample Train Blank)	0.5
Blank Result Less than 10% of Limit Value	Y

Uncertainty Calculation for Total Particulate Matter to BS EN 13284-1

Determined Concentration	3.7	mg/m3 (at Reference Cond)

Measured Values

Sampled Volume	1.288	m^3
Sampled gas Temperature	291.75	k
Sampled gas Pressure	102.31	kPa
Sampled gas Humidity	0	% by volume
Oxygen content	21	% by volume
Mass	4.52	mg

Leak	0.05	%
Uncollected Mass	0	mg

Standard Uncertainties for Measured Values

Sampled Volume	0.001	m3
Sampled gas Temperature	2	k
Sampled gas Pressure	1	kPa
Sampled gas Humidity	1	% by volume
Oxygen content	0.1	% by volume
Mass	0.14152385	mg

Uncertainty Calculation for Volume Correction

Volume Correction Factor	0.945		
	Sensitivity Coefficient		**Uncertainty, Uv**
Sampled gas Temperature	0.0032		0.0065
Sampled gas Pressure	0.0092		0.0092
Sampled gas Humidity	0.0095		0.0095
		Sqrt (Uv)^2	0.0147
		Total Uv	**0.019**

Uncertainty Calculation for Oxygen Correction

Oxygen Correction Factor	1.0000		
	Sensitivity Coefficient		**Uncertainty, Uo**
Oxygen Measurement	N/A		N/A
		Total Uo	**N/A**

Uncertainty Contributions (Itemised)

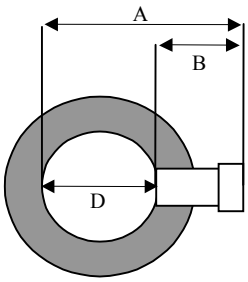
	Value		Sensitivity coefficient	Uncertainty Contribution			
				Concentration		%	
Volume Correction	1.201	m3	3.10	0.06	$mg.m^{-3}$	1.58	%
Mass (weighing)	4.52	mg	0.82	0.12	$mg.m^{-3}$	3.13	%
Oxygen Correction	N/A		0.00	0.00	$mg.m^{-3}$	0.00	%
System Leak	0.00	$mg.m^{-3}$	1.00	0.00	$mg.m^{-3}$	0.03	%
Uncollected Mass	0.00	mg	0.82	0.00	$mg.m^{-3}$	0.00	%
			Total Uncertainty	**0.13**	$mg.m^{-3}$		

Uncertainty Result (Uncertainty has been expanded with a coveragefactor of 2 (K=2))

Expanded Uncertainty =	**0.26**	$mg.m^{-3}$
=>	**7.02**	**% of Result**
=>	**0.00**	**% of ELV**

APPENDIX 8:
Industrial Spray Booth 2 RH Sampling, Analysis & Uncertainty Data

Diagram of Industrial Spray Booth 2 RH stack



Access in front of ports inadequate.

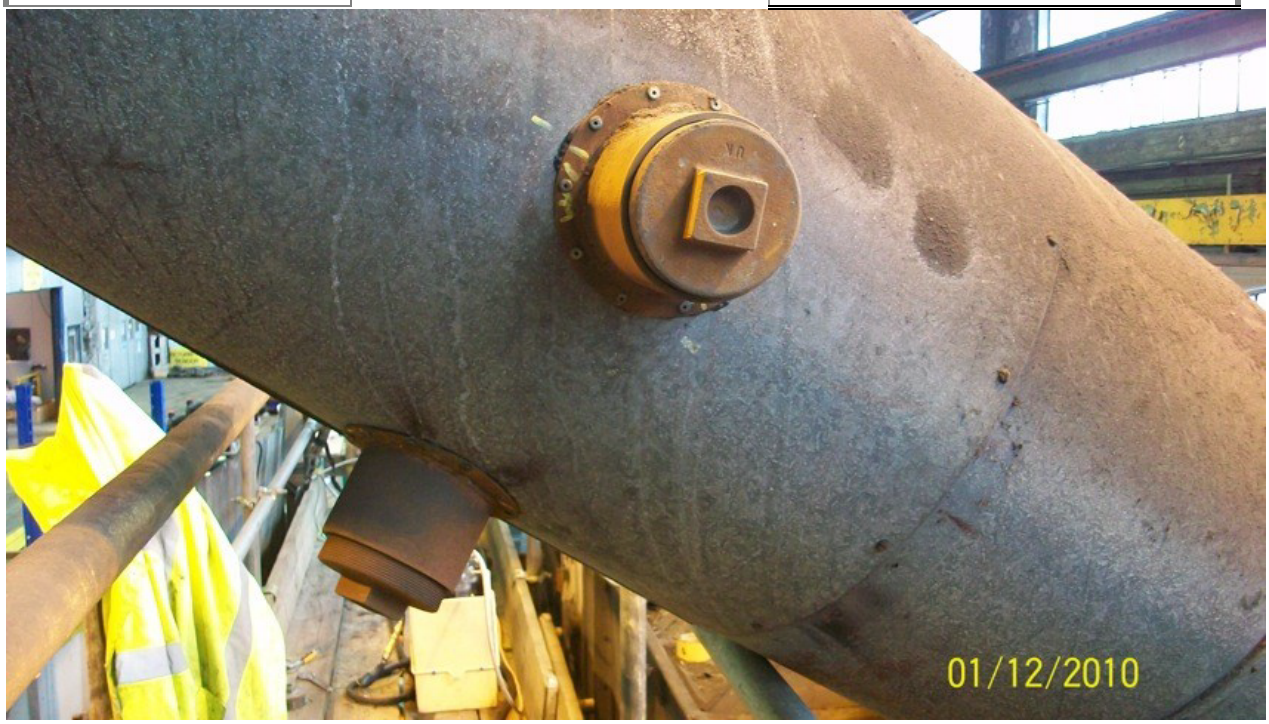
Each stack has 2 x sample ports incorrectly located.

