

# BIOMASS UK NO.2 LTD

**Annual Performance Report 2021**

**Permit EPR/AB3790ZB**

**Barry Energy Production Facility**

**Biomass UK No.2 Ltd**

Year: 2021

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This report is required under the Industrial Emissions Directive's Article 55(2) requirements on reporting and public information on waste incineration plants and co-incineration plants, which require the operator to produce an annual report on the functioning and monitoring of the plant and make it available to the public.

### Plant Description and Design

The Barry Energy Production Facility is a renewable energy generation facility which has been designed to recover energy from pre-prepared mixed waste wood feedstocks using gasification. The gasification facility is an Advanced Thermal Treatment (ATT) process that will produce a combustible synthesis gas, which is then used to raise steam and generate electricity, through steam cycle turbine generation.

The Advanced Thermal Treatment (ATT) plant is designed to process shredded mixed waste wood feedstocks to produce heat to raise steam in a conventional tube boiler for utilisation in a steam turbine for the production of renewable electricity with an export capacity up to 10MWe (notionally 9.95MWe).

The Installation has been designed to process approximately 86,400 tonnes of pre-processed non-hazardous mixed waste wood per annum.

The site has been shut down for a majority of the year pending some mechanical upgrade works and some associated reliability improvements, as such the facility has processed <1000 tonnes of wood.

### Summary of Operational Processes and Procedures

2022

The principle components of the process comprise the following:

*Waste Acceptance and Reception*: All waste wood is delivered directly into the fuel storage building via electrically operated roller shutter doors. When required, the waste is discharged onto the feedstock feed system, which delivers the waste into the gasification building. All waste is accepted in accordance to the sites waste acceptance procedures.

*Gasification*: The feedstock feed system delivers the waste into the fluidised bed gasification system where the waste is combusted to produce a synthetic gas (syngas). The syngas is then combusted to produce a high temperature flue-gas. A steam boiler then recovers the heat from the combustion gases through the conversion into superheated steam.

*Electricity Generation*: The superheated steam then passes to a Steam Turbine and Generator, which will export 10MWe (net) of renewable electricity onto the Local Distribution Network.

*Flue-Gas Cleaning*: Flue gas cleaning and pollution control consists of urea injection for De-NO<sub>x</sub>, lime injection for acid gas neutralisation and activated carbon powder injection for absorption and removal of heavy metals, dioxins, VOCs and other harmful substances. The stream has a baghouse system, which is designed to have the capacity to remove submicron dust particles within anticipated emission limit values (ELV's) stipulated by Chapter IV of the Industrial Emissions Directive (IED).

The plant is operated in accordance with its Environmental Management System which is designed to meet the requirements of ISO14001:2004.

**Summary of Plant Operations and Maintenance during the reporting year**

The ongoing Covid-19 situation combined with the ongoing planning related issues, it was decided to take the plant fully off line to facilitate a series of plant mechanical improvements. These improvement upgrades have been targeted at increasing the reliability of the facility and to ensure that the process is not subject to fouling and/or slagging.

With the exception of a number of commissioning runs the facility has been largely non-operational during 2021 and will come online once clarity around the planning regularisation is assured by the Welsh Government.

As a result of the above, the site processed less than 1000 tonnes during 2021. All fuel storage and reception areas have been emptied.

**Operational Data**

Plant Size	86,400 tonnes pa	MWth	10 MWe
No. of combustion lines	1	No. of Turbines:	1

Total waste received	Unit	Q1	Q2	Q3	Q4	Year Total
Waste wood (biomass)	Tonnes	-	-	828	-	828
Total waste wood co-incinerated		-	-	813	-	813

Energy Usage / Export	Unit	Q1	Q2	Q3	Q4	Year Total	MWh/tonne incinerated
Electrical Energy Generated	MWh	-	-	743	-	743	1
Electrical Energy Exported		-	-	652	-	652	1
Electrical Energy Used on site		-	-	-	-	-	-
Power Imported		-	-	2,445	-	2,445	3
Parasitic Load	%	0.0%	-	-	-	79.6%	
Thermal Energy Produced	MWh	-	-	-	-	-	-
Thermal Energy Used on site		-	-	-	-	-	-

