Element Materials Technology, Unit 3, Wednesbury One, Black Country New Road, Wednesbury, WS10 7NZ
Your Element Contact: James Eldridge (07826 916 684)
E: james.eldridge@element.com

Stack Emissions Testing Report Commissioned by
VIP Polymers Ltd

Installation Name & Address
VIP Polymers Ltd
15 Windover Road
Huntingdon
Cambridgeshire
PE29 7EB

PPC Permit: B11/94

Stack Reference
Stack 27 - The Cooling Booth on Desma 16

Dates of the Monitoring Campaign
12th February 2020

Job Reference Number
EST-5466

Report Written by
Harpreet Badwal Team Leader MCERTS Level 2 MM 03 149 TE1 TE2 TE3 TE4

Report Approved by
Brian Jacob Assistant Operations Manager MCERTS Level 2 MM 06 693 TE1 TE2 TE3 TE4

Report Date
27th February 2020

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

MONITORING OBJECTIVES

VIP Polymers Ltd, Huntingdon
Stack 27 - The Cooling Booth on Desma 16
12th February 2020

Overall Aim of the Monitoring Campaign

Element were commissioned by VIP Polymers Ltd to carry out stack emissions testing on the Stack 27 - The Cooling Booth on Desma 16 at Huntingdon.

The aim of the monitoring campaign was to demonstrate compliance with a set of emission limit values (ELVs) as specified in the Site's Permit.

Special Requirements

There were no special requirements.

Target Parameters

Total Particulate Matter, Total VOCs (as Carbon)

MONITORING RESULTS

VIP Polymers Ltd, Huntingdon
Stack 27 - The Cooling Booth on Desma 16
12th February 2020

where MU = Measurement Uncertainty associated with the Result

	Concentration				Mass Emission			
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Units**	**Result**	**MU +/-**	**Limit**
Total Particulate Matter [1]	mg/m³	1.1	2.4	10	g/hr	1.3	2.9	-
Total VOCs (as Carbon) [1]	mg/m³	17.1	0.57	-	g/hr	25.6	1.8	-
Water Vapour	% v/v	0.31	0.06					
Stack Gas Temperature	°C	10.0						
Stack Gas Velocity	m/s	5.4	0.23					
Volumetric Flow Rate (ACTUAL)	m³/hr	1553	96.7					
Volumetric Flow Rate (REF) [1]	m³/hr	1500	93.4					

NOTE: VOLUMETRIC FLOW RATE & VELOCITY DATA TAKEN FROM THE PRELIMINARY VELOCITY TRAVERSE.

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

MONITORING DATE(S) & TIMES

VIP Polymers Ltd, Huntingdon
Stack 27 - The Cooling Booth on Desma 16
12th February 2020

Parameter		Units	Concentration	Units	Mass Emission	Sampling Date(s)	Sampling Times	Duration mins
Total Particulate Matter	R1	mg/m³	1.1	g/hr	1.3	12/02/2020	15:50 - 16:30	40
Total VOCs (as Carbon)	R1	mg/m³	17.1	g/hr	25.6	12/02/2020	15:50 - 16:30	40
Velocity Traverse	R1					12/02/2020	15:33 - 15:43	

All results are expressed at the respective reference conditions.

PROCESS DETAILS

VIP Polymers Ltd, Huntingdon
Stack 27 - The Cooling Booth on Desma 16
12th February 2020

Standard Operating Conditions

Parameter	Value
Process Status	Plant Operational
Capacity (of 100%) and Tonnes / Hour	Normal Operation
Continuous or Batch Process	Continuous
Feedstock (if applicable)	Rubber Products
Abatement System	None
Abatement System Running Status	N/A
Fuel	N/A
Plume Appearance	None Visible

MONITORING & ANALYTICAL METHODS

VIP Polymers Ltd, Huntingdon
Stack 27 - The Cooling Booth on Desma 16
12th February 2020