Platform width approx 1.5m

A = 0.69m

B = 0.09m

D = 0.60m



Company Name:	TS COVRAD Heat Transfer	Date:	28/01/14
Site Name:	Canley	Run:	Total Particulate Matter
Sampling Point Ref:	Industrial Spray Booth 2 - RH		
Project Reference:	FTBS 29314		

Stack Static press.mm H_2O:	10	Stack Diamter (m)	0.60
		Stack Area (m2):	0.283

Traverse Point No.	Port A			Port B		
	Δ p, mm H_2O	Root Δ p	Stack Temp °C	Δ p, mm H_2O	Root Δ p	Stack Temp °C
1	3.5	1.871	14			
2	3.5	1.871	14		access	
3	4	2.000	14		obstructed	
4	4	2.000	14			
Minimum	3.5	1.871	14			
Maximum	4.0	2.000	14			
Mean	**3.8**	**1.935**	**14.0**			
Sum	15	7.742	56			
Total Sum						

Max. pitot press. =	4.0
Min. pitot press. =	3.5
Ratio Max:Min =	1.1 :1

Gas Data

Oxygen %	21.0
CO_2 %	0.04
CO %	

Oxygen Correction

Required Correction Value	0
Actual Oxygen Factor	1
Enter 0 if correction is not required	0

BS EN 13284-1 & M1 Sample Point Requirements	Requirement Met?
Duct gas Flow: angle with regard to duct access <15°?	Y
Duct Gas Flow Negative Velocity: Not Permitted	Y
Duct Gas Flow: Ratio of max to min velocity <3:1?	y
Working Area > 5m²?	Y
Handrails with removable chains / self closing gates across the top of the ladder?	Y
Handrails (approx 0,5 and 1,0 m high) and vertical baseboards (approx 0,25m high)?	Y
Scaffold Built to 'Heavy Duty' Scafftag Rating or at least 2.5kN/m2 loading	Y
Handrails not restricting access to ports?	Y
Room opposite sampling port equal or greater than the length of the sampling probe plus 1 metre?	Y
Sufficient Power (Waterproof 110V BS4343 Standard) close or on the platform?	Y

Company Name:	TS COVRAD Heat Transfer	In-stack Filter?	Y	Bar. Press.mm Hg	756.8	K Factor	5.13	Ambient Temp.	15	Leak Rate (fin / %)	0.2
Site Name:	Canley										
Sampling Point Ref:	Industrial Spray Booth 2 - RH	Outstack Filter?	N	Cp	0.834	Dn used	6.86	Start Time	10:26	Leak Rate (start / %)	0.4
Date:	28/01/14										
Run:	Total Particulate Matter	Operators	IB CD	Bws%	1	Nozzle No.	FYS367-7	Stop Time	11:29	Probe setting	160 +/- 5 °C
Project Reference:	FTBS 29314										
						Meter Correction Yd	0.984				

Sample Filter Weights

	Reference	Laboratory	Increase, mg
Filter	104160	RPS	4.37
Probe Washings	20006560	RPS	0.9

Sample Filter Blank Weighings

	Reference	Laboratory	Increase, mg
Filter	104159	RPS	**0.04**
Probe Wash	20006559	RPS	**0.5**

Note: Results in Bold are reported at the L.O.D.

