MVV Environment Ridham Ltd

Ridham Dock Biomass Facility

Annual Report 2016

27th February 2017/v1

TABLE OF CONTENTS

LIST OF TABLES

1 INTRODUCTION

This document provides the Annual Report for MVV Environment Ridham Dock Biomass Facility and has been submitted in accordance with the requirements of Condition 4.2.2 and Schedule 4 – Table S4.1 Reporting of Monitoring data, specifically 'Functioning and monitoring of the incineration plant as required by condition 4.2.2' of Ridham Dock Biomass Facility's Environmental Permit EPR/TP3536CL.

Permit Condition 4.2.2 requires the operator to provide;

Report or reports on the performance of the activities over the previous year shall be submitted to the Environment Agency by 31 January (or other date agreed in writing by the Environment Agency) each year. The report(s) shall include as a minimum:

(a) a review of the results of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data;

(b) the annual production/ treatment data set out in schedule 4 table S4.2;

(c) the performance parameters set out in schedule 4 table 4.3 using the forms specified in table S4.4 of that schedule;

(d) the functioning and monitoring of the incineration plant in a format agreed with the Environment Agency. The report shall, as a minimum requirement, (as required by Article 12(2) of the Waste Incineration Directive) give an account of the running of the process and the emissions into air and water compared with the emission standards in the WID.'

This report is being submitted after the 31st January following agreement with the site's Environment Agency Officer (Jolanta Diver).

In the absence of an EA template (which is understood to be in production), this report has been draft to a structure previous submitted, and approved at other similar facilities.

2 FACILITY INFORMATION

OPERATOR	MVV Environment Ridham Ltd
NAME OF FACILITY	Ridham Dock Biomass Facility
EPR PERMIT NUMBER	EPR/TP3536CL
FACILITY ADDRESS	Ridham Dock, Sittingbourne, Kent, ME9 8SR
TELEPHONE NUMBER	01795 342150

Development of the Ridham combined heat and power (CHP) biomass facility commenced in January 2012 and construction was completed in 2014. Commissioning was undertaken in two stages with the optimisation phase commencing once the commissioning two stages had been completed.

The cold commissioning stage covered the powering of electrical systems and other elements of the process, such as motors and drives, first distinct, and then coupled accordingly. This was to ascertain aspects such as functionality, correct voltages, control valve operation, insulation resistance, emergency stop effectiveness, reliability and calibration.

The hot commissioning stage commenced on the 1st December 2014 and was scheduled to conclude on the 25th May 2015 however a series of delays were encountered, resulting in the commissioning period being extended to the 15th September 2015.

Throughout the hot commissioning process a series of tests were undertaken on the facility to gradually increase the load, and transferring from use of fuel oils to biomass, to ensure it was performing as intended and to optimise the process up to full load.

The facility specialises in the generation of energy from renewable biomass sources. The Facility is the second in the UK built by MVV Umwelt of Germany who have extensive experience of waste management over the last 50 years.

The biomass facility is designed to process around 172,000 tonnes per annum of waste wood from various sources with a net electrical capacity of 23 megawatts.

The facility is capable of generating approximately 188 million kilowatt-hours of electrical energy, heat energy from the CHP process is typically used in district heating systems and as process steam for industrial purposes, though this element is currently not developed.

The fuel consists of old and used wood (processed wood and wood with slight to medium contamination such as chipboard, fibreboard and old furniture, and wood from building sites and demolished buildings) from the surrounding region. These types of wood usually cannot be re-used and have largely been exported to the continent for use in similar energy from waste facilities.

Biomass is an important part of a global clean power generation solution and biomass power plants divert non – recyclable wood waste away from landfills in order to reduce atmospheric release of methane and potent greenhouse gas.

2.1 Technical details of the facility:

- Maximum Permitted throughput – 181,800 tonnes per annum with a blended calorific value of 10-16MJ/kg
- Feedstock storage capacity – 6000t
- Flue gas treatment – urea, lime and activated carbon followed by needle felt filter bags, discharging via a 90-metre-high stack with a diameter of 1.95m
- Energy produced – Design gross generating capacity is 25MW
- Steam output – At present there are no steam outputs from the facility.

The Ridham Dock biomass facility provides a sustainable alternative the landfilling of waste wood which cannot be otherwise recycled.