	Monitoring				Analysis					
Parameter	**Standard**	**Technical Procedure**	**Sampling Accreditation**	**Testing Lab**	**Analytical Procedure**	**Analytical Technique**	**Analysis Accreditation**	**Analysis Lab**	**Overall Accreditation**	**LOD (Average)**
Total Particulate Matter	EN 13284-1	CAT-TP-01	MCERTS	EET	CAT-TP-03	Gravimetric	MCERTS	EET	MCERTS	0.32 mg/m³
Water Vapour	EN 14790	CAT-TP-05	MCERTS	EET	CAT-TP-05	Gravimetric	MCERTS	EET	MCERTS	0.1 % v/v
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20	MCERTS	EET	Flame Ionisation Detection by Sick 3006 FID				MCERTS	0.32 mg/m³
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	CAT-TP-41	MCERTS	EET	Pitot Tube and Thermocouple				MCERTS	1.2 m/s

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Element Stockport (EET)	ISO 17025 Accreditation Number: 4279

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Total Particulate Matter	1	It is a requirement of MID 13284-1, V2.4 for the overall weighing uncertainty to be less than 5% of the ELV, unless the ELV is <5mg/m³ where a 1 hour sample is deemed to be sufficient.

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.32
Width	m	-
Area	m^2	0.08
Port Depth	cm	9
Orientation of Duct	-	Vertical
Number of Ports	-	1
Sample Port Size	-	4" BSP

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	On Roof
Inside / Outside	Outside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	N/A
Platform has vertical base boards (approx. 0.25m high)	N/A
Platform has chains / self closing gates at top of ladders	N/A
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Sampling Plane Validation Criteria (from EN 15259)

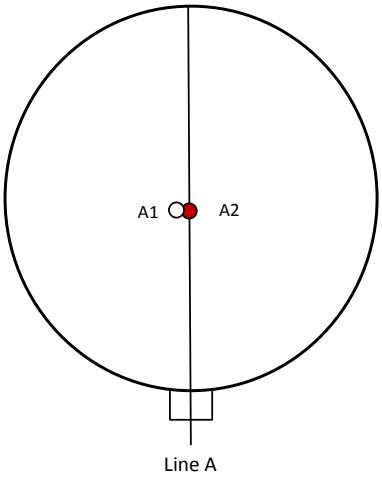
Criteria in EN 15259	Units	Traverse 1	Required	Compliant
Lowest Differential Pressure	Pa	22.7	> 5 Pa	Yes
Mean Velocity	m/s	5.36	-	-
Lowest Gas Velocity	m/s	4.97	-	-
Highest Gas Velocity	m/s	5.75	-	-
Ratio of Above	: 1	1.16	< 3 : 1	Yes
Maximum Angle of Swirl	°	0.00	< 15°	Yes
No Local Negative Flow	-	Yes	-	Yes

PLANT PHOTOS

Photo 1

Photo 2

SAMPLE POINTS



where
- ○ = isokinetic point sampled at
- ● = isokinetic point not sampled at
- ● = combustion gases sample point
- ● = non-isokinetic sample point

APPENDIX CONTENTS

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Harpreet Badwal	MCERTS Level 2	MM 03 149	TE1 TE2 TE3 TE4
Team Leader	Lee Heaton	MCERTS Level 2	MM 17 1433	TE1