Impinger Weights

Weights	Initial	Final	Increase, g
Impinger 1	703.7	703.9	0.2
Impinger 2	726	728.8	2.8
Impinger 3	590.1	591	0.9
Impinger 4			
Impinger 5			
Silica Gel	915.1	921.3	6.2
		Total	10.1

Sample Point	Clock Time min	Pitot Δ p, mm H_2O	Stack Temp, °C	Orifice Δ H, mm H_2O		Gas Meter Reading m^3	Temp at Gas Meter Outlet °C	Condenser Temp, °C	Filter Box Temp °C	Probe Temp °C	Pump Vacuum Inches Hg	Impinger Stem Temp. °C	Root Δ p,
				Desired	Actual								
A1	0	3.5	14	17.955	18	7896	12	.	.	160	2.5	13	1.871
	5	3.5	14	17.955	18		12	.	.	160	2.5	14	1.871
	10	3.5	14	17.955	18		13	.	.	160	2.5	15	1.871
A2	15	4	15	20.52	21		13	.	.	160	3	16	2.000
	20	4	15	20.52	21		13	.	.	160	3	16	2.000
	25	4	15	20.52	21		14	.	.	160	3	16	2.000
Endpoint	30							.	.				
B1	0	4	15	20.52	21		14	.	.	160	3	16	2.000
	5	4	15	20.52	21		15	.	.	160	3	17	2.000
	10	4	15	20.52	21		15	.	.	160	3	17	2.000
B2	15	4	15	20.52	21		15	.	.	160	3	17	2.000
	20	4	15	20.52	21		15	.	.	160	3	18	2.000
	25	4	15	20.52	21		16	.	.	160	3	18	2.000
Endpoint	30					8797		.	.				
	60.00	**3.875**	**14.8**	**19.9**	**20.3**	**0.901**	**13.9**	**.**	**.**	**160.0**	**2.9**	**16.1**	**2.0**

Company Name: TS COVRAD Heat Transfer
Site Name: Canley
Project Reference: FTBS 29314
Date: 28/01/14

Sampling Point Re Industrial Spray Booth 2 - RH	Total Particulate Matter
Meter Volume Sampled, acm	0.901
Sample Run Start Time	10:26
Sample Run End Time	11:29
Total Actual Sampling Time, min	60.0
Barometric Pressure, mm Hg	756.81
Stack Pressure, mm Hg	757.55
Average Stack Temp, °C	14.8
Meter Volume at Wet STP, scm	0.854
Stack Moisture Content, %	1.5
Average Stack Velocity, m/sec	6.602
Stack Flow Rate, scms wet, STP	1.764
Nozzle Diameter, mm	6.86
% Isokinetic Variation	**102.6**
Total Mass of Particulate, mg	5.3
Percentage of Total Particulate Collected on Filter	82.9
Stack Particulate Concentration, mg/m^3	**6.2**
Particulate Mass rate, kg/hour	0.039
Emission Limit value mg/m3	**50**

Sample Train Blank Results	
Sample Blank Particulate Concentration, mg/m^3	0.6
Total Weight Gain, mg (Sample Train Blank)	0.5
Blank Result Less than 10% of Limit Value	Y

Uncertainty Calculation for Total Particulate Matter to BS EN 13284-1

Determined Concentration	6.2	mg/m3 (at Reference Cond)

Measured Values

Sampled Volume	0.901	m^3
Sampled gas Temperature	286.9166667	k
Sampled gas Pressure	101.00	kPa
Sampled gas Humidity	0	% by volume
Oxygen content	21	% by volume
Mass	5.27	mg

Leak	0.05	%
Uncollected Mass	0	mg

Standard Uncertainties for Measured Values

Sampled Volume	0.001	m3
Sampled gas Temperature	2	k
Sampled gas Pressure	1	kPa
Sampled gas Humidity	1	% by volume
Oxygen content	0.1	% by volume
Mass	0.14152385	mg

Uncertainty Calculation for Volume Correction

Volume Correction Factor	0.949		
	Sensitivity Coefficient		**Uncertainty, Uv**
Sampled gas Temperature	0.0033		0.0066
Sampled gas Pressure	0.0094		0.0094
Sampled gas Humidity	0.0095		0.0095
		Sqrt (Uv)^2	0.0149
		Total Uv	**0.013**