The facility is regulated by the Environment Agency and operates in accordance with an integrated management system which is externally certified by a UKAS accredited assessment body (DEKRA/AFNOR) in compliance with the following standards:

- ISO 9001
- ISO 14001,
- BS OHAS 18001
- ISO 50001

3 OPERATIONAL INFORMATION

The facility commenced operation in September 2015. Prior to August 2016 unplanned shutdowns lead to intermittent operation. Investigations were undertaken and issues identified, primarily relating to the evaporator which forms part of the boiler system. As a result improvements were identified, and modifications were carried out during a planned annual outage between the 16th May 2016 and the 10th June 2016.

Since August 2016 the availability of the facility has been significantly improved and has been running as scheduled.

Detailed below in Table 1 is the annual production / treatment data in accordance with condition 4.2 and as set out in Schedule 4, Table S4.2 of the Environmental Permit.

Table 1 : Operational Details

Operational hours	6740	Hours
Total Waste Accepted on site	141026	Tonnes
Total Waste Incinerated	141026	Tonnes
Electrical Energy produced	171542.8	MWhrs
Electricity Energy exported	148078.3	MWhrs
Thermal Energy produced	502075.8	MWhrs
Waste heat utilised by the installation	0	MWhrs
Waste Heat utilised off site	0	MWhrs

3.1 Performance parameters

Detailed below in Table 2 is the performance parameters in accordance with condition 4.2 and as set out in Schedule 4, Table 4.3 of the Environmental Permit.

In the EA Compliance Assessment Report (CAR) dated 9th January 2017 it was confirmed that performance parameters could be reported *per tonne of waste incinerated (gross weight – as received)* rather than *per tonne of waste incinerated (dry basis)*.

Table 2 : Performance Parameters

Parameter	Q1	Q2	Q3	Q4	Units
Waste incinerated (gross weight)	39474	22342	32593	46617	tonnes
Electrical energy exported by the installation	1017	1062.5	1034	1088.61	kWhrs/t[1]
Electrical energy imported by the installation	63.2	36.91	30.41	8.23	kWhrs/t[1]
Electrical energy used by the installation	169	151.7	137.96	114.8	kWhrs/t[1]
Heat Steam exported, imported and used by the installation	0	0	0	0	kWhrs/t[1]

1 Specific Per tonne of waste wood incinerated (gross weight – as received).

Parameter	Q1	Q2	Q3	Q4	Units
Light fuel oil consumption	4.7	11	5.11	1.05	Kgs/t[1]
Mass of bottom ash/boiler ash produced	56	56	46	49	Kgs/t[1]
Mass of APC residues produced	12.8	13.2	9.41	10.9	Kgs/t[1]
Mass of Other solid residues produced	4.73	5.7	4.84	3.94	Kgs/t[1]
Solid Urea consumption	1.8	1.53	1.46	1.59	Kgs/t[1]
Activated carbon consumption	0.28	0.29	0.27	0.28	Kgs/t[1]
Total sodium bicarbonate/lime Consumption	3.43	3.85	2.81	2.5	Kgs/t[1]
Water consumption	25	34	25.5	17	Litres/t[1]
Periods of WID abnormal operation	0	0	0	0	No of occasions
	0	0	0	0	Cumulative hours for current calendar year for each line

3.2 Solid Residue Outputs

3.2.1 Residue Quality

Residue quality is monitored in accordance with condition 3.5 and the parameters detailed in Schedule 3, Table S3.4 of the Environmental Permit. Data is reported monthly in the first year of operation and subsequently quarterly in accordance with the reporting period schedule detailed in Schedule 4, Table 4.1.

During an internal reporting review, gaps in data sets were identified and it was proposed in an email to the Environment Agency on 1st of February 2017 that monthly monitoring, and reporting, continue in order to ensure a complete data set for Incinerator Bottom Ash (IBA) and Air Pollution Control residues (APCr) residue quality is provided.

Loss on ignition (LOI) results for IBA identified one instance where levels exceeded the <5% limit set in Schedule 3, Table 3.4 of the Environmental Permit, with a result of 5.18% noted in February 2016. This information was discussed with operational staff at the time and improvements to grate control & combustion air distribution were made. The operator is confident that improvements to operations now ensure compliance in this regard. This is borne out by subsequent analysis results.

Due to an administrative error this was not reported to the Environment Agency at the time. Training and improvements to the internal reporting system have been made, to ensure that the Environment Agency will be made aware of any future breaches in accordance with condition 4.3.1.