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	CAT 7.67
Control Box DGM (2)	-
Box Thermocouples (1)	CAT 3.164
Box Thermocouples (2)	-
Umbilical (1)	CAT 3.146
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	CAT 5.126
Heated Probe (2)	CAT 5.127
Heated Probe (3)	CAT 5.128
S-Pitot (1)	CAT 21S.57
S-Pitot (2)	CAT 21P.110
L-Pitot	-
Site Balance	CAT 17.33
500g / 1Kg Check Weights	CAT 17.33 a & b
Last Impinger Arm	-
Callipers	CAT 23.40
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-350E	-
Horiba PG-250	-
Servomex 5200 MP	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
Ankersmid APS 313	CAT 4.847
Gasmet DX4000	-
Gasmet Sampling System	-
Bernath 3006 FID	CAT 8.31
M&C PSS	CAT 12.107
Mass Flow Controller (1)	CAT 6.61
Mass Flow Controller (2)	CAT 6.62
Mass View (1)	-
Mass View (2)	-
Hioki 5043 (V)	CAT 11.69
Easylogger EN-EL-12 Bit	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	CAT 3.142
Digital Manometer (2)	CAT 3.144
Digital Temperature Meter	-
Stopwatch	CAT 14.84
Barometer	CAT 13.40
Stack Thermocouple (1)	CAT 4.1277
Stack Thermocouple (2)	CAT 4.1281
Stack Thermocouple (3)	CAT 4.0123
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	CAT 20.116
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	CAT 20.116
Laboratory Balance	CAT 1.18, 1.18a, 1.18b
Tape Measure	CAT 16.45

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Total Particulate Matter	EN 13284-1	CAT-TP-01
Water Vapour	EN 14790	CAT-TP-05
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20
Velocity & Vol. Flow Rate	EN 16911-1 (MID)	CAT-TP-41

PRELIMINARY STACK SURVEY: CALCULATIONS

General Stack Details

Stack Details (from Traverse)	Units	Value
Stack Diameter / Depth, D	m	0.32
Stack Width, W	m	-
Stack Area, A	m^2	0.08
Average Stack Gas Temperature, T_a	°C	10.0
Average Stack Gas Pressure	Pa	26.6
Average Stack Static Pressure, P_{static}	kPa	0.017
Average Barometric Pressure, P_b	kPa	101.4
Average Pitot Tube Calibration Coefficient, C_p	-	0.82

Stack Gas Composition & Molecular Weights

Component	Conc ppm	Conc Dry % v/v	Conc Wet % v/v	Volume Fraction r	Molar Mass M	Density kg/m³ p	Conc kg/m³ p_i
CO_2 (Estimated)	-	0.06	0.06	0.0006	44.01	1.9635	0.00118
O_2 (Estimated)	-	20.80	20.74	0.2080	32.00	1.4277	0.29696
N_2	-	79.14	78.90	0.7914	28.01	1.2498	0.98913
Moisture (H_2O)	-	-	0.31	0.0031	18.02	0.8037	0.00247

Where: $p = M / 22.41$

$p_i = r \times p$

Calculation of Stack Gas Densities

Determinand	Units	Result
Dry Density (STP), P_{STD}	kg/m³	1.287
Wet Density (STP), P_{STW}	kg/m³	1.286
Dry Density (Actual), P_{Actual}	kg/m³	1.243
Average Wet Density (Actual), $P_{ActualW}$	kg/m³	1.242

Where: P_{STD} = sum of component concentrations, kg/m³ (not including water vapour)

P_{STW} = sum of all wet concentrations / 100 x density, kg/m³ (including water vapour)

$P_{Actual} = P_{STD} \times (T_{STP} / (P_{STP})) \times ((P_{static} + P_b) / T_a)$

$P_{ActualW}$ (at each sampling point) $= P_{STW} \times (T_s / P_s) \times (P_a / T_a)$

Calculation of Stack Gas Volumetric Flowrate, Q

Duct gas flow conditions	Units	Actual	REF [1]
Temperature	°C	10.0	0.0
Total Pressure	kPa	101.4	101.3
Moisture	%	0.31	0.31

Gas Volumetric Flowrate (from Traverse)	Units	Result
Gas Volumetric Flowrate (Actual)	m³/hr	1553
Gas Volumetric Flowrate (STP, Wet)	m³/hr	1500
Gas Volumetric Flowrate (STP, Dry)	m³/hr	1495
Gas Volumetric Flowrate REF [1]	m³/hr	1500

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID)

(1 of 1)