Uncertainty Calculation for Oxygen Correction

Oxygen Correction Factor	1.0000		
	Sensitivity Coefficient		**Uncertainty, Uo**
Oxygen Measurement	N/A		N/A
		Total Uo	**N/A**

Uncertainty Contributions (Itemised)

	Value		Sensitivity coefficient	Uncertainty Contribution			
				Concentration		%	
Volume Correction	0.841	m3	7.34	0.10	$mg.m^{-3}$	1.60	%
Mass (weighing)	5.27	mg	1.17	0.17	$mg.m^{-3}$	2.69	%
Oxygen Correction	N/A		0.00	0.00	$mg.m^{-3}$	0.00	%
System Leak	0.00	$mg.m^{-3}$	1.00	0.00	$mg.m^{-3}$	0.03	%
Uncollected Mass	0.00	mg	1.17	0.00	$mg.m^{-3}$	0.00	%
			Total Uncertainty	**0.19**	$mg.m^{-3}$		

Uncertainty Result (Uncertainty has been expanded with a coveragefactor of 2 (K=2))

Expanded Uncertainty =	**0.39**	$mg.m^{-3}$
=>	**6.25**	**% of Result**
=>	**0.00**	**% of ELV**

APPENDIX 9:
Laboratory Data

RPS

UKAS TESTING 0605

Test Certificate

Date 07/02/2014

Client	RPS FM North Unit 1 Lowfields Business Park Old Power Way Elland West Yorkshire HX5 9DE	**Order No.**	FTBS 29314
		Certificate No.	WK14-0610
		Issue No.	1
Contact	Chris Davies	**Date Received**	31/01/2014
Description	10 filters & 10 solutions for TPM	**Technique**	Gravimetric Stack

Sample No.	**777543**	**103170**	**Method**
Total particulate matter	<0.04 mg		D9(U)
Sample No.	**777544**	**20006556**	**Method**
Total particulate matter	<0.5 mg		D9(U)
Sample No.	**777545**	**103173**	**Method**
Total particulate matter	2.30 mg		D9(U)
Sample No.	**777546**	**20006557**	**Method**
Total particulate matter	0.9 mg		D9(U)
Sample No.	**777547**	**103156**	**Method**
Total particulate matter	0.77 mg		D9(U)
Sample No.	**777548**	**20006558**	**Method**
Total particulate matter	0.7 mg		D9(U)
Sample No.	**777549**	**104159**	**Method**
Total particulate matter	<0.04 mg		D9(U)
Sample No.	**777550**	**20006559**	**Method**
Total particulate matter	<0.5 mg		D9(U)

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UKAS TESTING 0605

Date 07/02/2014

Test Certificate

Client	RPS FM North		Certificate No.	WK14-0610
			Issue No.	1
Sample No.	777551	104160		Method
Total particulate matter		4.37 mg		D9(U)
Sample No.	777552	20006560		Method
Total particulate matter		0.9 mg		D9(U)
Sample No.	777553	103158		Method
Total particulate matter		2.62 mg		D9(U)
Sample No.	777554	20006561		Method
Total particulate matter		1.9 mg		D9(U)
Sample No.	777555	104152		Method
Total particulate matter		0.08 mg		D9(U)
Sample No.	777556	20006562		Method
Total particulate matter		1.5 mg		D9(U)
Sample No.	777557	101486		Method
Total particulate matter		<0.04 mg		D9(U)
Sample No.	777558	20006563		Method
Total particulate matter		<0.5 mg		D9(U)
Sample No.	777559	104151		Method
Total particulate matter		<0.04 mg		D9(U)
Sample No.	777560	20006564		Method
Total particulate matter		<0.5 mg		D9(U)
Sample No.	777561	103157		Method
Total particulate matter		0.63 mg		D9(U)

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UKAS TESTING
0605

Date 07/02/2014

Test Certificate

Client	RPS FM North		**Certificate No.**	**WK14-0610**
			Issue No.	1
Sample No.	**777562**	**20006565**		**Method**
Total particulate matter	0.6 mg			D9(U)

Tested By Kirstie Davenport Date 05/02/2014
07/02/2014

Approved By Date 07/02/2014

Joanne Dewhurst
Laboratory Manager

For and on authority of RPS Laboratories Ltd.

Method Symbols (U) Analysis is UKAS Accredited
(N) Analysis is not UKAS Accredited

Concentration values (mg/m3 and ppm) are calculated on the basis of information provided by the customer.
Results stated as ml are refering to the sample volume.

RPS Laboratories terms and conditions apply - a copy is available on request.
Analysis carried out on samples 'as received'

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End of Report