



**Transforming waste™**

**The Environmental Permitting (England  
and Wales) Regulations 2010**

**Permit: EPR/FP3134GU  
Ardley Energy from Waste Facility**

**Annual Performance Report 2016**

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## Quality Assurance

This report has been prepared with all reasonable skill, care and diligence. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

### **Report Details**

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## **1. Introduction**

Ardley Energy from Waste (EfW) facility is located close to junction 10 of the M40. The facility has a design capacity to process 326,000 tonnes per year of residual municipal waste and has the capability of generating 26.9MW of electricity.

In accordance with the requirements of Condition 4.2.2, Schedule 4 and Table S5.1, Schedule 5 of Permit EPR/FP3134GU issued by Environment Agency to Viridor Waste Management Limited (Viridor) on 29<sup>th</sup> September 2010, Viridor is required to produce an annual performance report which is to be submitted to the Environment Agency by the 31<sup>st</sup> March as agreed in writing with the Environment Agency of each year.

This report summarises the environmental and performance data collected at the site 1<sup>st</sup> January 2016 – 31<sup>st</sup> December 2016 and fulfils the requirement of Chapter IV, Article 55(2) of the Industrial Emissions Directive.

The report will cover the following areas of environmental and performance monitoring:

- Section 2 – Point Source Emissions to Air
- Section 3 – Point Source Emissions to Water
- Section 4 – Residue Quality Monitoring Requirements
- Section 5 – Performance Parameters

## **2. Point Source Emissions to Air**

### **2.1. Introduction**

Permit Condition 3.5.1(a) and Tables S4.1 and S4.1(a) require Viridor to undertake performance monitoring of the point source emissions to air arising at sample points A1 and A2.

A summary of the point source emissions to air monitoring data at sample point A1 and A2 for the period is included as Table 1 and 2.

Viridor note, in line with Permit Variation dated 21 April 2015; 30 minute carbon monoxide monitoring was replaced with CO 10 minute average monitoring.

### **2.2 Commentary on Data**

The recorded concentrations remained compliant with the limits set out in Permit Tables S4.1 and S4.1(a) during the review period, with the exception of those listed in 2.3 below. During the 2015 period, Line 1 was operational 89.4% of the time and Line 2 91.5 %.

Note 1: In line with the Permit, periodic testing is now undertaken biannually. Further to this, detail of periodic sampling timings, uncertainty and method used have previously been supplied to the Environment Agency within the 2016 quarterly reports.

Note 2: Results recorded by both, periodic and continuous monitoring are within the range expected for the energy recovery operation, with exception to the exceedances detailed in 2.3 below.

### **2.3 Schedule Notices Issued**

23<sup>rd</sup> March 2016 – Failure of VOC measuring system to restart after outage.

5<sup>th</sup> April 2016 – SO<sub>2</sub> half hour breach stack A1 (reaching 259mg/m<sup>3</sup>) peak related to combustion conditions. CAR for FP3134GU/0261803 received (CCS3).

16<sup>th</sup> May 2016 – VOC half hour breach stack A1 (reaching 25.93mg/m<sup>3</sup>) related to complete transformer loss and plant trip. CAR form FP3134GU/0264255 received (CCS 3).

16<sup>th</sup> September 2016 - Failure of VOC measuring system to restart due to air supply fault after complete site blackout.

**Table 1: Emissions to Air from A1 and A2 (Continuous)**

**Point A1**

Releases to Air from Incinerators – Continuous Monitoring												
Parameter	Limit	Reference Period	A1 Quarter 1		A1 Quarter 2		A1 Quarter 3		A1 Quarter 4		Test Method	Uncertainty *
			Max	Avg	Max	Avg	Max	Avg	Max	Avg		
Oxides of nitrogen	200 mg/m <sup>3</sup>	Daily average	160	150	159	148.4	177	150.0	158	148.11	BS EN 15267-3	*
	400 mg/m <sup>3</sup>	½ hourly average	292	150	295	149	241	149.7	265	148		*
Particulate Matter	10 mg/m <sup>3</sup>	Daily average	1	1	2	1	1	1	1	1		*
	30 mg/m <sup>3</sup>	½ hourly average	1.7	1	1	1	1	1	4	1		*
TOC	10 mg/m <sup>3</sup>	Daily average	1	1	1	1	1	1	2	1.05		*
	20 mg/m <sup>3</sup>	½ hourly average	10	1	26 <sup>\$</sup>	1	7	1	4	1		*
Hydrogen chloride	10 mg/m <sup>3</sup>	Daily average	6	4.6	7.6	6.0	9	6.32	6	5.03		*
	60 mg/m <sup>3</sup>	½ hourly average	17	4	23	6.0	24	6.3	19	5		*
Sulphur dioxide	50 mg/m <sup>3</sup>	Daily average	30	20.1	31	18.9	26	14.8	21	13.56		*
	200 mg/m <sup>3</sup>	½ hourly average	73	20	259 <sup>\$\$</sup>	19	116	15	96	13.3		*
Carbon monoxide	50 mg/m <sup>3</sup>	Daily average	28	8.2	10	7.4	17	8.6	20	9.24		*
	150 mg/m <sup>3</sup>	10 minute average	65	9	19	7.3	33	9	24	9.3		*

