



Davies & Co. (Environmental) Ltd
Emissions Monitoring Specialists

EMISSIONS MONITORING TEST REPORT

CANLEY GARDEN CREMATORIUM
Cannon Hill Road
Coventry
CV4 7DF

18th – 20th July 2016

Report Authorised by



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1. INTRODUCTION

The four cremators and associated flue gas treatment systems at Canley Garden Crematorium were monitored between the 18th to 20th July 2016 to the requirements given in Process Guidance Note PG5/2 (2012) for emission releases to atmosphere for abated plant.

The work involved monitoring a range of flue gas components with the plant operating normally.

The plant comprises Nos.1, 2 & 3 Cremators that are designated as the model FTII, and No.4 Cremator that is the model type FTIII. The two cremator types are similar other than the FTIII having a wider hearth capable of accepting larger coffin sizes. Each cremator is fitted with two nozzle mix burners utilising natural gas as the support fuel.

Cremators 1 & 2 share a combined flue gas treatment system designated as Stream 1, with an identical arrangement for Cremators 3 & 4 designated as Stream 2.

The waste gases from the two cremators combine, and are ducted to a common flue gas treatment plant. The treatment plant comprises a shell and tube boiler to cool the flue gases, a reagent feeder station that introduces a blend of activated carbon/sodium bicarbonate to react with the cooled gases, and a bag filter to clean the treated gases. The waste heat from the boiler in the form of warm water is dissipated to atmosphere via a finned tube air blast cooler situated outside the crematory.

The plant operates under full microprocessor based automatic control that requires little manual intervention.

The cremator and flue gas clean up system were manufactured, installed and commissioned by Facultatieve Technologies Limited to meet the requirements of the Environmental Permitting (England and Wales) Regulations 2010 – (EPR 2010) as relevant to cremators, summarised in the Secretary of State's Process Guidance Note PG 5/2 (2012).

The flue ducting and test points were in accordance with the requirements of EA TGN M1.

Measurements were undertaken to enable comparisons to be made of the operation of the cremator and associated flue gas treatment system with the requirements of the Guidance Note in terms of emission releases to air.

This report details the monitoring procedures used and the results obtained from this test work along with comparisons with the Guidance Note requirements and comments where appropriate.

Relevant procedures were followed to enable quality control to be maintained throughout the test preparation, site test work, laboratory analysis, calculations and reporting.

2. PROCEDURES

2.1 Total Particulate Matter

A flue gas sample was extracted and filtered to collect total particulate matter. A Whatman QM-A filter paper was used with a particle retention of not less than 99.5% at a particle size of 0.3 micron. The flue gas extraction employed techniques given in BS EN 13284 Part 1.

The sampling was conducted using apparatus in accordance with the requirements of BS EN 13284 Part 1.

This consisted of a heated known dimension Pyrex glass nozzle, heated Pyrex glass probe liner, heated Pyrex glass filter housing with Titanium filter support containing quartz microfibre filter (all heaters set to 160°C), PTFE sample line, dreschel absorption bottles, gas dryer (silica gel), sample line to pump, pump, gas meter, rotameter, pitot and impulse lines, electronic manometer, type K thermocouple, balance (for gravimetric moisture) and datalogger. Settings tables were pre-prepared to enable isokinetic flow to be maintained (based on online measurements of flue gas velocity and temperature to correct the sampling rate).

Particulate matter analysis was carried out by weighing the filter and probe rinse collection on a calibrated balance, with the media being dried and weighed prior to and following the test.

Testing was conducted using centre point sampling given that the duct diameter is 350mm.

The tests reported herein were conducted to prove the performance of the cremators relative to PG5/2(2012).

2.2 Hydrogen Chloride

A flue gas sample was extracted and filtered.

A Whatman QM-A filter paper was used with a particle retention of not less than 99.5% at a particle size of 0.3 micron. The flue gas extraction employed techniques given in BS EN 13284 Part 1

The gas sample was then passed through an absorption medium of de-ionised water to collect hydrogen chloride.

The method employed was BS EN 1911 Parts 1-3.

Laboratory analysis for hydrogen chloride was carried out on the absorption medium using Ion Chromatography (IC).

2.3 Mercury

A flue gas sample was extracted and filtered to collect solid phase mercury.

A Whatman QM-A filter paper was used with a particle retention of not less than 99.5% at a particle size of 0.3 micron. The flue gas extraction employed techniques given in BS EN 13284 Part 1.

The gas sample was then passed through an absorption medium of acidified potassium dichromate to collect vapour phase mercury.

The method employed was BS EN 13211.

Laboratory analysis for solid and vapour phase mercury was carried out on the filter and absorption medium using Inductively Coupled Plasma (ICP-OES) Spectrophotometry.

2.4 Carbon Monoxide

A flue gas sample was continuously extracted, filtered and dried before being passed through a pre-calibrated Siemens Ultramat 23/O₂ infrared analyser for the on-line measurement of carbon monoxide. The analyser has a fixed range of 0-1250 mg/Nm³ and was zeroed with air and calibrated with a nominal 800 ppmv carbon monoxide in balance nitrogen gas.

The method employed was BS EN 15058.

The analyser output was continuously recorded using a Grant 'Squirrel' data logger.

For these tests a relatively high range analyser was used due to the typical pattern of carbon monoxide concentration emissions from cremators being very low (often indicated as zero) for most of the cycle, but with occasional, high, short duration spikes of CO being emitted. The convention since non-continuous emissions monitoring became a mandatory requirement for cremators during 1990, has been to attempt to monitor the magnitude of spikes, as these are often the main contributor to total CO emissions. If the mean one minute emission of CO was say 200 mg/Nm³, it would be expected that the peak concentration during that one minute averaging period would be considerably higher than this. It follows that utilising a lower range analyser would frequently understate CO emissions, despite increasing sensitivity at low CO concentrations.

2.5 Volatile Organic Compounds

A flue gas sample was continuously extracted and filtered before being passed via a heated line through a pre-calibrated Signal 3030PM Flame Ionisation Detection (FID) analyser for the on-line measurement of volatile organic compounds. The analyser was ranged 0-100 ppmv total hydrocarbons and was calibrated using a certified reference gas prior to, and following each test.

zeroed with air passed through a catalytic converter and calibrated with a nominal 50 ppmv propane in balance air gas prior to, and following each test.

The method employed was BS EN 12619.

The analyser output was continuously recorded using a Grant 'Squirrel' data logger.

Similar comments apply to VOC's as CO, in that the analyser scaling is set to quantify the peaks that are the nature of the emission.

2.6 Oxygen

A flue gas sample was continuously extracted from the same position in the flue as the other pollutants extraction, filtered and dried before being passed through a pre-calibrated Siemens Ultramat 23/O₂ electrochemical cell analyser for the on-line measurement of flue oxygen.

The method employed was BS EN 14789.

The analyser was calibrated using a certified reference gas prior to, and following each test.

The output of the analyser was continuously recorded using a Grant 'Squirrel' data logger.

2.7 Moisture

A flue gas sample was extracted and filtered. The gas sample was then passed through an absorption medium to collect any water vapour.

The method employed was BS EN 14790.

Flue gas moisture was determined gravimetrically by weighing the absorption medium and final gas drier prior to and following the test.

This was carried out alongside testing for hydrogen chloride and mercury.

2.8 Temperature

The cremator temperatures were measured by the use of calibrated Type K thermocouples.

The method employed was BS EN 13284 Part 1.

The gas temperatures were continuously recorded using a Grant 'Squirrel' data logger.

2.9 Velocity and Volumetric Flow

Flue gas velocity was found from inserting a calibrated s-type pitot tube into the flue. The pitot head pressure was then measured using a calibrated electronic manometer.

The method employed was BS EN 13284 Part 1.

The electronic manometer output was continuously recorded using a Grant 'Squirrel' data logger.

Flue gas velocity was then calculated from Bernoulli's equation as the density of the flue gas was known (from measurements of flue gas moisture and temperature).

Flue gas volumetric flow rate was found from the measurement of the flue duct size and hence its area and corrected to normalised conditions (again from measurements of flue gas moisture and temperature).

3. RESULTS

The results are summarised in Tables 1 & 3 are 60 minute mean results.

Total Particulate Matter, Hydrogen Chloride, Carbon Monoxide and Volatile Organic Compound determinations are given in Table 1.

Mercury determinations are given in Tables 2 & 4, and are single tests of extended duration.

Moisture determinations were made on all tests.

Carbon Monoxide, Volatile Organic Compounds, Oxygen, Temperature and Velocity and Volumetric Flow were continuously monitored.

All values in the tables are corrected to the reference conditions of 273K, 101.3kPa, 11%v/v oxygen and dry gas as given in PG5/2(2012) where required.

All data logs and calculations are given in Appendix 1.

All analysis reports are given in Appendix 2.

Appendix 3 gives details of plant operation during the various tests.

TABLE 1
Canley Garden Crematorium Stream 1 Abatement System Outlet
Emissions Monitoring 19th - 20th July 2016
Total Particulate Matter & Hydrogen Chloride Sampling

	Test 1	Test 2	Test 3	Average	Requirement to PG5/2 (2012)
Total Particulate Matter - mg/Nm ³ c.	4.55 ± 3.26	6.84 ± 4.05	2.71 ± 1.67	4.70	<20
Hydrogen Chloride - mg/Nm ³ c.	3.24 ± 0.66	5.76 ± 0.86	1.39 ± 0.21	3.46	<30
Carbon Monoxide					
Test Average - mg/Nm ³ c.	2.39 ± 0.12	1.09 ± 0.05	5.57 ± 0.28	3.01	<100
First 30 min Average - mg/Nm ³ c.	4.62 ± 0.23	2.14 ± 0.11	3.05 ± 0.15	-	
Second 30 min Average - mg/Nm ³ c.	0.09 ± 0.00	0.00 ± 0.00	8.16 ± 0.41	-	
First 60 min Average - mg/Nm ³ c.	2.39 ± 0.12	1.09 ± 0.05	5.57 ± 0.28	-	
Organic Compounds - mg/Nm ³ c.	0.35 ± 0.02	0.11 ± 0.01	0.09 ± 0.00	0.18	<20
Flue Oxygen - %v/v dry	15.59 ± 0.10	16.18 ± 0.10	13.15 ± 0.10	14.98	
Flue Moisture - %v/v	2.5 ± 0.3	3.7 ± 0.4	4.5 ± 0.4	3.6	
- %w/w	1.6 ± 0.2	2.3 ± 0.2	2.8 ± 0.3	2.3	
Flue Temperature - Deg C	119 ± 2	121 ± 2	135 ± 2	125	
Volumetric Flow - Nm ³ /h dry	2781 ± 56	2442 ± 49	3466 ± 69	2896	

Note 1: All emissions as concentration levels are given as mg/Nm³ corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (±) are calculated to a 95% confidence interval

Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

TABLE 2
Canley Garden Crematorium Stream 1 Abatement System Outlet
Emissions Monitoring 20th July 2016
Mercury Sampling