IBA and APC residues were monitored throughout 2016 for the following metals;

- Antimony
- Cadmium
- Thallium
- Mercury
- Lead
- Chromium
- Copper
- Manganese
- Nickel
- Arsenic
- Cobalt
- Vanadium
- Zinc

During May 2016 the facility underwent a shutdown period which, due to a lack of residues being generated from incineration process, meant solid residue outputs were not sampled. Routine sampling recommenced upon commencement of operations in June 2016.

Due to communication issues with the laboratory carrying out the analysis of solid residue outputs, analysis of dioxins/furans and dioxin-like PCBs in IBA did not commence until April 2016, and for APCr from July 2016 onwards.

As previously mentioned in order to ensure complete data sets are available, MVV Ridham Ltd have proposed to continue the monthly sampling schedule until at least July 2017.

Improvements have been made to the system for sampling, analysis and recording of samples and going forward all parameters will be monitored.

3.2.2 Disposal of solid residue outputs

Incinerator Bottom Ash (IBA) is currently transported to Whitemoss Hazardous Landfill (EPR/DP3639LM) located in Skelmersdale, Lancashire. Prior to this IBA was disposed of at Augean's East Northants Resource Management Facility, Stamford Road, Kings Cliffe PE8 6XX.

Trial loads of IBA were transported to Whitemoss Hazardous Landfill on the 2nd March 2016 with disposal at both the Augean site and the Whitemoss site. As part of the due diligence process, disposal at the two sites continued for approximately 1 month. Following a compliance visit to the Whitemoss, the decision was made to send all IBA for disposal at the Whitemoss site from the end of April 2016.

Augean East Northants Resource Management Facility Stamford Road Kings Cliffe PE8 6XX, was used to dispose of a total of 11 loads over the 2016 Christmas period due to disposal availability. The disposal of IBA at the Whitemoss hazardous landfill recommenced in 2017.

All IBA removed from site is currently consigned as hazardous waste and undergoes a Hazard Assessment carried out by WRc in order to classify the residue correctly.

A total of 7217 tonnes of IBA were removed from site in 2016[2]

The fine particulate matter, known as Air Pollution Control Residue (APCr), is removed from the process and stored in sealed silos ready for collection. The APCr is sent to Augean's King's Cliffe site located in Peterborough, where it is stabilised before final disposal in the landfill.

All APCr removed from site is currently consigned as hazardous waste and undergoes a Hazard Assessment carried out by WRc in order to classify the residue correctly.

A total of 1606 tonnes of APCr were removed from site in 2016[2].

During 2016 a total of 10613[2] tonnes of other residues e.g. metals (pre and post combustion), office waste, construction waste, turbine control oils, yard water, glycol were also removed from site. The bulk of this (8154 tonnes relates to the off-site disposal of process water from the decant. pit, the emergency discharge from which is covered by emission point W2).

2 From submitted quarterly waste returns

In line with MVV Environment Ridham's corporate responsibility, Duty of Care audits are conducted.

3.3 Water Discharges from Site

Condition 3.5, Schedule 3, Table 3.2 of the Environmental Permit identifies the point source emissions to water which must be monitored and the relevant monitoring requirements.
At discharge point W2 (discharge to east side ditch) neutralised process water can be discharged. The neutralisation sequence ensures that the pH of the discharge is always within the pH limits (between 6 and 9) identified in Table S3.2.

This emission source is the subject of an environmental permit variation application to align the facility's 'as built' design intention with those authorised by its environmental permit. In the interim, treated effluent from the demineralisation and treated site surface waters are being tankered off-site to an authorised treatment facility.

During a review of the monitoring technology improvements were identified and a flow meter installed in addition to the pH probe. The current DCS system used to record data from monitoring events is being reviewed and improvements are to be made.

Given that the permit is currently subject to variation in relation to discharge points, and monitoring thereof, the operator is liaising with the Environment Officer to confirm monitoring and reporting requirements in the interim.

3.4 Flue Gases

All gaseous emissions generated during the combustion process pass through a comprehensively designed flue gas cleaning process, which begins in the boiler itself where optimum combustion conditions are maintained and solid urea is added to treat oxides of nitrogen.

Gases exit the boiler into the cyclone where they are cooled prior to entering the flue gas cleaning system. Lime is injected to neutralise acid gases and activated carbon is added to remove metals and dioxins, and finally gases pass through the bag filter house to complete reaction and remove any remaining particulates. The cleaned gases are finally released into the atmosphere through the stack.