Parameter	Units	Value
Date of Survey	-	12/02/2020
Time of Survey	-	15:33 - 15:43
Atmospheric Pressure	kPa	101.4
Average Stack Static Pressure	Pa	17
Result of Pitot Stagnation Test	-	Pass
Are Water Droplets Present?	-	No
Device Used	S-Type Pitot with KIMO MP 210 (500Pa)	

Parameter	Units	Value
Initial Pitot Leak Check	-	Pass
Final Pitot Leak Check	-	Pass
Orientation of Duct	-	Vertical
Pitot Tube, C_p	-	0.82
Number of Lines Available	-	1
Number of Lines Used	-	1

Sampling Line A

Traverse Point	Depth m	ΔP Pa	Temp °C	Wet Density kg/m³	Velocity m/s	Swirl °
STATIC (Units: Pa)		*16.8*				
Mean		**26.6**	**10.0**	**1.242**	**5.36**	
1	0.05	22.7	10.0	1.242	4.97	0.0
2	0.27	30.4	10.0	1.242	5.75	0.0

PRELIMINARY STACK SURVEY: VELOCITY TRAVERSE TO EN 16911-1 (MID) - MEASUREMENT UNCERTAINTY

(1 of 1)

Performance characteristics (Uncertainty Components)	Uncertainty	Value	Units
Standard Uncertainty on the coefficient of the Pitot Tube	u(k)	0.005	-
Standard Uncertainty associated with the mean local dynamic pressures	u(Δpi)	1.084	Pa
- Resolution	u(res)	0.00087	
- Calibration	u(cal)	0.073	
- Drift	u(drift)	0.083	
- Lack of Fit	u(fit)	0.017	
- Overall corrections to dynamic measurements	u(Cf)	0.174	
Standard uncertainty associated with the molar mass of the gas	u(M)	0.00003	-
- $\varphi O_2,w$	-	20.736	
- $\varphi CO_2,w$	-	0.060	
- Oxygen, dry	u(ϕO_2,d)	0.637	
- Carbon Dioxide, dry	u(ϕCO_2,d)	0.002	
- Water Vapour	u(ϕH_2O)	0.016	
- Oxygen, wet	u(ϕO_2,w)	0.635	
- Carbon Dioxide, wet	u(ϕCO_2,w)	0.002	
Standard uncertainty associated with the stack temperature	u(Tc)	1.444	K
Standard uncertainty associated with the absolute pressure in the duct	u(pc)	175.695	Pa
- Atmospheric Pressure	u(patm)	175.692	
- Static Pressure	u(pstat)	1.084	
Standard uncertainty associated with the density in the duct	u(ρ)	0.00669	-
Standard uncertainty associated with the local velocities	u(vi)	0.141	Pa
Standard uncertainty associated with the mean velocity	u(v)	0.117	m/s
Standard uncertainty associated with the mean velocity (95% Confidence)	Uc(v)	0.229	m/s
Standard uncertainty associated with the mean velocity (95% Confidence), relative	Uc,rel(v)	4.27	%
Standard uncertainty associated with the volume flow rate (95% Confidence)	Uc(qV,w)	96.7	m^3/hr
- $u^2(a)/a^2$	-	0.00053	
- $u^2(qV,w)/q^2V,w$	-	0.00101	
- $u^2(qV,w)$	-	2433	
- $u(qV,w)$	-	49.3	
Standard uncertainty associated with the volume flow rate (95% Confidence), relative	Uc,rel(qV,w)	6.22	%

TOTAL PARTICULATE MATTER: RESULTS SUMMARY

VIP Polymers Ltd, Huntingdon
Stack 27 - The Cooling Booth on Desma 16

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	1.1		1.1
Uncertainty	±mg/m³	2.4		2.4
Mass Emission	g/hr	1.3		1.3
Uncertainty	±g/hr	2.9		2.9

NOTE: Where the maximum Blank concentration is higher than the Sample concentration, the maximum Blank concentration has been reported.