		Test 4	Requirement to PG5/2 (2012)
Mercury	- $\mu\text{g}/\text{Nm}^3\text{c}$.	3.71 \pm 0.99	<50
Flue Oxygen	- %v/v dry	14.04 \pm 0.10	
Flue Moisture	- %v/v	13.2 \pm 1.3	
	- %w/w	8.6 \pm 0.9	
Flue Temperature	- Deg C	136 \pm 2	
Volumetric Flow	- Nm^3/h dry	2609 \pm 52	

Note 1: All emissions as concentration levels are given as $\mu\text{g}/\text{Nm}^3$ or mg/Nm^3 corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (\pm) are calculated to a 95% confidence interval

Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

TABLE 3
Canley Garden Crematorium Stream 2 Abatement System Outlet
Emissions Monitoring 18th - 19th July 2016
Total Particulate Matter & Hydrogen Chloride Sampling

	Test 1	Test 2	Test 3	Average	Requirement to PG5/2 (2012)
Total Particulate Matter - mg/Nm ³ c.	3.71 ± 2.72	8.00 ± 6.12	3.49 ± 2.70	5.07	<20
Hydrogen Chloride - mg/Nm ³ c.	13.24 ± 0.98	19.67 ± 1.99	6.19 ± 0.48	13.03	<30
Carbon Monoxide					
Test Average - mg/Nm ³ c.	0.41 ± 0.02	4.58 ± 0.23	3.12 ± 0.16	2.70	<100
First 30 min Average - mg/Nm ³ c.	0.81 ± 0.04	9.01 ± 0.45	6.14 ± 0.31	-	
Second 30 min Average - mg/Nm ³ c.	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	-	
First 60 min Average - mg/Nm ³ c.	0.41 ± 0.02	4.58 ± 0.23	3.12 ± 0.16	-	
Organic Compounds - mg/Nm ³ c.	0.22 ± 0.01	0.53 ± 0.03	0.12 ± 0.01	0.29	<20
Flue Oxygen - %v/v dry	16.84 ± 0.10	18.17 ± 0.10	16.51 ± 0.10	17.17	
Flue Moisture - %v/v	3.1 ± 0.3	2.7 ± 0.3	5.2 ± 0.5	3.7	
- %w/w	2.0 ± 0.2	1.7 ± 0.2	3.3 ± 0.3	2.3	
Flue Temperature - Deg C	113 ± 2	100 ± 2	101 ± 2	105	
Volumetric Flow - Nm ³ /h dry	5662 ± 113	3704 ± 74	5236 ± 105	4867	

Note 1: All emissions as concentration levels are given as mg/Nm³ corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (±) are calculated to a 95% confidence interval

Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

TABLE 4
Canley Garden Crematorium Stream 2 Abatement System Outlet
Emissions Monitoring 19th July 2016
Mercury Sampling

		Test 4	Requirement to PG5/2 (2012)
Mercury	- $\mu\text{g}/\text{Nm}^3\text{c}$.	3.41 \pm 1.32	<50
Flue Oxygen	- %v/v dry	17.16 \pm 0.10	
Flue Moisture	- %v/v	4.6 \pm 0.5	
	- %w/w	2.9 \pm 0.3	
Flue Temperature	- Deg C	106 \pm 2	
Volumetric Flow	- Nm^3/h dry	4773 \pm 95	

Note 1: All emissions as concentration levels are given as $\mu\text{g}/\text{Nm}^3$ or mg/Nm^3 corrected to 11%v/v oxygen and dry gas

Note 2: All uncertainties (\pm) are calculated to a 95% confidence interval

Uncertainties estimated using the procedure suggested in the STA Quality Guidance Note QGN001-01

4. COMMENTS

The results from these series of tests demonstrate that both plant streams satisfy the requirements of PG5/2(2012) for the releases to air of particulate matter, hydrogen chloride, mercury, carbon monoxide and volatile organic compounds.

The cremators and flue gas treatment system operated satisfactorily during testing without any failure or alarm events.

No visible chimney emissions other than the expected steam plume during pre-heat were observed throughout the test work.

5. QUALITY CONTROL

All the tests performed were carried out to the methods given in the appropriate listed Standards using calibrated equipment. The gas analysers were calibrated prior to use using suitable calibration gases.

Analysis of the filters and absorbers was carried out in-house and at an external laboratory.

For this test work the following external laboratory was used for the given determinations:

Scientific Analysis Laboratories (SAL)	}	Hydrogen Chloride
		Mercury

APPENDIX 1

Data Logs and Calculations

Canley Garden Crematorium Stream 1 Abatement System Outlet Data Log

19/07/16

Test 1

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa
13:08	109	52.8	17.10	4.91	0.06	60.5
13:09	109	53.1	15.30	3.52	0.40	68.9
13:10	110	53.1	15.50	0.91	0.32	71.4
13:11	112	53.1	14.90	0.33	0.00	102.5
13:12	113	53.3	15.30	9.33	0.00	87.4
13:13	113	53.3	14.90	13.81	2.26	75.6
13:14	113	53.4	16.20	21.79	4.56	47.0
13:15	113	53.7	15.80	23.18	5.14	58.8
13:16	114	53.7	15.20	8.31	2.65	72.2
13:17	114	53.9	16.00	10.85	1.53	51.2
13:18	114	54.1	16.10	18.05	2.25	64.7
13:19	115	54.0	15.40	2.87	0.98	60.5
13:20	115	54.0	15.20	0.17	0.04	58.8
13:21	116	54.1	15.30	0.00	0.00	67.2
13:22	116	54.3	14.90	0.49	0.00	68.0
13:23	117	54.5	15.00	0.00	0.00	68.0
13:24	117	54.6	15.00	0.00	0.00	67.2
13:25	117	54.7	15.00	0.00	0.00	68.0
13:26	118	54.9	15.20	0.00	0.00	74.8
13:27	119	55.0	15.10	0.00	0.00	75.6
13:28	119	55.0	15.10	0.00	0.00	70.6
13:29	119	55.4	14.90	0.00	0.00	67.2
13:30	120	55.6	14.80	0.00	0.00	69.7
13:31	120	55.7	15.70	16.11	1.11	56.3
13:32	120	55.8	14.80	6.31	0.00	63.8
13:33	120	56.0	15.30	0.00	0.00	52.1
13:34	120	56.1	15.10	0.00	0.00	46.2
13:35	120	56.1	14.80	0.00	0.00	50.4
13:36	120	56.3	14.80	0.00	0.00	56.3
13:37	121	56.5	14.70	0.00	0.00	73.1
13:38	121	56.6	15.90	2.17	0.00	59.6
13:39	121	56.8	15.60	2.60	0.00	58.8
13:40	121	57.1	14.80	0.00	0.00	58.0
13:41	121	57.0	15.10	0.00	0.00	42.8
13:42	120	57.1	16.80	0.00	0.00	37.0
13:43	120	57.2	16.60	0.00	0.00	45.4
13:44	121	57.2	15.40	0.00	0.00	65.5
13:45	121	57.3	15.00	0.00	0.00	54.6
13:46	121	57.3	15.50	0.00	0.00	55.4
13:47	121	57.4	15.60	0.00	0.00	62.2

13:48	122	57.4	15.50	0.00	0.00	74.8
13:49	121	57.8	15.40	0.00	0.00	62.2
13:50	122	58.0	15.60	0.00	0.00	74.8
13:51	122	58.1	14.80	0.00	0.00	61.3
13:52	122	58.1	16.20	0.00	0.00	52.1
13:53	122	58.2	16.30	0.00	0.00	73.9
13:54	122	58.4	15.50	0.00	0.00	68.9
13:55	122	58.5	16.40	0.00	0.00	58.8
13:56	122	58.7	16.40	0.00	0.00	68.0
13:57	122	58.8	15.10	0.00	0.00	53.8
13:58	122	58.9	16.50	0.00	0.00	47.9
13:59	122	58.9	16.50	0.00	0.00	65.5
14:00	122	59.0	15.40	0.00	0.00	54.6
14:01	122	59.0	16.80	0.00	0.00	59.6
14:02	123	59.2	15.90	0.00	0.00	64.7
14:03	122	59.2	15.60	0.00	0.00	51.2
14:04	122	59.2	17.10	0.00	0.00	58.8
14:05	123	59.4	16.00	0.00	0.00	67.2
14:06	123	59.6	15.80	0.00	0.00	57.1
14:07	123	59.7	17.40	0.00	0.00	62.2
14:08	123	59.8	16.20	0.00	0.00	67.2
Average	119	56.4	15.59	2.39	0.35	62.6

Average for first 30 mins of test	4.62	-
Average for second 30 mins of test	0.09	-
Average for first 60 mins of test	2.39	0.35

Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

19/07/16

Test 2

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa
14:25	121	60.6	17.80	13.27	1.29	45.4
14:26	120	60.9	16.90	14.99	2.14	43.7
14:27	121	61.0	16.10	5.95	1.17	57.1
14:28	121	61.1	15.80	1.55	0.00	49.6
14:29	121	61.0	16.60	3.89	0.00	67.2
14:30	122	61.2	14.70	0.00	0.00	64.7
14:31	121	61.1	15.70	1.14	0.00	40.3
14:32	121	61.2	15.10	1.02	0.00	37.0
14:33	120	61.1	15.90	0.79	0.00	38.6
14:34	121	61.3	16.80	4.08	0.00	55.4
14:35	121	61.2	15.80	3.86	0.00	55.4
14:36	121	61.3	16.30	2.14	0.00	51.2
14:37	121	61.4	16.30	2.78	0.00	58.8
14:38	121	61.4	15.20	0.00	0.00	47.0
14:39	121	61.4	16.50	0.67	0.09	40.3
14:40	121	61.5	15.10	2.04	2.33	60.5
14:41	121	61.6	15.40	0.00	0.00	39.5
14:42	120	61.8	16.60	0.69	0.00	37.0
14:43	121	61.9	15.50	1.46	0.00	57.1
14:44	121	62.0	15.30	0.00	0.00	38.6
14:45	120	62.0	16.40	1.09	0.00	21.8
14:46	120	62.0	15.70	0.00	0.00	44.5
14:47	121	62.3	14.70	0.00	0.00	48.7
14:48	120	62.2	16.80	3.84	0.00	41.2
14:49	121	62.4	15.80	0.97	0.00	58.8
14:50	121	62.4	15.20	0.00	0.00	41.2
14:51	120	62.5	16.70	0.00	0.00	33.6
14:52	120	62.6	15.30	0.00	0.00	43.7
14:53	120	62.7	15.30	0.00	0.00	37.0
14:54	120	62.7	17.00	0.00	0.00	42.0
14:55	120	62.8	15.70	0.00	0.00	39.5
14:56	119	62.8	16.10	0.00	0.00	26.9
14:57	120	62.7	17.00	0.00	0.00	53.8
14:58	120	62.8	15.00	0.00	0.00	70.6
14:59	120	62.8	15.40	0.00	0.00	57.1
15:00	120	62.8	15.40	0.00	0.00	56.3
15:01	120	63.1	15.50	0.00	0.00	55.4
15:02	121	63.3	15.60	0.00	0.00	54.6
15:03	121	63.3	15.70	0.00	0.00	54.6
15:04	121	63.4	15.80	0.00	0.00	54.6