[1] Note: CEMS data figures are adjusted for the method of uncertainty

[2] Note: Schedule 6 completed 16/5/2016

[3] Note: Schedule 6 completed 5/4/2016

## Point A2

Releases to Air from Incinerators – Continuous Monitoring												
Parameter	Limit	Reference Period	A2 Quarter 1		A2 Quarter 2		A2 Quarter 3		A2 Quarter 4		Test Method	Uncertainty *
			Max	Avg	Max	Avg	Max	Avg	Max	Avg		
Oxides of nitrogen	200 mg/m <sup>3</sup>	Daily average	162	150	180	149.8	180	150.6	162	148.39	BS EN 15267-3	*
	400 mg/m <sup>3</sup>	½ hourly average	292	150	341	150.6	321	150.7	297	148.7		*
Particulate Matter	10 mg/m <sup>3</sup>	Daily average	1	1	2	1	1	1	1	1		*
	30 mg/m <sup>3</sup>	½ hourly average	1	1	1	1	2	1	1	1		*
TOC	10 mg/m <sup>3</sup>	Daily average	1	0.3	1	1	1	1	1	0.77		*
	20 mg/m <sup>3</sup>	½ hourly average	2	1	7	1	5	1	19.6	1		*
Hydrogen chloride	10 mg/m <sup>3</sup>	Daily average	7	5.4	7	5.3	9	5.7	6	5.66		*
	60 mg/m <sup>3</sup>	½ hourly average	24	5	24	5.3	24	5.7	21	5.7		*
Sulphur dioxide	50 mg/m <sup>3</sup>	Daily average	23	9.6	48	16.7	20	13.1	24	14.28		*
	200 mg/m <sup>3</sup>	½ hourly average	64	11	118	16	83	13	71	14.3		*
Carbon monoxide	50 mg/m <sup>3</sup>	Daily average	17	7.6	13	7.6	16	7.9	11	7.97		*
	150 mg/m <sup>3</sup>	10 minute average	19	8	24	8.6	16	8	18	8		*

\* Note. CEMS data figures are adjusted for the method uncertainty.

**Table 2: Emissions to Air from A1 and A2 (Periodic) - Biannual**

Releases to Air from Incinerators – Periodic Monitoring									
Substance / Parameter	Emission Limit Value	A1				A2			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Nitrous oxide	-	22.1	N/A	13.2	N/A	15.4	N/A	22.4	N/A
Hydrogen fluoride	1 mg/m <sup>3</sup>	<0.052	N/A	<0.012	N/A	<0.067	N/A	0.012	N/A
Cd and Th and their compounds	0.05 mg/m <sup>3</sup>	0.00094	N/A	<0.0009	N/A	0.00082	N/A	0.000080	N/A
Hg and its compounds	0.05 mg/m <sup>3</sup>	<0.00040	N/A	0.0019	N/A	<0.00036	N/A	0.0025	N/A
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V and their compounds	0.5 mg/m <sup>3</sup>	0.41	N/A	0.070	N/A	0.22	N/A	0.083	N/A
Dioxins & Furans (I-TEQ)	0.1 ng/m <sup>3</sup>	0.0022	N/A	0.032	N/A	0.0022	N/A	0.028	N/A
PCBs (WHO-TEQ Humans / Mammals)	None set ng/m <sup>3</sup>	0.00042	N/A	0.00066	N/A	0.00042	N/A	0.0000071	N/A
PCBs (WHO-TEQ Fish)	None set ng/m <sup>3</sup>	0.000019	N/A	0.000033	N/A	0.000019	N/A	0.0000038	N/A
PCBs (WHO-TEQ Birds)	None set ng/m <sup>3</sup>	0.00099	N/A	0.0026	N/A	0.0010	N/A	0.0016	N/A
Anthanthrene	None set	<0.011	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A