In compliance with the WID and EPR Permit requirements, the flue gases are continuously monitored, for specific parameters, using MCERTS accredited equipment.

In addition to the Continuous Emissions Monitoring System (CEMS), an extractive sampling campaign is undertaken quarterly by an approved service supplier. The organisation used for analysis and monitoring are accredited by the United Kingdom Accreditation Service (UKAS) and the Environment Agency's Monitoring Certification Scheme (MCERTS).

3.4.1 Continuous and Extractive Emissions Monitoring

The parameters measured and the frequency of monitoring are carried out in accordance with Condition 3.5, Schedule 3, Table S3.1, and reported as set out in Table S4.1

Table 3: Frequency of Measured Emissions in 2016

Parameter	Frequency				
	Continuous	Jan – Mar (Q1)	Apr-Jun (Q2)	July – Sept (Q3)	Oct – Dec (Q4)
Particulate Matter	✓				
TOC	✓				
Hydrogen Chloride	✓				
Hydrogen Fluoride		✓	✓	✓	✓
Carbon Monoxide	✓				
Sulphur Dioxide	✓				
Oxides of Nitrogen (NO and NO_2 expressed as $NO_{2)}$	✓				
Cadmium & thallium and their compounds (total)		✓	✓	✓	✓
Mercury and its compounds		✓	✓	✓	✓
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)		✓	✓	✓	✓
Ammonia (NH_3)	✓				
Nitrous Oxide (N_2O)	✓				

Parameter	Frequency				
	Continuous	Jan – Mar (Q1)	Apr-Jun (Q2)	July – Sept (Q3)	Oct – Dec (Q4)
Dioxins and Furans (I-TEQ)		✓	✓	✓	✓
Dioxin-like PCBs		✓	✓	✓	✓
PAHs		✓	✓	✓	✓

The results of the quarterly extractive campaign, in comparison to Permitted limits are summarised in Table 4.

3.4.2 Extractive Emissions Monitoring

Table 4: Quarterly Extractive Testing Results

Parameter	Unit	Jan – Mar (Q1)	Apr-Jun (Q2)	July – Sept (Q3)	Oct – Dec (Q4)	Emission Limit
Hydrogen Fluoride	mg/m^3	0.019	0.02	0.037	0.01	3
Cadmium, Thallium and their compounds	mg/m3	0.00073	0.0006	0.0007	0.0015	0.05
Mercury and its compounds	mg/m^3	0.0008	0.0015	0.0006	0.0002	0.05
Sb, As, Pb, Cr, Cu, Mn, Ni, V and their compounds (total)	mg/m^3	0.05776	0.032	0.0599	0.0808	0.5
Dioxins and Furans (I -TEQ)	ng/m^3	0.013	0.0097	0.0059	0.0116	0.1
Dioxin-like PCBs (WHO-TEQ Humans / Mammals)	ng/m^3	0.0015	0.0004	0.0015	0.0007	No Limit Applied
Dioxin-like PCBs (WHO-TEQ Fish)	ng/m^3	0.0001	0	0.0001	0	No Limit Applied
Dioxin-like PCBs (WHO-TEQ Birds)	ng/m^3	0.0039	0.0013	0.0041	0.0023	No Limit Applied
Poly-cyclic aromatic hydrocarbons (PAHs) Total	µg/ m^3	0.2	0.48	0.22	6.35	No Limit Applied
Dioxins / furans (WHO-TEQ Humans / Mammals)	ng/m^3	0.00139	0.00096	0.00065	0.0131	No Limit Applied
Dioxins / furans (WHO-TEQ Fish)	ng/m^3	0.0146	0.0111	0.0067	0.0142	No Limit Applied
Dioxins / furans (WHO-TEQ Birds)	ng/m^3	0.0224	0.0153	0.0084	0.02	No Limit Applied

No permit limit breaches were noted during 2016. However, PAH levels, specifically Naphthalene (6.35 µg/ m^3) showed significant variation in Q4.

Naphthalene ($C_{10}H_8$) can be formed from a methane flame in the right conditions but can also be formed the generation of volatiles from wood during the combustion process. If combustion conditions are at their optimum then this component will be at its minimum concentration, however a certain variance will occur due to fluctuations within the process.