15:05	121	63.4	15.90	0.00	0.00	54.6
15:06	121	63.4	16.00	0.00	0.00	53.8
15:07	121	63.6	16.10	0.00	0.00	53.8
15:08	121	63.7	16.20	0.00	0.00	54.6
15:09	121	63.7	16.30	0.00	0.00	52.9
15:10	121	63.7	16.40	0.00	0.00	49.6
15:11	121	63.9	16.50	0.00	0.00	49.6
15:12	121	63.9	16.50	0.00	0.00	55.4
15:13	121	64.0	16.80	0.00	0.00	55.4
15:14	121	64.0	16.90	0.00	0.00	55.4
15:15	121	64.1	16.90	0.00	0.00	55.4
15:16	121	64.1	17.10	0.00	0.00	55.4
15:17	121	64.2	17.10	0.00	0.00	54.6
15:18	121	64.1	17.20	0.00	0.00	54.6
15:19	121	64.3	17.30	0.00	0.00	58.0
15:20	122	64.2	17.20	0.00	0.00	68.9
15:21	121	64.3	16.40	0.00	0.00	47.9
15:22	121	64.3	17.20	0.00	0.00	44.5
15:23	121	64.3	17.20	0.00	0.00	43.7
15:24	121	64.4	17.20	0.00	0.00	42.0
15:25	121	64.5	17.20	0.00	0.00	42.0
Average	121	62.7	16.18	1.09	0.11	49.5

Average for first 30 mins of test	2.14	-
Average for second 30 mins of test	0.00	-
Average for first 60 mins of test	1.09	0.11

Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

20/07/16

Test 3

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa
08:22	127	34.6	15.10	12.59	2.64	108.4
08:23	127	34.8	14.00	4.72	1.04	105.0
08:24	128	35.0	14.10	1.60	0.56	119.3
08:25	128	35.2	14.30	2.99	0.89	109.2
08:26	128	35.5	14.10	1.74	0.06	90.7
08:27	129	35.7	13.80	1.53	0.00	92.4
08:28	129	36.0	13.70	1.51	0.00	73.9
08:29	129	36.2	13.20	1.03	0.00	73.9
08:30	129	36.5	13.20	0.64	0.00	76.4
08:31	129	36.8	14.20	5.90	0.00	68.9
08:32	130	37.1	12.50	3.30	0.00	108.4
08:33	130	37.4	15.00	6.52	0.07	89.9
08:34	131	37.7	13.40	4.09	0.00	104.2
08:35	132	38.1	13.70	0.96	0.00	118.4
08:36	132	38.3	14.50	2.93	0.00	84.8
08:37	131	38.6	13.40	2.24	0.00	89.0
08:38	132	38.9	13.40	2.50	0.00	106.7
08:39	133	39.3	13.70	2.88	0.00	123.5
08:40	134	39.6	14.00	3.15	0.00	125.2
08:41	135	40.1	13.80	2.09	0.00	126.0
08:42	136	40.3	13.80	1.67	0.00	139.4
08:43	136	40.5	14.10	2.18	0.00	144.5
08:44	135	41.0	14.20	2.36	0.00	129.4
08:45	135	41.2	13.90	2.26	0.00	117.6
08:46	135	41.5	13.90	2.26	0.00	121.8
08:47	136	42.0	13.70	1.92	0.00	127.7
08:48	137	42.3	13.60	1.90	0.00	128.5
08:49	138	42.6	13.80	2.09	0.00	129.4
08:50	138	43.0	13.90	2.96	0.00	128.5
08:51	137	43.2	14.00	3.44	0.00	116.8
08:52	137	43.4	14.70	6.69	0.00	133.6
08:53	137	43.9	11.30	15.78	0.00	129.4
08:54	139	44.3	11.60	12.03	0.00	142.0
08:55	139	44.6	13.30	19.38	0.00	120.1
08:56	140	44.9	12.60	7.03	0.00	105.0
08:57	139	44.8	12.50	5.65	0.00	89.9
08:58	138	45.1	13.70	12.49	0.00	63.8
08:59	137	45.7	11.80	7.72	0.00	68.9
09:00	137	45.9	12.20	3.87	0.00	75.6
09:01	136	46.4	12.80	4.40	0.00	54.6

09:02	136	46.4	11.90	5.39	0.00	56.3
09:03	137	46.8	10.10	4.13	0.00	95.8
09:04	140	47.1	11.70	19.36	0.00	145.3
09:05	141	47.2	14.50	30.39	0.00	159.6
09:06	140	47.5	13.00	10.51	0.00	128.5
09:07	139	47.8	13.50	5.61	0.00	102.5
09:08	138	48.2	14.20	5.75	0.00	100.0
09:09	138	48.5	11.40	7.61	0.00	107.5
09:10	139	48.7	11.70	6.99	0.00	108.4
09:11	140	48.8	13.70	8.51	0.00	121.0
09:12	141	48.9	11.50	3.16	0.00	120.1
09:13	141	49.1	12.10	4.50	0.00	95.8
09:14	140	49.6	14.10	8.72	0.00	84.8
09:15	140	49.7	10.90	3.66	0.00	115.9
09:16	140	49.8	12.80	8.67	0.00	103.3
09:17	139	50.0	12.10	6.07	0.00	84.8
09:18	139	50.2	11.50	1.68	0.00	89.0
09:19	138	50.5	11.90	3.85	0.00	73.9
09:20	139	50.9	13.30	5.07	0.00	71.4
09:21	140	51.1	11.90	3.08	0.00	91.6
09:22	140	51.3	12.10	3.82	0.00	89.0
Average	135	43.2	13.15	5.57	0.09	105.0

Average for first 30 mins of test	3.05	-
Average for second 30 mins of test	8.16	-
Average for first 60 mins of test	5.57	0.09

Canley Garden Crematorium Stream 1 Abatement System Outlet

Total Particulate Matter and Hydrogen Chloride

Contract Canley Garden Crematorium, DEM0940
Date 19th - 20th July 2016
Location Flue Gas Abatement System Outlet
Engineer(s) JB & ST
Absorbent H₂O

Test Log	Test 1		Test 2		Test 3	
Barometric Pressure(kPa)	101.7		101.5		100.6	
Gas Meter Temperature(Deg C)	56.4		62.7		43.2	
Oxygen Concentration(%v/v dry)	15.59		16.18		13.15	
Flue Gas Volumetric Flow(Nm ³ /h dry)	2781		2442		3466	
Time	Start	End	Start	End	Start	End
Gas Meter Reading(Am ³ dry)	13:08	14:08	14:25	15:25	08:22	09:22
Absorber Weight(g)	158.012	158.487	158.616	159.056	159.108	159.726
Filter Reference	3499.5	3507.8	3565.4	3576.5	3504.3	3524.3
Filter Weight(g)	CA190716F11		CA190716F12		CA200716F13	
Probe Rinse Reference	0.53370	0.53449	0.53501	0.53597	0.54035	0.54127
Probe Rinse Weight(g)	CA190716R11		CA190716R12		CA200716R13	
Sample Reference HCl	78.3036	78.3038	78.3038	78.3040	78.3040	78.3042
Absorbent Volume(ml)	CA190719H11		CA190716H12		CA200716H13A&B	
Absorbent(mg/l as HCl)	500		500		250	
Blank(mg/l as HCl)	1.6		2.2		2.3	
	0.22		0.22		0.22	

Calculation: General

Barometric Pressure(kPa)	101.7	101.5	100.6
Gas Meter temperature(Deg C)	56.4	62.7	43.2
Gas Volume Sampled(Am ³ dry)	0.475	0.440	0.618
Gas Volume Sampled(Nm ³ dry)	0.3952	0.3585	0.5299
Mass of Dry Gas(g @ 1292.8 g/Nm ³)	510.93	463.52	685.00
Change in Absorber Weight(g)	8.3	11.1	20.0
Water Vapour Volume(Nm ³ @ 803.9 g/Nm ³)	0.0103	0.0138	0.0249
Gas Volume(Nm ³ wet)	0.4055	0.3724	0.5547
Mass of Wet Gas(g)	519.23	474.62	705.00
Moisture Concentration(%v/v)	2.5	3.7	4.5
Moisture Concentration(%w/w)	1.6	2.3	2.8

Calculation: Particulate

Increase In Filter Weights(g)	0.00097	0.00118	0.00113
Particulate Emission(mg/Nm ³ dry)	2.45	3.28	2.13
Oxygen Concentration(%v/v dry)	15.59	16.18	13.15
Particulate Emission	4.55	6.84	2.71
(mg/Nm³ @ 11 %v/v Oxygen dry)			
Flue Gas Volumetric Flow(Nm ³ /h dry)	2781	2442	3466
Particulate Emission(g/h)	6.81	8.01	7.37
Required Sample Velocity(Nm/s)	8.03	7.05	10.01
Nozzle Used(mm)	4.0	4.0	4.0
Area of Nozzle(m ²)	0.00001257	0.00001257	0.00001257
Test Duration(mins)	60	60	60
Actual Sample Velocity(Nm/s)	8.74	7.93	11.71
Isokinetic Closure(%)	109	112	117
		113	

Calculation: HCl

Absorbent(mg/l as HCl)	1.60	2.20	2.52
Blank(mg/l as HCl)	0.22	0.22	0.22
Chloride Absorbed(mg/l as HCl)	1.38	1.98	2.3
Chloride Absorbed(mg as HCl)	0.69	0.99	0.58
HCl(mg)	0.69	0.99	0.58
HCl Emission(mg/Nm ³ dry)	1.75	2.76	1.09
Oxygen Concentration(%v/v dry)	15.59	16.18	13.15
HCl Emission	3.24	5.76	1.39
(mg/Nm³ @ 11 %v/v Oxygen dry)			
Flue Gas Volumetric Flow(Nm ³ /h dry)	2781	2442	3466
HCl Emission(g/h)	4.85	6.74	3.76

Canley Garden Crematorium Stream 1 Abatement System Outlet

Flue Gas Volumetric Flow

Contract Canley Garden Crematorium, DEM0940
 Date 19th - 20th July 2016
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST

Test Log	Test 1	Test 2	Test 3
Flue Gas Temperature(Deg C)	119	121	135
Flue Gas Pitot Head Sample Points(Pa)	62.6	49.5	105.0
Flue Gas Moisture(%v/v)	2.5	3.7	4.5
Flue Gas Moisture(%w/w)	1.6	2.3	2.8
Flue Gas Duct Dimensions(mm)	350 mm Diameter Circular Stack		
Flue Gas Duct Area(m ²)	0.0962		