Parameter	Units	Run 1		Mean
Water Vapour	% v/v	0.31		0.31
Uncertainty	±% v/v	0.06		0.06

Blank Runs

Parameter	Units	Blank 1		Maximum
Concentration	mg/m³	1.10		1.10

General Sampling Information

Parameter	Value	
Standard	EN 13284-1	
Technical Procedure	CAT-TP-01	
Probe Material	Titanium	
Filter Housing Material	Titanium	
Positioning of Filter	In Stack	
Filter Size and Material	47mm Glass Fibre	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1 & A2	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL PARTICULATE MATTER: ISOKINETIC SAMPLING CALCULATIONS

Test	Units	Run 1
Absolute pressure of stack gas, P_s		
Barometric pressure, P_b	mmHg	760.6
Stack static pressure, P_{static}	mmH_2O	1.7
$P_s = (P_b + (P_{static} / 13.6)$	mmHg	760.7
Volume of water vapour collected, V_{wstd}		
Total mass collected in impingers (liquid trap)	g	-2.1
Total mass collected in impingers (silica trap)	g	4.1
Total mass of liquid collected, V_{lc}	g	2.0
$V_{wstd} = (0.001246)(V_{lc})$	m^3	0.0025
Volume of gas metered dry, V_{mstd}		
Volume of gas sample through gas meter, V_m	m^3	0.8560
Gas meter correction factor, Y_d	-	0.9900
Average dry gas meter temperature, T_m	°C	14.4
Average pressure drop across orifice, ΔH	mmH_2O	47.2
$V_{mstd} = ((0.3592)(V_m)(P_b + (\Delta H/13.6))(Y_d)) / (T_m + 273)$	m^3	0.8093
Moisture content, B_{wo} & R_{wv}		
$B_{wo} = V_{wstd} / (V_{mstd} + V_{wstd})$	m^3	0.0031
B_{wo} as a percentage	% v/v	0.31
Reported Water Vapour, checked with Tables in EN 14790, Rwv	% v/v	0.31
Volume of gas metered wet, V_{mstw}		
$V_{mstw} = (V_{mstd})(100/(100 - R_{wv}))$	m^3	0.8118
Volume of gas metered at Oxygen Reference Conditions, $V_{mstd@X\%O_2}$ & $V_{mstw@X\%O_2}$		
IED & Incinerates Hazardous Material? (Yes = no positive O_2 correction)	-	No
% wet oxygen measured in gas stream, $ACT\%O_{2w}$	% v/v	N/A
% dry oxygen measured in gas stream, $ACT\%O_{2d}$	% v/v	N/A
% oxygen reference condition, $REF\%O_2$	% v/v	N/A
O_2 Reference Factor wet $(O_{2REFw}) = (21 - REF\%O_2) / (21 - ACT\%O_{2w})$	-	N/A
O_2 Reference Factor dry $(O_{2REFd}) = (21 - REF\%O_2) / (21 - ACT\%O_{2d})$	-	N/A
$V_{mstw@X\%oxygen} = (V_{mstw}) / (O_{2REFw})$	m^3	N/A
$V_{mstd@X\%oxygen} = (V_{mstd}) / (O_{2REFd})$	m^3	N/A
Molecular weight of dry gas stream, M_d		
CO_2 (Estimated)	% v/v	0.06
O_2 (Estimated)	% v/v	20.80
Total	% v/v	20.86
N_2	% v/v	79.14
$M_d = 0.44(\%CO_2)+0.32(\%O_2)+0.28(\%N_2)$	g/gmol	28.84
Molecular weight of stack gas (wet), M_s		
$M_s = M_d(1 - (R_{wv}/100)) + 18(R_{wv}/100)$	g/gmol	28.81
Velocity of stack gas, V_s		
Pitot tube velocity constant, K_p	-	34.97
Velocity pressure coefficient, C_p	-	0.84
Average of velocity heads, ΔP_{avg}	mmH_2O	1.65
Average square root of velocity heads, √ΔP	$\sqrt{mmH_2O}$	1.28
Average stack gas temperature, T_s	°C	10.0
$V_s = ((K_p)(C_p)(\sqrt{\Delta P})(\sqrt{T_s} + 273)) / (\sqrt{(M_s)(P_s)})$	m/s	4.30
Total flow of stack gas: Actual (Q_a), Wet (Q_{stw}), Dry (Q_{std}), Wet@O_{2REF} (Q_{stwO_2}), Dry@O_{2REF} (Q_{stdO_2})		
Area of stack, A_s	m^2	0.08
$Q_a = (60)(A_s)(V_s)$	m^3/min	20.7
Conversion factor (K/mm.Hg), C_f	-	0.3592
$Q_{stw} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273)$	m^3/min	20.0
$Q_{std} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273)$	m^3/min	20.0
$Q_{stwO_2} = ((Q_a)(P_s)(C_f)) / ((T_s) + 273) / (O_{2REFw})$	m^3/min	N/A
$Q_{stdO_2} = ((Q_a)(P_s)(C_f)(1 - (R_{wv}/100))) / ((T_s) + 273) / (O_{2REFd})$	m^3/min	N/A
Percent isokinetic, %I		
Nozzle diameter, D_n	mm	10.01
Nozzle area, A_n	mm^2	78.76
Total sampling time, q	min	40
$\%I = (4.6398E^6)(T_s+273)(V_{mstd}) / (P_s)(V_s)(A_n)(q)(1 - (R_{wv}/100))$	%	103.5