	$\mu\text{g}/\text{m}^3$								
Benzo(a)anthracene	None set $\mu\text{g}/\text{m}^3$	0.069	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Benzo(a)pyrene	None set $\mu\text{g}/\text{m}^3$	<0.011	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Benzo(b)fluoranthene	None set $\mu\text{g}/\text{m}^3$	0.10	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Benzo(b)naptho(2,1-d)thiophene	None set $\mu\text{g}/\text{m}^3$	<0.011	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Benzo(c)phenanthrene	None set $\mu\text{g}/\text{m}^3$	0.023	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Benzo(ghi)perylene	None set $\mu\text{g}/\text{m}^3$	0.023	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Benzo(k)fluoranthene	None set $\mu\text{g}/\text{m}^3$	0.069	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Cholanthrene	None set $\mu\text{g}/\text{m}^3$	<0.011	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Chrysene	None set $\mu\text{g}/\text{m}^3$	0.15	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Cyclopenta(cd)pyrene	None set $\mu\text{g}/\text{m}^3$	0.023	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Dibenzo(ai)pyrene	None set $\mu\text{g}/\text{m}^3$	<0.011	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Dibenzo(ah)anthracene	None set $\mu\text{g}/\text{m}^3$	<0.011	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A



Fluoranthene	None set $\mu\text{g}/\text{m}^3$	0.39	N/A	0.026	N/A	0.013	N/A	0.024	N/A
Indeno(123- cd)pyrene	None set $\mu\text{g}/\text{m}^3$	0.023	N/A	<0.013	N/A	<0.013	N/A	0.012	N/A
Naphthalene	None set $\mu\text{g}/\text{m}^3$	0.64	N/A	0.23	N/A	0.72	N/A	0.18	N/A

### **3. Point Source Emissions to Water**

#### **3.1. Introduction**

Permit Condition 3.5.1(a) and Table S4.2 requires Viridor to ensure sample point W1 is free of oil, grease and visible solids

#### **3.2 Commentary on Data**

Periodic checks on the monitoring point W1 have indicated that the sample point has remained free of oil grease and visible solids.

#### **3.3 Schedule Notices Issued**

No Permit limit exceedances were recorded during the review period for emissions to water.

## **4. Residue Quality Monitoring Requirements**

### **4.1 Introduction**

Permit Condition 3.5.1(c) and Table S4.4 require Viridor to undertake residue quality monitoring at minimum monthly intervals for both bottom ash and air pollution control residues.

### **4.2 Commentary on Data**

#### **Incinerator Bottom Ash**

Figures shown in Table 3 are an average of the analysis undertaken during 2016 which has followed the criteria laid out in the ESA protocol.

Results recorded for incinerator bottom ash are within the expected range for an energy recovery facility.

#### **Air Pollution Control Residues**

Figures displayed in Table 3 are an average of the analysis undertaken during 2016.

Results recorded for air pollution control residues are within the expected range for an energy recovery facility.

### **4.3 Schedule Notices Issued**

No Permit limit exceedances were recorded during the review period for residue quality.

**Table 3: Residue Quality - IBA**

Residue quality									
Parameter	Limit	Normal Operation							
		Q1		Q 2		Q 3		Q 4	
		Line 1	Line 2	Line 1	Line 2	Line 1	Line 2	Line 1	Line 2
Total Organic Carbon	3%	1.1	1.3	1.3	1.1	0.61	0.41	1.0	1.3
Antimony (mg/kg)	---	110		192		71.6		121	
Cadmium (mg/kg)	---	19.7		46.9		9.33		11.1	
Thallium (mg/kg)	---	<0.1		<0.1		0.09		<0.1	
Mercury (mg/kg)	---	<0.5		<0.5		0.43		<0.5	
Lead (mg/kg)	---	349.5		795.6		413		470.1	
Chromium (mg/kg)	---	146		128		145		153	
Copper (mg/kg)	---	1896.7		1741.6		1820		1783.7	
Manganese (mg/kg)	---	907		750		1171		757	
Nickel (mg/kg)	---	115.9		61.8		167		114.3	
Arsenic (mg/kg)	---	17.9		20.3		8.54		15.2	
Cobalt (mg/kg)	---	31.0		30.9		69.8		52.3	
Vanadium (mg/kg)	---	101		50.7		24.8		62.0	
Zinc (mg/kg)	---	2717.8		3267.2		2451		3142.9	
Dioxins WHO-TEQ (ng/kg)	---	4.48		5.696		2.19		3.39	
Furans (WHO-TEQ) (ng/kg)		4.53		6.022		2.79		2.82	
PCB (WHO-TEQ) Humans (ng/kg)	---	1.86		0.533		0.17		0.97	