Calculation

Flue Gas Density(kg/m ³)	0.8952	0.8887	0.8548
<u>Sample Points</u>			
Flue Gas Velocity(Am/s)	11.83	10.56	15.67
Flue Gas Volumetric Flowrate(Am ³ /h)	4096	3657	5429
Flue Gas Volumetric Flowrate(Am ³ /h dry)	3992	3522	5185
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	2781	2442	3466
<u>Duct Mean</u>			
Flue Gas Velocity(Am/s)	11.67	10.42	15.46
Flue Gas Volumetric Flowrate(Am ³ /h)	4041	3608	5356
Flue Gas Volumetric Flowrate(Am ³ /h dry)	3938	3475	5116
Flue Gas Volumetric Flowrate(Nm³/h dry)	2743	2410	3419

Canley Garden Crematorium Stream 1 Abatement System Outlet

Data Log

20/07/16

Test 4

Time	Flue Gas °C	Meter °C	Flue O ₂ %v/v dry	Sample Point Pa
09:54	137	49.1	14.80	97.4
09:55	136	49.1	14.80	68.0
09:56	136	49.3	14.30	51.2
09:57	135	49.5	13.90	40.3
09:58	135	49.6	13.50	43.7
09:59	135	49.8	12.80	55.4
10:00	135	49.9	13.40	38.6
10:01	134	50.2	12.60	35.3
10:02	134	50.3	12.30	34.4
10:03	133	50.5	12.70	36.1
10:04	133	50.9	12.70	40.3
10:05	134	51.1	12.70	50.4
10:06	135	51.2	11.80	88.2
10:07	136	51.5	13.80	96.6
10:08	136	51.8	13.70	73.1
10:09	135	51.9	13.50	57.1
10:10	134	51.9	12.90	47.0
10:11	133	51.9	12.60	45.4
10:12	133	52.0	12.80	48.7
10:13	133	52.0	13.00	47.0
10:14	133	52.2	13.40	45.4
10:15	133	52.4	13.60	44.5
10:16	133	52.6	13.80	37.0
10:17	132	52.7	12.80	36.1
10:18	131	52.8	13.00	28.6
10:19	131	53.0	13.10	40.3
10:20	131	53.3	14.20	29.4
10:21	131	53.4	12.80	47.0
10:22	133	53.5	14.20	78.1
10:23	134	53.6	14.00	82.3
10:24	133	53.7	14.30	58.8
10:25	132	53.9	13.90	47.0
10:26	132	54.1	13.50	68.9
10:27	133	54.3	14.10	73.9
10:28	133	54.5	15.20	63.8
10:29	134	54.5	14.80	76.4
10:30	134	54.9	14.80	79.8
10:31	135	55.0	14.30	105.0
10:32	135	55.1	14.70	117.6
10:33	135	55.0	14.70	98.3
10:34	135	55.3	12.40	79.0

10:35	136	55.3	11.40	78.1
10:36	136	55.6	11.40	76.4
10:37	136	55.6	11.60	72.2
10:38	136	55.8	12.00	73.1
10:39	135	56.1	12.20	71.4
10:40	135	56.0	12.00	73.9
10:41	135	56.1	12.40	70.6
10:42	135	56.1	12.50	68.9
10:43	136	56.5	12.70	66.4
10:44	136	56.4	12.80	66.4
10:45	136	56.7	13.10	66.4
10:46	136	56.7	13.20	67.2
10:47	135	56.6	13.40	66.4
10:48	135	57.0	13.40	63.0
10:49	135	56.9	13.20	61.3
10:50	135	56.9	13.40	64.7
10:51	136	57.0	13.60	68.9
10:52	136	57.1	14.40	72.2
10:53	136	57.3	14.60	72.2
10:54	136	57.3	14.70	73.1
10:55	135	57.6	14.90	68.9
10:56	135	57.6	14.50	67.2
10:57	135	57.7	13.00	86.5
10:58	137	57.9	13.90	94.9
10:59	137	57.9	13.70	83.2
11:00	137	58.0	12.90	67.2
11:01	137	58.2	13.60	68.0
11:02	136	58.3	13.90	71.4
11:03	137	58.5	15.50	112.6
11:04	137	58.5	16.60	100.8
11:05	137	58.6	15.70	117.6
11:06	138	58.7	14.60	98.3
11:07	138	58.7	13.20	86.5
11:08	139	58.7	13.70	92.4
11:09	139	58.9	14.90	98.3
11:10	138	59.0	15.40	96.6
11:11	138	59.3	15.50	106.7
11:12	139	59.3	15.40	122.6
11:13	139	59.4	14.50	119.3
11:14	140	59.3	14.70	124.3
11:15	141	59.4	14.70	119.3
11:16	142	59.6	15.10	124.3
11:17	142	59.7	15.50	126.8
11:18	141	59.9	15.80	112.6
11:19	140	60.2	15.90	83.2
11:20	139	60.1	15.50	68.0
11:21	139	60.0	14.90	70.6
11:22	139	60.0	13.30	66.4
11:23	139	59.9	14.70	91.6

11:24	140	60.0	15.70	117.6
11:25	141	60.1	16.00	124.3
11:26	140	60.4	16.40	121.8
11:27	140	60.5	16.20	127.7
11:28	139	60.5	16.30	120.1
11:29	140	60.7	16.20	124.3
11:30	140	60.6	16.30	115.9
11:31	140	60.8	16.00	105.0
11:32	140	60.9	16.10	90.7
11:33	140	61.1	16.00	85.7
11:34	139	61.1	15.80	82.3
11:35	138	61.1	15.60	79.8
11:36	138	61.1	15.60	84.8
11:37	138	61.1	15.90	79.0
11:38	138	61.0	16.20	79.8
11:39	139	61.2	16.30	87.4
11:40	138	61.2	14.80	79.8
11:41	138	61.3	14.00	79.0
11:42	138	61.4	13.80	77.3
11:43	137	61.4	14.20	59.6
11:44	137	61.6	13.80	46.2
11:45	137	61.6	13.10	40.3
11:46	137	61.6	12.80	39.5
11:47	136	61.7	12.80	39.5
11:48	136	61.7	12.80	38.6
11:49	135	61.7	12.90	38.6
11:50	135	61.6	12.90	37.8
11:51	135	61.6	12.90	38.6
11:52	135	61.8	13.10	49.6
11:53	136	62.1	14.40	52.1
11:54	136	62.5	14.70	66.4
11:55	137	62.7	14.80	103.3
11:56	138	62.9	13.40	100.0
11:57	137	63.0	13.60	77.3
11:58	137	62.9	14.10	72.2
11:59	137	63.2	13.60	66.4
12:00	138	63.3	12.80	66.4
12:01	138	63.2	12.60	79.8
12:02	139	63.1	13.00	98.3
12:03	138	63.2	13.60	85.7
12:04	138	63.4	13.40	71.4
12:05	137	63.4	13.30	68.0
12:06	137	63.5	13.50	68.0
12:07	137	63.5	13.60	70.6
12:08	138	63.5	13.20	69.7
12:09	138	63.6	13.30	70.6
12:10	138	63.4	13.60	68.9
12:11	138	63.4	13.60	66.4
12:12	138	63.4	13.40	64.7

12:13	137	63.6	13.70	56.3
12:14	137	63.4	13.50	52.9
12:15	137	63.5	13.60	59.6
12:16	137	63.7	14.40	59.6
12:17	137	63.6	14.50	58.8
12:18	137	63.5	14.60	58.0
12:19	137	63.5	14.60	57.1
12:20	136	63.5	14.70	55.4
12:21	136	63.5	14.50	55.4
12:22	136	63.7	14.50	51.2
12:23	136	63.9	13.90	48.7
12:24	136	63.9	14.20	45.4
12:25	136	63.8	16.70	50.4
12:26	135	63.9	18.30	43.7
Average	136	58.2	14.04	72.5

Canley Garden Crematorium Stream 1 Abatement System Outlet

Mercury

Contract Canley Garden Crematorium, DEM0940
 Date 20th July 2016
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST
 Absorbent 4% K₂CR₂O₇ / 20% HNO₃ in H₂O

Test Log

Test 4

Barometric Pressure(kPa) 102.3
 Gas Meter Temperature(Deg C) 58.2
 Oxygen Concentration(%v/v dry) 14.04
 Flue Gas Volumetric Flow(Nm³/h dry) 2609

	Start	End
Time	09:54	12:26
Gas Meter Reading(Am ³ dry)	159.815	160.839
Absorber Weight(g)	3548.7	3652.9
Filter Reference	CA200716HgF1	
Filter Fraction Analysed	1	
Filter(µg as Hg)	0.02	
Filter Blank(µg as Hg)	0.02	
Probe Rinse Reference	Washed into Hg1A	
Probe Rinse Volume(ml)	0	
Probe Rinse(µg/l as Hg)	0	
Probe Rinse Blank(µg/l as Hg)	0	
Absorbent Reference	CA200716Hg1A&B	
Absorbent Volume(ml)	250	250
Absorbent(µg/l as Hg)	9.3	0.5
Absorbent Blank(µg/l as Hg)	0.5	0.5

Calculation: General

Barometric Pressure(kPa) 102.3
 Gas Meter Temperature(Deg C) 58.2
 Gas Volume Sampled(Am³ dry) 1.024
 Gas Volume Sampled(Nm³ dry) 0.8523
 Mass of Dry Gas(g @ 1292.8 g/Nm³) 1101.90
 Change in Absorber Weight(g) 104.2
 Water Vapour Volume(Nm³ @ 803.9 g/Nm³) 0.1296
 Gas Volume(Nm³ wet) 0.9820
 Mass of Wet Gas(g) 1206.10
Moisture Concentration(%v/v) 13.2
Moisture Concentration(%w/w) 8.6

Calculation: Mercury

Filter(μg as Hg)	0.00
Probe Rinse(μg as Hg)	0.00
Absorbent(μg as Hg)	2.20
Total Mercury Sampled(μg)	2.20
Mercury Emission($\mu\text{g}/\text{Nm}^3$ dry)	2.58
Oxygen Concentration(%v/v dry)	14.04
Mercury Emission	3.71
($\mu\text{g}/\text{Nm}^3$ @ 11 %v/v Oxygen dry)	
Flue Gas Volumetric Flowrate(Nm^3/h dry)	2609
Mercury Emission(g/h)	0.007
Required Sample Velocity(Nm/s)	7.63
Nozzle Used(mm)	4.0
Area of Nozzle(m^2)	0.00001257
Test Duration(mins)	152
Actual Sample Velocity(Nm/s)	7.44
Isokinetic Closure(%)	97

Canley Garden Crematorium Stream 1 Abatement System Outlet

Flue Gas Volumetric Flow

Contract	Canley Garden Crematorium, DEM0940
Date	20th July 2016
Location	Flue Gas Abatement System Outlet
Engineer(s)	JB & ST

Test Log

Test 4

Flue Gas Temperature(Deg C)	136
Flue Gas Pitot Head Sample Points(Pa)	72.5
Flue Gas Pitot Head Duct Mean(Pa)	70.6
Flue Gas Moisture(%v/v)	13.2
Flue Gas Moisture(%w/w)	8.6
Flue Gas Duct Dimensions(mm)	350 mm Diameter
Flue Gas Duct Area(m ²)	0.0962