TOTAL PARTICULATE MATTER: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	15:50 - 16:30
Sampling Dates	-	12/02/2020
Sampling Device	-	ISO
Volume Sampled (REF)	m^3	0.8118
Filter I.D. Number	-	47-66462
Start Filter Mass	g	0.14820
End Filter Mass	g	0.14856
Total Mass on Filter	g	0.00036
Probe Rinse I.D. Number	-	PR-47-66462
Start Probe Rinse Mass	g	2.97728
End Probe Rinse Mass	g	2.97769
Total Mass in Probe Rinse	g	0.00040
Total Mass Collected	mg	0.76
Calculated Concentration	mg/m^3	0.94
Balance Uncertainty / LOD	mg/m^3	0.32

Where: ISO stands for Manual Isokinetic Sampling Train

Blank Runs

Parameter	Units	Blank 1
Blank Dates	-	12/02/2020
Average Volume Sampled (REF)	m^3	0.8118
Filter I.D. Number	-	47-66461
Start Filter Mass	g	0.14987
End Filter Mass	g	0.15058
Total Mass on Filter	g	0.00071
Probe Rinse I.D. Number	-	PR-47-66461
Start Probe Rinse Mass	g	2.84944
End Probe Rinse Mass	g	2.84962
Total Mass in Probe Rinse	g	0.00018
Total Mass Collected	mg	0.89
Calculated Concentration	mg/m^3	1.10
Balance Uncertainty / LOD	mg/m^3	0.32

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	21.2
Pre-Sampling Leak Rate	l/min	0.05
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.60
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

MU (Concurrent Water Vapour)	Units	Run 1
Measurement Uncertainty (MU)	%	19.2
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel (Concurrent Water Vapour)	Units	Run 1
Less than 50% Faded	%	Yes

Isokinetic Criterion Compliance	Units	Run 1
Isokinetic Variation	%	103.5
Allowable Isokinetic Range	%	95 - 115
Isokineticity Acceptable	-	Yes

Weighing Uncertainty Criteria	Units	Run 1
Overall Weighing Uncertainty	± mg	0.49
Overall Weighing Uncertainty	± mg/m³	0.60
ELV [Daily ELV for IED]	mg/m³	10.00
Allowable Weighing Uncertainty	mg/m³	0.50
Weighing Uncertainty Acceptable	-	No

Filter Temperatures	Units	Run 1
Pre-Conditioning Temperature	°C	180
Post-Conditioning Temperature	°C	160
Maximum Filter Temperature	°C	10

