Annual Performance Report for Boiler 7 Renewable Energy process at Shotton Paper during 2017

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This report has been written to meet the requirements of Article 12 (2) of the Waste Incineration Directive 2000/76/EC(WID)

"For incineration or co-incineration plants with a nominal capacity of two tonnes or more per hour and notwithstanding Article 15(2) of Directive 96/61/EC, an annual report to be provided by the operator to the competent authority on the functioning and monitoring of the plant shall be made available to the public. This report shall, as a minimum requirement, give an account of the running of the process and the emissions into air and water compared with the emission standards in this Directive."

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1. Introduction

The principle of Boiler 7 design of the plant was to burn all the site sludge produced from the de-inking and effluent treatment processes on site. The volume of sludge being generated on site is still lower than design due to the shutdown during 2015 of a proportion of the paper manufacturing process.
Due to the low calorific value of the site derived sludge Boiler 7 also requires support fuel for the combustion process. This support fuel is supplied as Biomass in various forms i.e.mainly Recycled wood and Arbicultural arisings.
All the biomass is supplied to site by BSW who source the materials from various local forests and wood processors. The local authority recycled waste wood is prepared for use, on site and helps sustain the boiler operation.

2. Plant description

The Boiler 7 plant comprises of the following equipment:

- Wood Bio-fuel reception and processing
- Waste Wood Processing Plant
- Site-derived waste sludge and wood bio-fuel storage;
- Conveyor systems
- Boiler 7 furnace with steam turbine and other associated equipment

Control of the combustion process remains highly automated with several layers of safeguards and interlocks built into the control strategy and hardware to ensure the operation is stable and conforms to the requirements of WID.

The use of the combustion optimisation package has continued in ensuring that combustion remains stable and maintain a good thermal efficiency.

3. Summary of Plant Operations

During the year the plant was operational for 8086 hours, with outages of 674 hours overall availability of 92.31%
The planned boiler outage took place in April, there was a number of unplanned shutdowns during the year in various locations of the Boiler
Output from the Boiler for the year remained at target levels of 34 kg/s.

During the year a high percentage of APC residues continue to be used at either cement block or cement replacement facilities. An additional recycling outlet has been identified for which approval has been granted by the relevant authorities.
Bottom ash continues to be classified as hazardous and leaving site for disposal at the appropriate facility.

Fuel Inputs

Fuel description	EWC code	Tonnes used
Site Waste Sludge	03 03 05	55337
Recovered bio-fuel	15 01 03 17 02 01 19 12 07 19 12 10 20 01 38	150048

Energy outputs

Description	Energy MWh	End Use
Electricity	157727	Supply of a portion of the electrical energy consumption for the site.
Process steam	206805	Supplied primarily to the pulp de-inking and paper drying processes.
Process water heating	26847	Process water from the paper machine was heated through plate heat exchangers by re-circulated Flue gas scrubber shower water.

Waste outputs

Waste description	EWC code	Tonnes produced	End Use
Bottom Ash	19 01 11	4784	Hazardous waste landfill
Fly ash	19 01 13	7525	Blended with other wastes for various cement replacement products.
Fly ash	19 01 13	10168	Landfill

Non Waste Outlets	Tonnes produced	End Use
Fly Ash	14487	Block Industry

4. Summary of Plant Monitoring

The following air emissions from the plant have been measured and reported continuously:

Carbon Monoxide (CO)
Sulphur Dioxide (SO_2)
Total Organic Carbon (TOC)
Hydrogen Chloride (HCl)
Particulates
Oxides of Nitrogen (NO_X)
Ammonia

In addition to the continuous monitoring the following air emissions were measured and reported periodically (twice per year):

Mercury
Cadmium and Thallium
Other Metals (Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V)
Hydrogen Fluoride (HF)
Dioxins and Furans

The continuous emissions monitoring system (CEMs) operated within the specified WID availability criteria throughout the year.

Results from the periodic air testing on Boiler 7 are reported below

Pollutants	Q1 results mg/m3	Q3 results mg/m3	Mean mg/m3
Mercury	0.0004	0.001	0.0009
Cadmium & Thallium	0.001	0.02	0.011
Tin, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium	0.066	0.08	0.106
HF	0.73	<0.02	0.74
Dioxins / Furans (ITEQ)	0.028	0.01	0.033

The ash residues produced by the process were also subject to a monitoring regime with analysis carried out quarterly for the following parameters:

Bottom Ash Weight loss on Ignition (LOI) as %
Bottom Ash heavy metals
Fly Ash heavy metals
Bottom Ash Dioxins and furans
Fly Ash Dioxins and furans

Results for Weight Loss on Ignition (LOI) testing of Bottom Ash are given below

Parameter	Q1	Q2	Q3	Q4
Bottom Ash LOI %	<1.0	<1.0	<1.0	<1.0

5. Summary of Plant Compliance

Air Pollutants	EU Directive ELV (mg/Nm3)	Percentage compliance
Particulates	10	100
NO_X	200	100
SO_2	50	100
CO	100	100
HCl	10	100
HF	1	100
Volatile organic compounds (TOC)	10	100
Mercury	0.05	100
Cadmium and thallium	0.05	100
Sum of heavy metals (Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V)	0.5	100
Dioxins + furans	0.1 x 10-6	100
Ammonia	No Limit (Warranty max. 5 ppm slip if in use)	N/A
CEMs operational 8757 hours	3	99.96

There were no periods of abnormal operation where continuous monitoring failed and periods where emissions exceeded the consented values.

Furnace combustion performance

Bottom Ash	Unit	EU Directive ELV	Percentage compliance
Loss on Ignition	%	5	100

Flue gas scrubber performance

Scrubber bleed water parameters	Unit	EU Directive ELV	Percentage compliance
Total solids	mg/l	45	1
Hg	µg/l	30	100
Cd	µg/l	50	100
Tl	µg/l	50	100
As	µg/l	150	100
Cu	µg/l	500	100
Pb	µg/l	200	100
Cr	µg/l	500	100
Ni	µg/l	500	100
Zn	µg/l	1500	100

6. Summary of Plant Improvements

This has been another year of stability with no major changes to the fuel supply a small increase in the use of recycled wood has been carried out.
The new Low Pressure Condensing Turbine (LPCT) continues to deliver above expected power generation.
Work continues to identify and develop alternative metals to be used within the process to increase the Boiler plant availability, during the 2018 shutdown some of these changes are to be implemented.
A service agreement has been entered into with a suitably qualified service provider to give additional support in carrying out inspections of the Boiler during planned outages

7. Summary of information made available:

The information made available in this report and the detailed monitoring returns from the site are available on the Public Register at:
Environment Agency Offices, Chester

Signed 

Date 22nd February 2018