Calculation

Flue Gas Density(kg/m ³)	0.8339
<u>Sample Points</u>	
Flue Gas Velocity(Am/s)	13.19
Flue Gas Volumetric Flowrate(Am ³ /h)	4569
Flue Gas Volumetric Flowrate(Am ³ /h dry)	3966
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	2644
<u>Duct Mean</u>	
Flue Gas Velocity(Am/s)	13.01
Flue Gas Volumetric Flowrate(Am ³ /h)	4507
Flue Gas Volumetric Flowrate(Am ³ /h dry)	3912
Flue Gas Volumetric Flowrate(Nm³/h dry)	2609

Canley Garden Crematorium Stream 2 Abatement System Outlet Data Log

18/07/16

Test 1

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa
14:39	105	26.2	18.10	0.00	3.67	231.8
14:40	104	26.5	18.00	0.00	2.84	190.7
14:41	104	26.9	17.80	0.00	0.07	168.8
14:42	104	27.2	18.60	0.00	0.00	180.6
14:43	104	27.6	17.60	0.00	0.00	212.5
14:44	106	28.0	17.90	0.00	0.00	298.2
14:45	107	28.4	18.50	0.00	0.00	301.6
14:46	108	28.8	18.30	0.00	0.00	279.7
14:47	107	29.2	17.30	0.00	0.00	233.5
14:48	107	29.6	16.90	0.00	0.00	232.7
14:49	108	30.1	17.70	0.00	0.76	277.2
14:50	109	30.5	17.00	25.19	5.02	294.8
14:51	109	31.0	15.80	0.00	0.77	278.9
14:52	111	31.4	15.60	0.00	0.00	298.2
14:53	111	31.8	16.00	0.00	0.00	276.4
14:54	112	32.2	16.30	0.00	0.00	297.4
14:55	112	32.6	16.70	0.00	0.00	302.4
14:56	113	33.0	16.70	0.00	0.00	299.9
14:57	114	33.5	15.40	0.00	0.00	299.9
14:58	114	33.9	15.30	0.00	0.00	302.4
14:59	115	34.3	16.40	0.00	0.00	292.3
15:00	115	34.7	16.40	0.00	0.00	283.9
15:01	116	35.2	16.40	0.00	0.00	299.0
15:02	116	35.5	16.30	0.00	0.00	290.6
15:03	116	35.9	16.10	0.00	0.00	299.9
15:04	117	36.3	15.90	0.00	0.00	295.7
15:05	117	36.8	15.50	0.00	0.00	301.6
15:06	118	37.1	15.60	0.00	0.00	299.9
15:07	118	37.5	16.10	0.00	0.00	290.6
15:08	117	38.0	16.70	0.00	0.00	240.2
15:09	117	38.3	15.90	0.00	0.00	240.2
15:10	117	38.6	15.70	0.00	0.00	283.1
15:11	118	39.0	16.30	0.00	0.00	295.7
15:12	118	39.4	16.40	0.00	0.00	293.2
15:13	118	39.7	16.70	0.00	0.00	291.5
15:14	118	40.0	16.60	0.00	0.00	300.7
15:15	118	40.4	16.60	0.00	0.00	301.6
15:16	118	40.7	17.30	0.00	0.00	297.4
15:17	118	41.1	16.90	0.00	0.00	294.0
15:18	118	41.4	17.30	0.00	0.00	294.0

15:19	117	41.7	17.30	0.00	0.00	271.3
15:20	118	42.1	17.40	0.00	0.00	299.0
15:21	118	42.4	17.40	0.00	0.00	300.7
15:22	118	42.7	16.50	0.00	0.00	290.6
15:23	117	43.0	16.10	0.00	0.00	268.0
15:24	117	43.4	16.00	0.00	0.00	268.0
15:25	118	43.6	16.30	0.00	0.00	296.5
15:26	117	44.0	16.40	0.00	0.00	252.8
15:27	116	44.2	16.30	0.00	0.00	225.1
15:28	116	44.5	16.60	0.00	0.00	233.5
15:29	116	44.8	16.90	0.00	0.00	240.2
15:30	115	45.1	17.20	0.00	0.00	226.8
15:31	115	45.3	17.20	0.00	0.00	218.4
15:32	114	45.7	17.40	0.00	0.00	206.6
15:33	113	45.9	17.40	0.00	0.00	186.5
15:34	112	46.2	17.30	0.00	0.00	177.2
15:35	111	46.4	17.40	0.00	0.00	171.4
15:36	111	46.8	17.40	0.00	0.00	162.1
15:37	110	47.0	17.40	0.00	0.00	142.8
15:38	109	47.1	17.50	0.00	0.00	142.0
15:39	108	47.3	19.40	0.00	0.00	146.2
Average	113	37.7	16.84	0.41	0.22	258.5

Average for first 30 mins of test	0.81	-
Average for second 30 mins of test	0.00	-
Average for first 60 mins of test	0.41	0.22

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

18/07/16

Test 2

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa
15:53	106	48.9	18.40	0.00	0.00	196.6
15:54	105	49.0	18.10	0.00	0.00	163.0
15:55	105	49.1	18.10	0.00	0.00	168.0
15:56	105	49.2	18.20	0.00	0.00	168.8
15:57	105	49.5	18.20	0.00	0.00	178.1
15:58	105	49.7	17.70	0.00	0.00	214.2
15:59	106	49.9	16.70	0.00	0.00	203.3
16:00	105	50.2	16.80	0.00	0.00	179.8
16:01	105	50.4	16.70	0.00	0.00	166.3
16:02	105	50.5	16.80	0.00	0.00	165.5
16:03	105	50.7	17.10	0.00	0.00	173.0
16:04	105	51.0	17.50	0.00	0.00	163.0
16:05	104	51.3	17.80	0.00	0.00	154.6
16:06	104	51.3	18.00	0.00	0.00	149.5
16:07	104	51.5	18.00	0.00	0.00	145.3
16:08	104	51.6	17.60	0.00	0.00	136.9
16:09	103	51.8	17.50	0.00	0.00	139.4
16:10	103	52.0	17.30	0.00	0.00	133.6
16:11	103	52.2	17.20	0.00	0.00	124.3
16:12	102	52.3	17.00	0.00	0.00	122.6
16:13	102	52.5	17.10	0.00	0.00	115.9
16:14	102	52.7	18.20	9.77	3.80	147.0
16:15	102	52.8	19.10	240.95	20.35	146.2
16:16	101	52.9	19.00	28.57	8.40	104.2
16:17	100	53.1	18.10	0.00	0.00	52.1
16:18	99	53.2	17.30	0.00	0.00	45.4
16:19	99	53.4	17.50	0.00	0.00	52.9
16:20	99	53.5	17.50	0.00	0.00	51.2
16:21	98	53.7	17.70	0.00	0.00	51.2
16:22	98	53.8	18.10	0.00	0.00	50.4
16:23	98	54.0	18.40	0.00	0.00	50.4
16:24	97	54.1	18.50	0.00	0.00	48.7
16:25	97	54.2	18.60	0.00	0.00	49.6
16:26	97	54.3	18.70	0.00	0.00	49.6
16:27	97	54.4	18.80	0.00	0.00	49.6
16:28	97	54.5	18.80	0.00	0.00	49.6
16:29	97	54.6	18.90	0.00	0.00	48.7
16:30	96	54.7	18.90	0.00	0.00	48.7
16:31	96	54.9	19.10	0.00	0.00	47.9
16:32	96	55.0	19.20	0.00	0.00	55.4

16:33	97	55.0	19.30	0.00	0.00	73.9
16:34	96	55.2	18.30	0.00	0.00	49.6
16:35	96	55.2	18.70	0.00	0.00	48.7
16:36	96	55.3	19.40	0.00	0.00	64.7
16:37	97	55.3	19.50	0.00	0.00	93.2
16:38	96	55.5	18.20	0.00	0.00	53.8
16:39	96	55.6	18.90	0.00	0.00	63.0
16:40	97	55.8	19.40	0.00	0.00	94.1
16:41	97	55.8	17.90	0.00	0.00	92.4
16:42	97	56.0	18.40	0.00	0.00	81.5
16:43	97	56.2	19.20	0.00	0.00	109.2
16:44	97	56.3	18.70	0.00	0.00	117.6
16:45	97	56.3	18.30	0.00	0.00	117.6
16:46	97	56.6	18.30	0.00	0.00	113.4
16:47	97	56.6	18.30	0.00	0.00	102.5
16:48	97	56.8	18.20	0.00	0.00	101.6
16:49	98	56.9	18.20	0.00	0.00	110.9
16:50	98	57.0	18.40	0.00	0.00	107.5
16:51	98	57.1	18.30	0.00	0.00	101.6
16:52	98	57.2	18.10	0.00	0.00	101.6
16:53	97	57.3	18.20	0.00	0.00	101.6
Average	100	53.6	18.17	4.58	0.53	105.9

Average for first 30 mins of test	9.01	-
Average for second 30 mins of test	0.00	-
Average for first 60 mins of test	4.58	0.53

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

19/07/16

Test 3

Time	Flue Gas °C	Meter °C	Flue Oxygen %v/v dry	CO mg/Nm ³ c.	VOC mg/Nm ³ c.	Sample Point Pa
07:55	95	32.4	16.60	4.80	0.53	228.5
07:56	95	32.5	15.80	3.67	0.00	187.3
07:57	95	32.8	15.10	2.55	0.00	160.4
07:58	96	33.0	14.80	5.82	0.00	259.6
07:59	99	33.3	16.00	6.43	0.00	320.9
08:00	100	33.6	16.40	12.25	0.94	336.0
08:01	101	33.9	16.80	54.90	3.80	317.5
08:02	101	34.2	15.60	13.95	1.36	287.3
08:03	101	34.6	16.60	14.64	0.93	253.7
08:04	100	34.9	16.70	11.94	0.00	192.4
08:05	101	35.3	15.90	6.30	0.00	241.1
08:06	101	35.6	16.50	6.93	0.00	219.2
08:07	102	36.0	15.70	4.55	0.00	278.0
08:08	103	36.4	16.00	6.03	0.00	308.3
08:09	102	36.7	16.70	7.02	0.00	241.9
08:10	102	37.1	16.20	7.12	0.00	224.3
08:11	102	37.5	16.60	8.23	0.00	216.7
08:12	101	37.9	16.00	4.62	0.00	184.8
08:13	100	38.2	16.20	1.89	0.00	154.6
08:14	100	38.6	16.50	0.00	0.00	146.2
08:15	100	38.9	16.00	0.00	0.00	168.0
08:16	99	39.2	16.70	0.00	0.00	142.8
08:17	98	39.6	16.00	0.00	0.00	141.1
08:18	98	40.0	16.00	0.00	0.00	110.9
08:19	98	40.3	16.20	4.40	0.00	147.0
08:20	99	40.7	16.00	1.81	0.00	143.6
08:21	98	40.9	17.10	0.00	0.00	125.2
08:22	100	41.3	16.40	0.00	0.00	199.9
08:23	99	41.6	16.70	0.00	0.00	156.2
08:24	99	41.9	17.90	0.33	0.00	177.2
08:25	100	42.2	16.20	0.00	0.00	231.0
08:26	99	42.6	17.00	0.00	0.00	181.4
08:27	99	42.9	16.40	0.00	0.00	189.8
08:28	100	43.1	15.50	0.00	0.00	222.6
08:29	101	43.4	17.10	0.00	0.00	258.7
08:30	102	43.7	17.10	0.00	0.00	241.9
08:31	101	44.1	16.70	0.00	0.00	224.3
08:32	102	44.4	16.30	0.00	0.00	226.8
08:33	101	44.7	16.10	0.00	0.00	197.4
08:34	101	44.9	16.80	0.00	0.00	209.2