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL PARTICULATE MATTER: QUALITY ASSURANCE

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	30.0
Pre-Sampling Leak Rate	l/min	0.05
Post-Sampling Leak Rate	l/min	
Allowable Leak Rate	l/min	0.60
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1
Allowable Blank	mg/m^3	1.0
Blank Acceptable	-	No

Acetone / Water Rinse Blank	Units	Blank
Acetone / Water Rinse Value	mg/l	2.7
Allowable Blank	mg/l	10
Blank Acceptable	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run, wx = deviation also applies to the concurrent water vapour run)	Run Number 1	
It is a requirement of MID 13284-1, V2.4 for the overall weighing uncertainty to be less than 5% of the ELV, unless the ELV is <5mg/m^3 where a 1 hour sample is deemed to be sufficient.	wx	

TOTAL PARTICULATE MATTER: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (Actual)	V_m	0.8560	uV_m	m^3	0.0171
Sampled Gas Temperature	T_m	287.4	uT_m	K	2.0
Sampled Gas Pressure	ρ_m	101.4	$u\rho_m$	kPa	0.5
Sampled Gas Humidity	H_m	0.0	uH_m	% v/v	1.0
Leak	L	0.24	uL	%	-
Mass of Particulate	m	0.76	um	mg	0.26
Uncollected Mass	UCM	0.89	uUCM	mg	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (Actual)	%	2.00	≤2%
Sampled Gas Temperature	%	0.70	≤1%
Sampled Gas Pressure	%	0.49	≤1%
Sampled Gas Humidity	%	1.00	≤1%
Leak	%	0.24	≤2%
Mass of Particulate	%	3.75	<5% of ELV
Uncollected Mass	%	-	-

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	0.8093	1.36
Leak	L	mg/m^3	0.001	1.00
Mass of Particulate	L_r	mg	0.763	1.44
Uncollected Mass	UCM	mg	0.52	1.44

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.027
Leak	mg/m^3	0.0015
Mass of Particulate	mg/m^3	0.3748
Uncollected Mass	mg/m^3	0.7435

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.83
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	1.63
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	2.45
Reported Uncertainty	mg/m^3	2.45
Expanded uncertainty (95% confidence), without Oxygen Correction	%	148.4
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	222.6
Reported Uncertainty	%	222.6

TOTAL VOCs (as CARBON): RESULTS SUMMARY

VIP Polymers Ltd, Huntingdon
Stack 27 - The Cooling Booth on Desma 16

Sample Runs

Parameter	Units	Run 1		Mean
Concentration	mg/m³	17.1		17.1
Uncertainty	±mg/m³	0.57		0.57
Mass Emission	g/hr	25.6		25.6
Uncertainty	±g/hr	1.8		1.8

