



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

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."

For any further enquiries or requests for information please contact:

Jamie Hill,
Utilities Manager,
Shotton Mill Limited,
Weighbridge Road,
Shotton, Deeside,
Flintshire, CH5 2LW
Direct Tel: +44 (0)1244 284454
jamie.hill@shottonmill.co.uk

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

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 remains 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 requires an additional support fuel to maintain the combustion process. This support fuel comprises of Recycled wood and Arboricultural arisings, with the higher percentage being Recycled Wood

All the biomass is supplied to site by Tilhill who source the materials from various outlets, with the majority of recycled waste wood being prepared on site.

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 High Pressure and Low Pressure steam turbines and all 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 and reduces the potential for environmental noncompliance.

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

3. Summary of Plant Operations

During the year the plant was operational for 8127 hours, with outages totalling 633 hours giving an overall availability of 92.5%

Boiler 7 continued at high operating rate (92.5%) and at the design load (32kg/s) throughout 2021. Fuel mix consisted of waste wood, virgin biomass and papermaking sludge (both site derived and imported).

The year saw a transition from 100% site derived sludge in the first nine months over to 100% imported paper sludge by the end of the year. Maintaining a sludge input kept the combustion profile as close to optimal as possible.

The plant saw 4 total shutdowns and start-ups, these taking place in January, June, July and September. The combustion control remained under the automated OEM system, ensuring stable combustion and emissions.

Fuel Inputs

Fuel description	EWC code	Tonnes used
Site Waste Sludge	03 03 05	52,775 T
Recovered bio-fuel	15 01 03 17 02 01 19 12 07 19 12 10 20 01 38	258,031 T

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

Energy outputs

Description	Energy MWh	End Use
Electricity	159122	Supply of a portion of the electrical energy consumption for the site.
Process steam	113658	Supplied primarily to the pulp de-inking and paper manufacturing processes.
Process water heating	16207	Process water from the paper machine was heated through plate heat exchangers by re-circulated Flue gas scrubber shower water.

Waste outputs

Waste description	EWG code	Tonnes produced	End Use
Bottom Ash	19 01 11	7955	Hazardous waste landfill
Fly ash	19 01 13	20682	Blended with other wastes for various cement replacement products.
Fly ash	19 01 13	3881	Landfill

Non Waste Recycled Outlets	Tonnes produced	End Use
Fly Ash	6360	Block Industry

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

4. Summary of Plant Monitoring

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

- Carbon Monoxide (CO)
- Sulphur Dioxide (SO₂)
- 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 bi-annually as required by permitted conditions

- 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 as follows

	Q1	Q2	Q3	Q4
Number of Occasions	1	3	0	2
Cumulative Hrs	3.5	13	13	15.5

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

Results from the periodic air emission testing on Boiler 7

Pollutants	H1 results ng/m3	H2 results ng/m3	Year Avg ng/m3
Mercury	0.0006	0.0008	0.0007
Cadmium & Thallium	0.0013	0.001	0.00115
Tin, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium	0.040	0.01	0.025
HF	0.088	0.45	0.269
Dioxins / Furans (ITEQ)	0.0010	0.002	0.005

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 Loss on Ignition (LOI) testing of Bottom Ash

Parameter	Q1 %	Q2 %	Q3 %	Q4 %	Avg %
Bottom Ash LOI %	0.2	0.2	0.2	0.2	0.2

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

Results for Heavy Metal APC Residues

Parameter	Q1 mg/kg	Q2 mg/kg	Q3 mg/kg	Q4 mg/kg	Avg mg/kg
Cd	5.45	3.1	1.1	0.35	2.50
Tl	0.2	0.1	0.1	0.1	0.1
Hg	0.45	0.35	0.15	0.10	0.26
Pb	1186	781	259	178	601
Cr	108.0	83.5	32.3	40.0	65.9
Cu	444	394	143	302	320
Mn	680	605	186	266	434
Ni	39.7	31.5	12.1	19.6	25.7
As	59.5	56.0	19.0	15.3	37.4
Co	9.9	8.8	3.3	3.5	6.3
V	28.3	19.6	8.0	10.6	16.6
Zn	1980	1447	391	260	1019

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

5. Summary of Plant Compliance

Air Pollutants	EU Directive ELV (mg/Nm ³)	Percentage compliance
Particulates	10	100
NO _x	200	100
SO ₂	50	100
CO	50	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	N/A
CEMs operational when Boiler running	8082.5 hrs	99.7%

Furnace combustion performance

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

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

Flue gas scrubber performance

Scrubber bleed water parameters	Unit	EU Directive ELV	Percentage compliance
Total solids	mg/l	30	95.75
Hg	µg/l	30	100
Cd	µg/l	50	100
Tl	µg/l	50	100
As	µg/l	150	100
Pb	µg/l	200	100
Cr	µg/l	500	100
Cu	µg/l	500	100
Ni	µg/l	500	100
Zn	µg/l	1500	100

6. Summary of Plant Improvements

2021 saw a stable year. The biggest challenge was understanding the impact the loss of site-derived sludge would have on the fuel mix and combustion profile.

To minimise impact, the re-circulation gas fan was upgraded in the September shutdown. This increasing the capability of the boiler to deal with increased CV fuel if sludge supply was interrupted.

Work to identify suitable replacement sludges from off-site took place successfully

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427



Annual Performance Report for Boiler 7 Renewable Energy Process at Shotton Mill during 2021

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

A handwritten signature in black ink, appearing to read "J Hill", written over a horizontal line.

Jamie Hill
Utilities Manager,
Shotton Mill Limited,

Date 28th February 2023

Shotton Mill Ltd.

Weighbridge Road
Deeside Industrial Park
Deeside
Flintshire
CH5 2LW

Telephone: +44 (0)1244 280000

Registered in England and Wales. No. 13074427