08:35	101	45.3	17.30	0.00	0.00	224.3
08:36	102	45.5	16.40	0.00	0.00	251.2
08:37	102	45.8	16.40	0.00	0.00	226.0
08:38	103	46.1	16.40	0.00	0.00	237.7
08:39	103	46.4	16.70	0.00	0.00	262.9
08:40	103	46.7	16.90	0.00	0.00	223.4
08:41	103	46.9	16.60	0.00	0.00	247.0
08:42	104	47.2	16.60	0.00	0.00	263.8
08:43	104	47.4	17.00	0.00	0.00	236.0
08:44	105	47.8	16.70	0.00	0.00	257.9
08:45	105	47.9	16.80	0.00	0.00	248.6
08:46	104	48.1	17.10	0.00	0.00	223.4
08:47	105	48.4	16.70	0.00	0.00	261.2
08:48	105	48.6	17.00	0.00	0.00	247.8
08:49	105	48.7	17.20	0.00	0.00	230.2
08:50	106	48.9	16.80	0.00	0.00	288.1
08:51	106	49.1	17.30	0.00	0.00	251.2
08:52	105	49.4	17.20	0.00	0.00	234.4
08:53	106	49.7	16.60	0.00	0.00	258.7
08:54	105	50.1	17.30	0.00	0.00	227.6
08:55	105	50.2	17.10	0.00	0.00	227.6
Average	101	41.8	16.51	3.12	0.12	222.7

Average for first 30 mins of test	6.14	-
Average for second 30 mins of test	0.00	-
Average for first 60 mins of test	3.12	0.12

Canley Garden Crematorium Stream 2 Abatement System Outlet

Total Particulate Matter and Hydrogen Chloride

Contract Canley Garden Crematorium, DEM0940
Date 18th - 19th July 2016
Location Flue Gas Abatement System Outlet
Engineer(s) JB & ST
Absorbent H₂O

Test Log	Test 1		Test 2		Test 3	
Barometric Pressure(kPa)	102.3		102.3		102.3	
Gas Meter Temperature(Deg C)	37.7		53.6		41.8	
Oxygen Concentration(%v/v dry)	16.84		18.17		16.51	
Flue Gas Volumetric Flow(Nm ³ /h dry)	5662		3704		5236	
Time	Start	End	Start	End	Start	End
Gas Meter Reading(Am ³ dry)	14:39	15:39	15:53	16:53	07:55	08:55
Absorber Weight(g)	154.552	155.251	155.335	155.818	155.865	156.524
Filter Reference	3474.9	3491.0	3616.5	3625.5	3500.5	3526.1
Filter Weight(g)	CA180716F21		CA180716F22		CA190716F23	
Probe Rinse Reference	0.54077	0.54154	0.53670	0.53744	0.54232	0.54305
Probe Rinse Weight(g)	CA180716R21		CA180716R22		CA190716R23	
Sample Reference HCl	75.5464	75.5466	75.5466	75.5468	75.5468	75.5469
Absorbent Volume(ml)	CA180716H21		CA180716H22		CA190716H23 A&B	
Absorbent(mg/l as HCl)	500		500		250	
Blank(mg/l as HCl)	7		4.7		6.3	
	0.22		0.22		0.22	

Calculation: General

Barometric Pressure(kPa)	102.3	102.3	102.3
Gas Meter temperature(Deg C)	37.7	53.6	41.8
Gas Volume Sampled(Am ³ dry)	0.699	0.483	0.659
Gas Volume Sampled(Nm ³ dry)	0.6203	0.4078	0.5772
Mass of Dry Gas(g @ 1292.8 g/Nm ³)	801.95	527.16	746.15
Change in Absorber Weight(g)	16.1	9.0	25.6
Water Vapour Volume(Nm ³ @ 803.9 g/Nm ³)	0.0200	0.0112	0.0318
Gas Volume(Nm ³ wet)	0.6403	0.4190	0.6090
Mass of Wet Gas(g)	818.05	536.16	771.75
Moisture Concentration(%v/v)	3.1	2.7	5.2
Moisture Concentration(%w/w)	2.0	1.7	3.3

Calculation: Particulate

Increase In Filter Weights(g)	0.00095	0.00091	0.00090
Particulate Emission(mg/Nm ³ dry)	1.53	2.24	1.56
Oxygen Concentration(%v/v dry)	16.84	18.17	16.51
Particulate Emission	3.71	8.00	3.49
(mg/Nm³ @ 11 %v/v Oxygen dry)			
Flue Gas Volumetric Flow(Nm ³ /h dry)	5662	3704	5236
Particulate Emission(g/h)	8.66	8.28	8.16
Required Sample Velocity(Nm/s)	16.35	10.69	15.12
Nozzle Used(mm)	3.5	3.5	3.5
Area of Nozzle(m ²)	0.00000962	0.00000962	0.00000962
Test Duration(mins)	60	60	60
Actual Sample Velocity(Nm/s)	17.91	11.77	16.66
Isokinetic Closure(%)	110	110	110
		110	

Calculation: HCl

Absorbent(mg/l as HCl)	7.00	4.70	6.6
Blank(mg/l as HCl)	0.22	0.22	0.22
Chloride Absorbed(mg/l as HCl)	6.78	4.48	6.38
Chloride Absorbed(mg as HCl)	3.39	2.24	1.60
HCl(mg)	3.39	2.24	1.60
HCl Emission(mg/Nm ³ dry)	5.46	5.49	2.76
Oxygen Concentration(%v/v dry)	16.84	18.17	16.51
HCl Emission	13.24	19.67	6.19
(mg/Nm³ @ 11 %v/v Oxygen dry)			
Flue Gas Volumetric Flow(Nm ³ /h dry)	5662	3704	5236
HCl Emission(g/h)	30.94	20.35	14.47

Canley Garden Crematorium Stream 2 Abatement System Outlet

Flue Gas Volumetric Flow

Contract Canley Garden Crematorium, DEM0940
Date 18th - 19th July 2016
Location Flue Gas Abatement System Outlet
Engineer(s) JB & ST

Test Log	Test 1	Test 2	Test 3
Flue Gas Temperature(Deg C)	113	100	101
Flue Gas Pitot Head Sample Points(Pa)	258.5	105.9	222.7
Flue Gas Moisture(%v/v)	3.1	2.7	5.2
Flue Gas Moisture(%w/w)	2.0	1.7	3.3
Flue Gas Duct Dimensions(mm)	350 mm Diameter Circular Stack		
Flue Gas Duct Area(m ²)	0.0962		

Calculation

Flue Gas Density(kg/m ³)	0.9068	0.9405	0.9313
<u>Sample Points</u>			
Flue Gas Velocity(Am/s)	23.88	15.01	21.87
Flue Gas Volumetric Flowrate(Am ³ /h)	8270	5198	7574
Flue Gas Volumetric Flowrate(Am ³ /h dry)	8012	5059	7178
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	5662	3704	5236
<u>Duct Mean</u>			
Flue Gas Velocity(Am/s)	23.56	14.81	21.57
Flue Gas Volumetric Flowrate(Am ³ /h)	8159	5128	7473
Flue Gas Volumetric Flowrate(Am ³ /h dry)	7904	4991	7082
Flue Gas Volumetric Flowrate(Nm³/h dry)	5586	3654	5166

Canley Garden Crematorium Stream 2 Abatement System Outlet

Data Log

19/07/16

Test 4

Time	Flue Gas °C	Meter °C	Flue O ₂ %v/v dry	Sample Point Pa
09:35	106	47.6	18.10	247.0
09:36	104	47.5	19.10	169.7
09:37	103	47.9	18.70	155.4
09:38	103	48.0	18.50	167.2
09:39	103	48.1	17.70	174.7
09:40	102	48.3	17.50	166.3
09:41	102	48.4	17.30	157.1
09:42	102	48.6	17.60	143.6
09:43	102	48.7	17.90	147.0
09:44	102	48.9	18.20	150.4
09:45	101	49.0	18.20	158.8
09:46	101	49.2	18.10	154.6
09:47	101	49.3	18.50	147.0
09:48	101	49.5	18.60	157.1
09:49	101	49.7	18.10	123.5
09:50	100	49.9	17.80	94.1
09:51	99	50.0	18.20	66.4
09:52	99	50.1	17.90	63.8
09:53	98	50.4	18.20	52.1
09:54	97	50.5	18.10	40.3
09:55	97	50.5	18.00	31.9
09:56	97	50.8	17.90	37.8
09:57	96	51.0	17.30	45.4
09:58	96	51.2	17.70	64.7
09:59	96	51.2	18.70	54.6
10:00	96	51.4	18.60	53.8
10:01	97	51.8	18.70	89.9
10:02	97	52.0	18.30	101.6
10:03	99	52.0	18.30	148.7
10:04	100	52.2	18.00	159.6
10:05	100	52.3	18.10	165.5
10:06	100	52.4	18.30	168.8
10:07	100	52.6	18.40	163.8
10:08	99	52.6	18.50	164.6
10:09	99	52.7	18.50	162.1
10:10	101	53.0	18.30	209.2
10:11	102	52.9	16.80	210.0
10:12	104	53.2	16.60	243.6
10:13	105	53.4	16.40	239.4
10:14	104	53.6	16.80	217.6
10:15	104	53.8	16.70	210.0

10:16	104	53.9	16.70	214.2
10:17	105	53.9	16.70	244.4
10:18	105	54.0	16.60	243.6
10:19	105	53.9	16.90	210.8
10:20	104	54.3	17.20	198.2
10:21	105	54.4	17.70	262.9
10:22	105	54.7	16.90	259.6
10:23	105	54.8	17.80	241.1
10:24	106	54.9	17.60	288.1
10:25	107	55.0	18.10	309.1
10:26	108	55.0	16.60	311.6
10:27	109	55.1	16.80	315.0
10:28	108	55.5	17.20	272.2
10:29	108	55.9	17.00	226.8
10:30	107	56.2	16.90	210.0
10:31	108	56.1	16.90	236.9
10:32	109	56.2	17.20	274.7
10:33	109	56.4	17.00	253.7
10:34	110	56.5	16.50	292.3
10:35	110	56.8	16.90	296.5
10:36	110	56.9	17.20	277.2
10:37	111	56.9	17.30	304.1
10:38	111	56.8	16.80	283.9
10:39	110	57.0	17.00	249.5
10:40	110	57.2	17.40	226.0
10:41	109	57.1	17.40	194.0
10:42	109	57.1	16.40	201.6
10:43	108	56.9	16.60	179.8
10:44	108	57.0	16.70	205.0
10:45	108	57.4	17.20	186.5
10:46	107	57.8	16.40	173.0
10:47	107	57.9	17.30	217.6
10:48	108	58.0	18.00	235.2
10:49	107	58.0	17.00	177.2
10:50	106	58.0	16.20	162.1
10:51	105	58.1	16.60	128.5
10:52	105	58.3	16.30	178.9
10:53	105	58.5	16.70	146.2
10:54	104	58.5	16.20	124.3
10:55	103	58.5	16.20	125.2
10:56	103	58.4	16.30	115.1
10:57	103	58.6	16.20	112.6
10:58	103	58.5	16.20	111.7
10:59	102	58.4	16.60	97.4
11:00	102	58.6	17.00	110.9
11:01	102	58.7	16.70	128.5
11:02	101	58.6	16.80	100.8
11:03	101	58.8	17.70	89.9
11:04	101	59.0	17.50	102.5