General Sampling Information

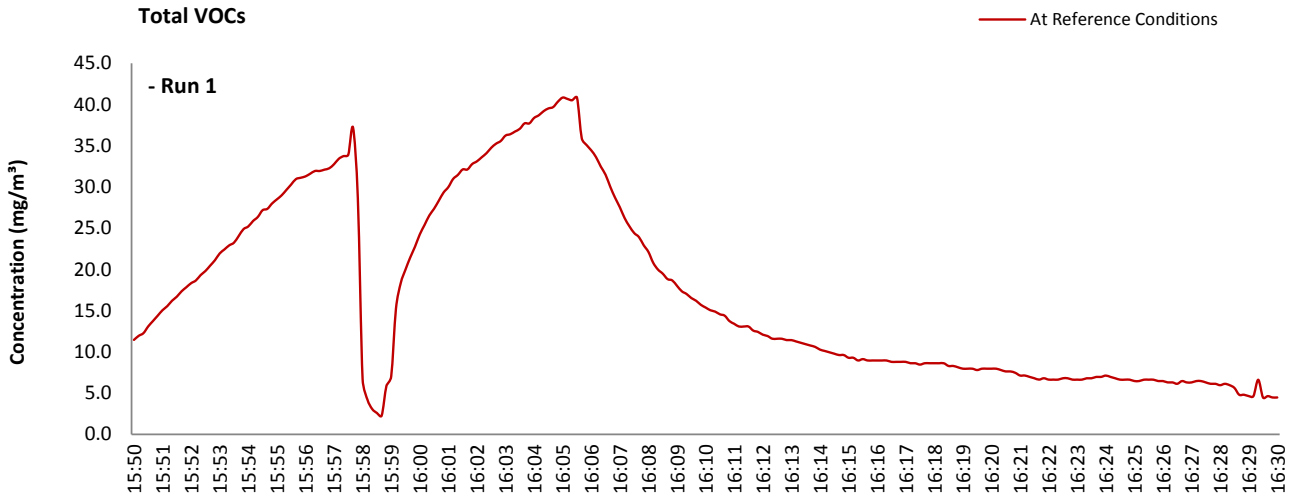
Parameter	Value	
Standard	EN 12619:2013	
Technical Procedure	CAT-TP-20	
Probe Material	Stainless Steel	
Filtration Type / Size	0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Propane In Synthetic Air (5 Grade)	
Span Gas Reference Number	CYL 1.0335a	
Span Gas Expiry Date	21/08/2023	
Span Gas Start Pressure (bar)	140	
Gas Cylinder Concentration (ppm)	79.9	
Span Gas Set Point (ppm)	79.90	
Span Gas Uncertainty (%)	N/A	
Zero Gas Type	Synthetic Air (5 Grade)	
Number of Sampling Lines Used	1/1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1/1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A3	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL VOCs (as CARBON): DATA TREND

Graphical Trend of Data



TOTAL VOCs (as CARBON): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	15:50 - 16:30
Sampling Dates	-	12 02 20
Instrument Range	ppm	100
Span Gas Value	ppm	79.9

Quality Assurance

	Zero Drift	Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	ppm	0.00
	Zero Down Sampling Line (Post)	ppm	0.30
	Zero Drift	ppm	0.30
	Allowable Zero Drift	± ppm	4.00
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	ppm	80.00
	Span Down Sampling Line (Post)	ppm	77.90
	Span Drift	ppm	-2.10
	Allowable Span Drift	± ppm	4.00
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	5 - 12

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
There are no deviations associated with the sampling employed.	x	

TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	-		mg/m³ (REF)
TGN M2 Allowable MU	15.0		%
Measured concentration	17.13		mg/m³ (STP, dry)
Range Used	100.0		ppm
Range Used [A]	160.6		mg/m³
Cal gas conc.	79.9		ppm
Conversion	1.61		ppm to mg/m³
MCERTS Range [B]	15.0		mg/m³
Lower of [A] or [B]	15.0		mg/m³
Cal gas conc.	128.3		mg/m³

Performance characteristics	RUN 1		Units
Response time	45		seconds
Number of readings in measurement	40		-
Repeatability at zero	2.00		% full scale
Repeatability at span level	0.00		% full scale
Deviation from linearity	0.11		% of value
Zero drift	0.38		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	1.60		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	1.40		% full scale/10K
Combined interference	0.45		% range
Dependence on voltage	0.50		% full scale/10V
Losses in the line (leak)	0.00		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.00		mg/m³
Lack of fit	0.01		mg/m³
Drift	0.00		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.01		mg/m³
Ambient temperature dependence	0.20		mg/m³
Combined interference (from MCERTS Certificate)	0.04		mg/m³
Dependence on voltage	0.06		mg/m³
Losses in the line (leak)	0.00		mg/m³
Uncertainty of calibration gas	0.20		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	17.13		mg/m³
Combined uncertainty			0.29		mg/m³
Expanded uncertainty	k =	1.96	0.58		mg/m³
Uncertainty corrected to std conds. (O_2)			0.58		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	3.37		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	N/A		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**N/A**		-

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 15% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components). Ref EA TGN M2.