A root cause analysis indicates that the $C_{10}H_8$ level observed was, in all likelihood, caused by fluctuations within the combustion process, due to maintenance works on the wood feeder which required the facility to be operated at a reduced steam flow rate, and the subsequent use of auxiliary burners. The results of the extractive testing carried out shortly after this period of instability could reflect the variation caused by these operational fluctuations.

3.4.3 Continuous Emissions Monitoring

The CEMS for the period of 1st January 2016 through to 31st December 2016 was in service for 100% of the WID operational hours. The equipment is meticulously serviced, maintained, and calibration checks are routinely conducted. The CEM system was retrofitted with a nitrous oxide (N_2O) sensor in June 2016.

The maximum half hourly average, and daily averages are reported to the Environment Agency monthly via email.

The recorded and reported emissions, from CEMS show no instances of monitored parameters exceeding the emission limit values.

In 2017 CEMS monitoring will continue as required by condition 3.5 and Table S3.1, but will be reported quarterly as required in Table S4.1.

3.4.4 WID Abnormal Operation

Table 2 Performance parameters reports that there were no events that constitute WID abnormal operations as defined in Schedule 6 of the Permit (where conditions 2.3.8 to 2.3.11 apply).

With regard to the requirements of the Environmental Permit *'WID abnormal operation' means any technically unavoidable stoppages, disturbances, or failures of the measurement devices*

during which the concentrations in the discharges into the air of the regulated substances may exceed the normal emission limit values.

The operator is currently discussing the reporting of broader WID abnormal operations i.e. those covered by Conditions 2.3.6 to 2.3.11 (from Articles 6 & 13 of the WID) and has provided a procedure to describe such.

3.4.5 Annual Mass Emissions

The annual mass emissions of the continuously monitored parameters are summarised in Table 5 below.

Table 5 : Annual Mass Emissions

Month	**NO_x**	**CO**	**SO_2**	**HCl**	**TOC**	**N_2O**	**NH_3**	**PM**[3]
	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)
January	16625.3	2291.8	1491.8	815.89	5.35	NR	572.84	33.96
February	17075.6	2465.9	1720.5	784.13	1.58	NR	492.54	5.01
March	18380.7	2444.9	1796.2	864.83	2.7	NR	599.10	18.87
April	13675.3	1417.2	1355.3	611.66	2.75	NR	492.69	6.50
May	5178.8	773.2	1335.1	230.12	7.11	NR	1041.05	3.55
June	11824.2	877.2	1426.9	527.62	0.58	NR	82.92	2.17
July	20702.0	1284.8	1645.8	849.93	0.38	255.18	77.17	0.65
August	11072.0	781.4	891.5	500.38	0.24	960.23	225.09	64.09
September	16909.1	1114.1	1624.3	717.23	4.8	1303.00	301.96	5.85
October	23586.9	1696.4	1690.9	1019.82	1.18	1525.23	121.03	3.35
November	203107.8	1775.6	1874.2	1044.60	0.65	1711.8	177.65	2.70
December	24963.6	2359.2	1928.6	1118.25	2.24	1558.12	120.65	10.49
Total	203101.2	19281.6	18781.4	9084.45	29.55	7313.57	4304.71	157.18
Max. quantity based on permit limit - from OPRA 2016	258000	-	64600	12900	12900	-	-	12900

3 Particulate Matter

3.4.6 Review of Emissions

All recorded and reported emissions, from continuous and extractive testing have remained below the emission limit values throughout 2016, and are within acceptable ranges for the facility.

4 USE OF HEAT/CHP

Currently the heat from the facility is not utilised, options are being explored and where economically viable development will be considered.

5 ENVIRONMENTAL CONTROLS

The management and staff of Ridham Dock biomass facility are highly qualified and experienced within the sector. Reliable environmental controls and a robust management system ensure that compliance with the Waste Incineration Directive and EPR Permit is maintained.

Staff are aware of the environmental impacts of their work and exercise an appropriate standard of good housekeeping, proportionate to the impacts of any potential emissions.

Training and competency of staff is controlled by the Facility Management in conjunction with the Integrated Management System and CARVAL dedicated HR software.

The company identifies training requirements of its employees and provides suitable resources to ensure they have the required knowledge, skills and expertise to carry out their duties.

Table 6: Facility Compliance Summary		
Exceedance of Emission Limit Values	1	Loss on ignition (LOI) in Incinerator Bottom Ash (IBA) – February 2016
WID Abnormal Operations	0	-
Enforcement Notices	0	-
Complaints	0	-