11:05	102	59.0	17.00	125.2
11:06	102	59.2	16.60	102.5
11:07	101	59.2	17.40	90.7
11:08	102	59.3	17.90	193.2
11:09	104	59.3	18.60	277.2
11:10	105	59.2	15.80	246.1
11:11	107	59.4	15.70	245.3
11:12	108	59.4	16.40	269.6
11:13	109	59.4	16.60	304.1
11:14	110	59.3	16.80	304.9
11:15	110	59.6	16.80	310.0
11:16	111	59.8	16.40	299.0
11:17	112	59.7	15.80	312.5
11:18	112	60.0	16.60	294.0
11:19	112	60.0	17.30	298.2
11:20	113	60.2	17.80	301.6
11:21	113	60.2	17.60	294.0
11:22	113	60.1	17.60	276.4
11:23	113	60.1	17.60	289.0
11:24	113	60.2	17.70	278.0
11:25	113	60.6	17.50	262.9
11:26	112	60.9	17.20	197.4
11:27	111	60.8	16.90	184.0
11:28	110	60.6	17.00	174.7
11:29	110	60.7	17.60	168.0
11:30	109	60.8	17.60	178.9
11:31	109	60.7	17.20	180.6
11:32	108	60.9	17.30	168.0
11:33	108	61.1	17.90	176.4
11:34	108	61.3	17.70	208.3
11:35	108	61.4	16.40	194.9
11:36	107	61.4	17.50	183.1
11:37	108	61.4	17.80	205.8
11:38	108	61.4	16.30	212.5
11:39	108	61.4	16.70	207.5
11:40	107	61.5	16.90	199.9
11:41	107	61.4	16.90	196.6
11:42	107	61.4	17.00	195.7
11:43	107	61.5	17.00	194.0
11:44	107	61.5	17.10	208.3
11:45	107	61.6	17.00	216.7
11:46	107	61.5	17.10	198.2
11:47	107	61.8	17.30	188.2
11:48	107	61.8	17.30	208.3
11:49	107	61.8	17.00	207.5
11:50	107	61.8	17.10	190.7
11:51	107	61.7	17.40	189.8
11:52	107	62.0	17.40	206.6
11:53	108	61.9	17.20	235.2

11:54	108	61.8	17.50	210.8
11:55	108	61.7	17.70	233.5
11:56	110	62.0	16.60	294.8
11:57	110	62.1	16.10	294.0
11:58	110	62.0	16.90	227.6
11:59	109	62.1	16.80	190.7
12:00	108	61.9	16.60	183.1
12:01	108	62.0	16.30	180.6
12:02	108	61.8	16.70	199.9
12:03	109	61.8	16.50	236.0
12:04	110	62.0	16.10	295.7
12:05	111	61.9	16.50	283.1
12:06	109	62.1	17.00	208.3
12:07	109	62.1	16.90	207.5
12:08	109	61.9	16.50	216.7
12:09	109	62.0	16.60	200.8
12:10	109	62.2	17.10	194.9
12:11	108	62.3	17.10	166.3
12:12	107	62.2	16.10	163.8
12:13	107	62.2	16.10	159.6
12:14	106	62.2	16.50	140.3
12:15	106	62.3	16.40	128.5
12:16	105	62.4	16.20	124.3
12:17	105	62.4	15.40	119.3
12:18	104	62.4	16.40	111.7
12:19	104	62.6	16.20	93.2
12:20	104	62.5	16.00	123.5
12:21	104	62.4	15.60	112.6
12:22	104	62.8	15.80	105.0
12:23	104	63.0	16.20	121.0
12:24	105	63.0	18.20	163.8
Average	106	57.4	17.16	190.2

Canley Garden Crematorium Stream 2 Abatement System Outlet

Mercury

Contract Canley Garden Crematorium, DEM0940
 Date 19th July 2016
 Location Flue Gas Abatement System Outlet
 Engineer(s) JB & ST
 Absorbent 4% K₂CR₂O₇ / 20% HNO₃ in H₂O

Test Log

Test 4

Barometric Pressure(kPa) 102.3
 Gas Meter Temperature(Deg C) 57.4
 Oxygen Concentration(%v/v dry) 17.16
 Flue Gas Volumetric Flow(Nm³/h dry) 4773

	Start	End
Time	09:35	12:24
Gas Meter Reading(Am ³ dry)	156.607	158.005
Absorber Weight(g)	3613.7	3659.4
Filter Reference	CA190716HgF2	
Filter Fraction Analysed	1	
Filter(µg as Hg)	0.11	
Filter Blank(µg as Hg)	0.02	
Probe Rinse Reference	Washed into Hg2A	
Probe Rinse Volume(ml)	0	
Probe Rinse(µg/l as Hg)	0	
Probe Rinse Blank(µg/l as Hg)	0	
Absorbent Reference	CA190716Hg2A&B	
Absorbent Volume(ml)	250	250
Absorbent(µg/l as Hg)	6.2	0.5
Absorbent Blank(µg/l as Hg)	0.5	0.5

Calculation: General

Barometric Pressure(kPa)	102.3
Gas Meter Temperature(Deg C)	57.4
Gas Volume Sampled(Am ³ dry)	1.398
Gas Volume Sampled(Nm ³ dry)	1.1665
Mass of Dry Gas(g @ 1292.8 g/Nm ³)	1508.08
Change in Absorber Weight(g)	45.7
Water Vapour Volume(Nm ³ @ 803.9 g/Nm ³)	0.0568
Gas Volume(Nm ³ wet)	1.2234
Mass of Wet Gas(g)	1553.78
Moisture Concentration(%v/v)	4.6
Moisture Concentration(%w/w)	2.9

Calculation: Mercury

Filter(μg as Hg)	0.09
Probe Rinse(μg as Hg)	0.00
Absorbent(μg as Hg)	1.43
Total Mercury Sampled(μg)	1.52
Mercury Emission($\mu\text{g}/\text{Nm}^3$ dry)	1.30
Oxygen Concentration(%v/v dry)	17.16
Mercury Emission	3.41
($\mu\text{g}/\text{Nm}^3$ @ 11 %v/v Oxygen dry)	
Flue Gas Volumetric Flowrate(Nm^3/h dry)	4773
Mercury Emission(g/h)	0.006
Required Sample Velocity(Nm/s)	13.97
Nozzle Used(mm)	3.0
Area of Nozzle(m^2)	0.00000707
Test Duration(mins)	169
Actual Sample Velocity(Nm/s)	16.28
Isokinetic Closure(%)	117

Canley Garden Crematorium Stream 2 Abatement System Outlet

Flue Gas Volumetric Flow

Contract	Canley Garden Crematorium, DEM0940
Date	19th July 2016
Location	Flue Gas Abatement System Outlet
Engineer(s)	JB & ST

Test Log

Test 4

Flue Gas Temperature(Deg C)	106
Flue Gas Pitot Head Sample Points(Pa)	190.2
Flue Gas Pitot Head Duct Mean(Pa)	185.1
Flue Gas Moisture(%v/v)	4.6
Flue Gas Moisture(%w/w)	2.9
Flue Gas Duct Dimensions(mm)	350 mm Diameter
Flue Gas Duct Area(m ²)	0.0962

Calculation

Flue Gas Density(kg/m ³)	0.9220
<u>Sample Points</u>	
Flue Gas Velocity(Am/s)	20.31
Flue Gas Volumetric Flowrate(Am ³ /h)	7034
Flue Gas Volumetric Flowrate(Am ³ /h dry)	6708
Flue Gas Volumetric Flowrate(Nm ³ /h dry)	4838
<u>Duct Mean</u>	
Flue Gas Velocity(Am/s)	20.04
Flue Gas Volumetric Flowrate(Am ³ /h)	6940
Flue Gas Volumetric Flowrate(Am ³ /h dry)	6618
Flue Gas Volumetric Flowrate(Nm³/h dry)	4773

APPENDIX 2

Analysis Reports



Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2404

Report Number: 589046-1

Date of Report: 02-Aug-2016

Customer: Davies & Co (Environmental)
Moor Road
Leeds
LS10 2DD

Customer Contact: . Reports

Customer Job Reference:
Customer Purchase Order: 50001288
Date Job Received at SAL: 29-Jul-2016
Date Analysis Started: 29-Jul-2016
Date Analysis Completed: 02-Aug-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with SAL SOPs

All results have been reviewed in accordance with Section 25 of the SAL Quality Manual



Report checked
and authorised by :
Michael Goodman
Project Manager

Issued by :
Michael Goodman
Project Manager

Signature valid

Digitally signed by Michael Goodman
Date: 2016.08.02 15:58:09 BST
Reason: Issue
Location: SAL

Page 1 of 2

589046-1

SAL Reference: 589046									
Customer Reference:									
Impinger(DI water) Analysed as Impinger(DI water)									
Miscellaneous									
SAL Reference		589046 001	589046 002	589046 003	589046 004	589046 005			
Customer Sample Reference		CA181716 H21	CA181716 H22	CA190716 H23A	CA190716 H23B	CA190716 H11			
Test Sample		AR	AR	AR	AR	AR			
Determinand	Method	LOD	Units	Symbol					
Hydrogen Chloride	IC	0.05	mg/l	U	(13) 7.0	(13) 4.7	(13) 6.3	(13) 0.30	(13) 1.6

SAL Reference: 589046									
Customer Reference:									
Impinger(DI water) Analysed as Impinger(DI water)									
Miscellaneous									
SAL Reference		589046 006	589046 007	589046 008	589046 009				
Customer Sample Reference		CA190716 H12	CA200716 H13A	CA200716 H13B	CA200716 HOB				
Test Sample		AR	AR	AR	AR				
Determinand	Method	LOD	Units	Symbol					
Hydrogen Chloride	IC	0.05	mg/l	U	(13) 2.2	(13) 2.3	(13) 0.22	(13) 0.22	

SAL Reference: 589046									
Customer Reference:									
Filter Analysed as Filter									
Miscellaneous									
SAL Reference		589046 010	589046 011	589046 012					
Customer Sample Reference		CA190716 HGF2	CA200716 HGF1	CA200716 HGFBLANK					
Test Sample		AR	AR	AR					
Determinand	Method	LOD	Units	Symbol					
Mercury	CVAFS (HF Digest BS EN 13211)	0.01	µg	U	0.11	0.02	0.02		