**Table 4: Residue Quality - APCr**

Residue quality					
Parameter	Limit	Normal Operation			
		Q1	Q 2	Q 3	Q 4
Antimony (mg/kg)	---	744	1059	948	946
Cadmium (mg/kg)	---	255	351	277	221
Thallium (mg/kg)	---	1.05	1.57	0.97	0.83
Mercury (mg/kg)	---	9.9	11.5	9.62	10.8
Lead (mg/kg)	---	1631	3113	1877	1707
Chromium (mg/kg)	---	45.3	53.1	44.3	61.9
Copper (mg/kg)	---	513	709	581	644
Manganese (mg/kg)	---	390	368	389	374
Nickel (mg/kg)	---	21.4	20.1	14.0	28.2
Arsenic (mg/kg)	---	67.0	69.7	55.9	56.8
Cobalt (mg/kg)	---	7.1	7.5	6.3	12.6
Vanadium (mg/kg)	---	26.0	14.1	<10	15.9
Zinc (mg/kg)	---	13290	17320	15500	13200
Dioxins WHO-TEQ (ng/kg)	---	2234.8	409.81	134.44	184.06
Furans (WHO-TEQ) (ng/kg)	---	1249.25	683.53	204.19	308.87
PCB (WHO-TEQ) Humans (ng/kg)	---	300.1	10.08	5.60	8.50

## 5. Performance Parameters

### 5.1 Introduction

Condition 4.2.2(b), (c), Table S5.2 and S5.3 of the Permit set out the reporting criteria for performance parameters.

### 5.2 Commentary on Data

The recorded performance data is set out in Tables 4; 5; 6 and 7.

**Table 4: Energy 1**

Parameter	Total (MWh)	Specific usage (MWh / tonne incinerated)
Electricity generated	221460 MWh	0.73 MWh/tonne
Electricity exported to the National Grid	195525 MWh	0.64 MWh/tonne
Energy exported as heat (if any)	0	0
Energy usage*	26577 MWh	0.08 MWh/tonne

\* Note. Includes imported and parasitic usage

**Table 5: Performance 1**

Parameter	Units	
Water Usage	m <sup>3</sup> /tonne waste incinerated	0.0988 (30030m <sup>3</sup> used)
Gas oil consumption	kg/tonne waste incinerated	1.85 kg/tonne (654000 litres/ 562440 tonnes used)
Total Urea used	kg/tonne waste incinerated	1.97 kg/tonne (600 tonnes used)
Total acid abatement reagent used (Lime)	kg/tonne waste incinerated	9.77 kg/tonne (2970 tonnes used)
Total Powdered Activated Carbon used	kg/tonne waste incinerated	0.349 kg/tonne (106 tonnes used)
Total Air Pollution Control residues disposed of	kg/tonne waste incinerated	20.38 kg/tonne (6195.68 tonnes produced)
Total bottom ash generated	kg/tonne waste incinerated	179.15 kg/tonne (54472 tonnes produced)

Total bottom ash recycled – ash as IBAA and metals recycled separately - total	kg/tonne waste incinerated	All ash reprocessed /recycled
Total bottom ash disposed of	kg/tonne waste incinerated	0

**Table 6: Production 1**

Parameter	Units	
Total mass of waste accepted	Tonnes	303625.5
Total mass of separately collected fractions	Tonnes	0
Municipal waste incinerated	Tonnes	218970 tonnes (72%) is local authority municipal (304063 total waste)
Electricity generated	MWh	221460 MWh
Electricity exported	MWh	195525 MWh

**Table 7: Water Usage 1**

Parameter	Units	
Mains water usage	m <sup>3</sup>	30030
Mains water usage	Litres/tonne waste incinerated	0.0987