SAL Reference: 589046									
Customer Reference:									
Impinger (4%K2Cr2O7/20%HNO3) Analysed as Impinger (4%K2Cr2O7/20%HNO3)									
Miscellaneous									
SAL Reference		589046 013	589046 014	589046 015	589046 016	589046 017			
Customer Sample Reference		CA190716 HG2A	CA190716 HG2B	CA200716 HG1A	CA200716 HG1B	CA200716 HGABLANK			
Test Sample		AR	AR	AR	AR	AR			
Determinand	Method	LOD	Units	Symbol					
Mercury	CVAFS (BS EN 13211)	0.5	µg/l	U	6.2	<0.5	9.3	<0.5	<0.5

Index to symbols used in 589046-1

Value	Description
AR	As Received
13	Results have been blank corrected.
U	Analysis is UKAS accredited

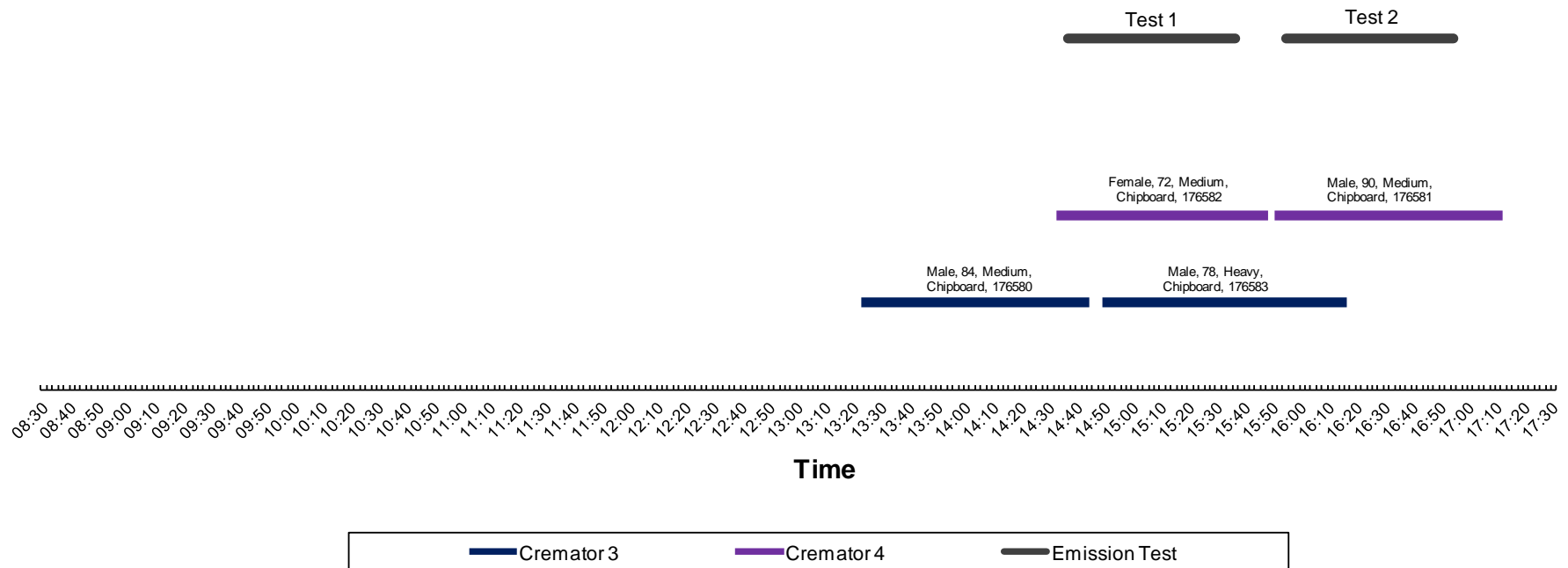
Particulate Weight Determination

Filter / Rinse Reference		Clean Dry Weight g	Dirty Dry Weight g
CA180716F21	B11	0.54077	0.54154
CA180716F22	B12	0.53670	0.53744
CA190716F23	B13	0.54232	0.54305
CA180716R21	1	75.54642	75.54660
CA180716R22	2	75.54660	75.54677
CA190716R23	3	75.54677	75.54694
CA190716F11	B14	0.53370	0.53449
CA190716F12	B15	0.53501	0.53597
CA200716F13	B16	0.54035	0.54127
CA190716R11	1	78.30363	78.30381
CA190716R12	2	78.30381	78.30402
CA200716R13	3	78.30402	78.30423

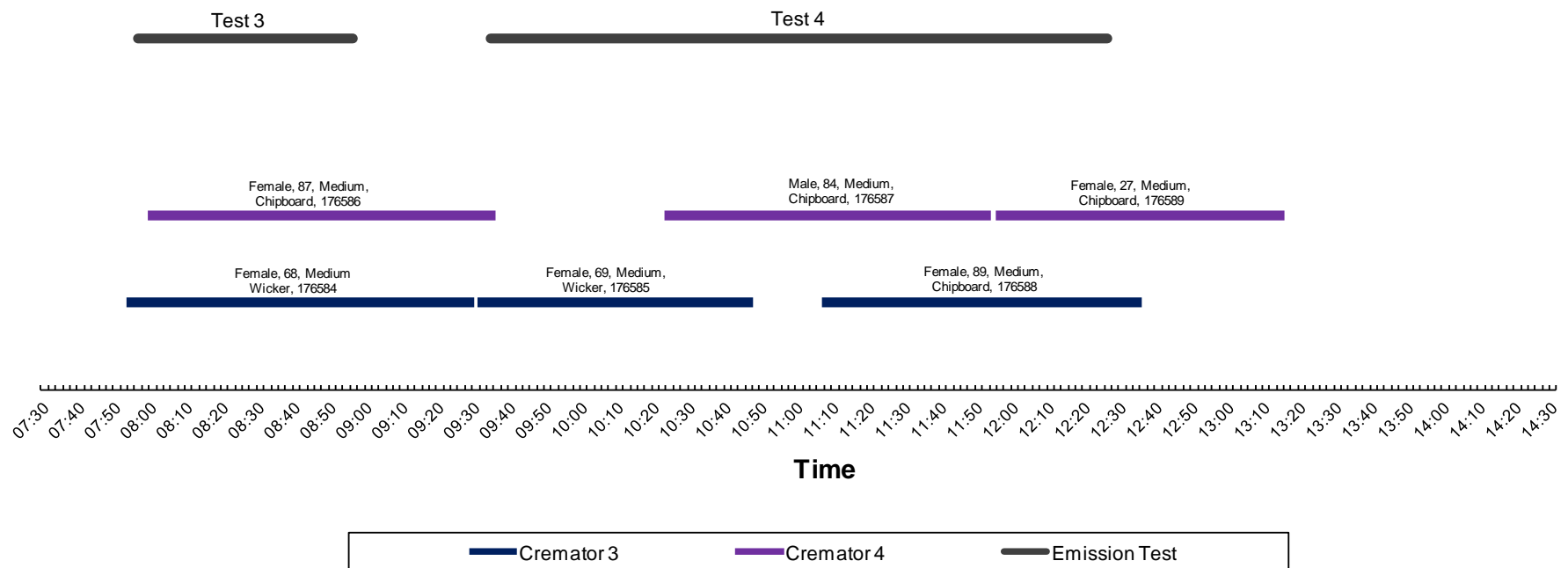
APPENDIX 3

Details of Plant Operation During Testing

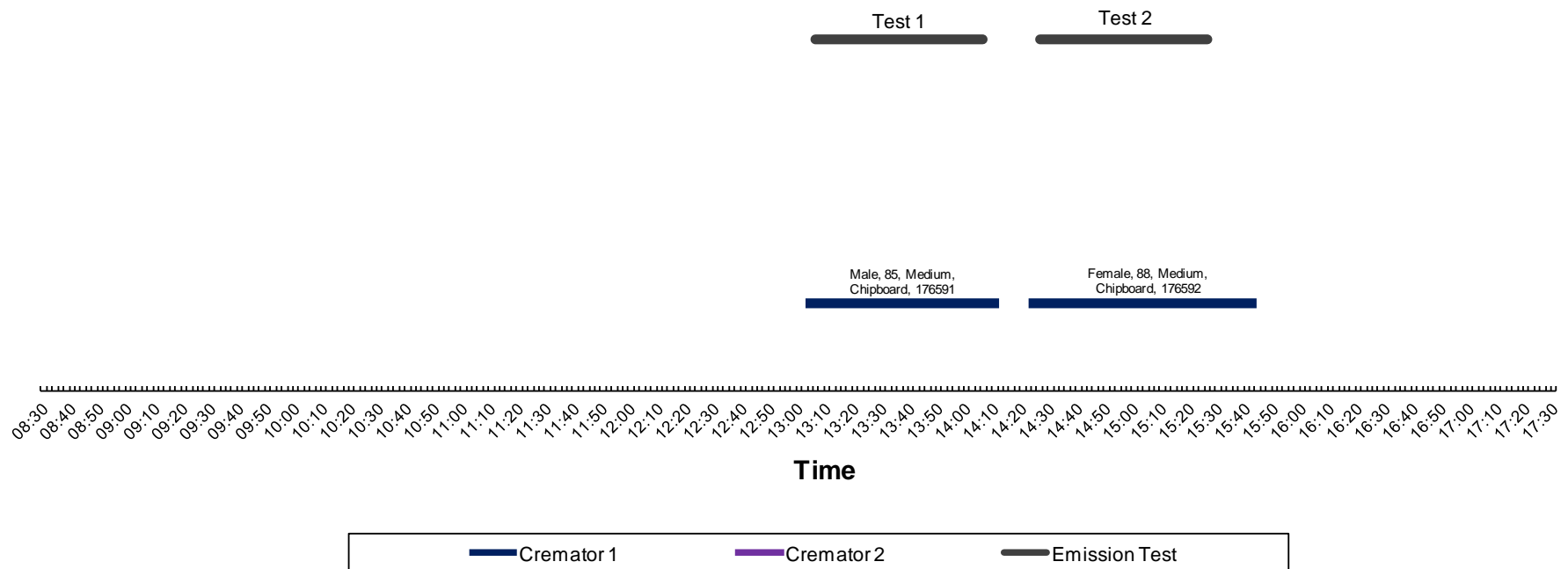
Canley Garden Crematorium Cremators 3 & 4 (Stream 2) Emission Tests 18/07/2016 Plant Operation & Test Periods



Canley Garden Crematorium Cremators 3 & 4 (Stream 2) Emission Tests 19/07/2016 Plant Operation & Test Periods



Canley Garden Crematorium Cremators 1 & 2 (Stream 1) Emission Tests 19/07/2016 Plant Operation & Test Periods



Canley Garden Crematorium Cremators 1 & 2 (Stream 1) Emission Tests 20/07/2016 Plant Operation & Test Periods