Waste Disposal & Recovery	Unit	Q1	Q2	Q3	Q4	Year Total	tonnes/tonne of waste co-incinerated
APC Residues - produced	tonnes	-	-	5	-	5	0.6%
Bottom Ash - produced		-	-	3	-	3	0.4%

Raw Material Usage	Unit	Q1	Q2	Q3	Q4	Year Total	tonnes/tonne of waste co-incinerated
Water Consumption	m <sup>3</sup>	-	-	27	-	27	0.03
Urea Consumption	tonnes	-	-	10	-	10	0.01
Activated Carbon Consumption	tonnes	-	-	-	-	-	-
Lime Consumption	tonnes	-	-	-	-	-	-
Fuel oil Consumption	tonnes	-	-	199	-	199	0.24

**2021 Annual Reporting Performance Form 1**

Permit EPR/AB3790ZB  
 Facility: Barry Energy Production Facility

Operator: Biomass UK No.2 Ltd  
 Form: Performance 1

Reporting of Performance Parameters for the Period from:

01 January 2020

31 December 2020

Parameter	Total Values	Units	Specific Value	Units
Electrical Energy imported from national grid	2444.6	MWh	3.0	MWh/tonne of waste co-incinerated (dry basis)
Electrical Energy exported to national grid	651.5	MWh	0.8	MWh/tonne of waste co-incinerated (dry basis)
Electrical Energy used at the installation	0	MWh	0.0	MWh/tonne of waste co-incinerated (dry basis)
Fuel Oil consumption	199	tonnes	0.24	tonnes/tonne of waste co-incinerated (dry basis)
Mass of bottom ash (including boiler ash)	3.2	tonnes	0.003936039	tonnes/tonne of waste co-incinerated (dry basis)
Mass of APC residues produced	4.7	tonnes	0.0	tonnes/tonne of waste co-incinerated (dry basis)
Urea consumption	9.8	tonnes	0.0	tonnes/tonne of waste co-incinerated (dry basis)
Activated Carbon consumption	0	tonnes	0.0	tonnes/tonne of waste co-incinerated (dry basis)
Lime Consumption	0	tonnes	0.0	tonnes/tonne of waste co-incinerated (dry basis)
Water consumption	27.3	m <sup>3</sup>	0.0	m <sup>3</sup> /tonne of waste co-incinerated (dry basis)

**Operator's comments :**

The plant has been in shutdown since April 2020 due to planning conditions by WAG and the Local Authority. All data therefore relates only to the period January - April 2020.

Reporting of Annual Production / Treatment for the Period from: 01 January 2020

to:

Parameter	Value	Unit
Total Waste Wood Received	828	Tonnes
Total Waste Wood Co-incinerated	813	Tonnes
Electrical Energy Generated	742.7	MWh
Electrical Energy Exported	651.5	MWh
Electrical Energy Used on Installation	0	MWh
Thermal Energy produced	0	MWh
Thermal Energy used on installation	0	MWh
Total bottom ash (including boiler ash produced)	3.2	Tonnes
Total APC residue produced	4.7	Tonnes

**Operator's comments :**

The plant has been in shutdown since April 2020 due to planning conditions by WAG and the Local Authority. All data therefore relates only to the period January - April 2020.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

**Summary of Permit Compliance**

**Compliance with permit limits for continuously monitored pollutants**

The plant met its emission limits as shown in the table below:

Substance	Percentage time compliant during operation	
	Half-hourly limit	Daily limit
Particulates	100%	100%
Oxides of nitrogen	100%	100%
Sulphur dioxide	100%	100%
Carbon monoxide	100%	100%
Total organic carbon	100%	100%
Hydrogen chloride	100%	100%
Hydrogen fluoride	100%	100%
Ammonia	N/A	100%

**Summary of any notifications or non-compliances under the permit**

Date	Summary of notification or non-compliance [including Line/Reference]	Reason	Measures taken to prevent reoccurrence
	None		

**Summary of any complaints received and actions to taken to resolve them.**

Date	Summary of complaint [including Line/Reference]	Reason *	Measures taken to prevent reoccurrence
N/A	None	N/A	N/A
N/A	None	N/A	N/A

\* including whether substantiated by the operator or the EA

### Summary of Plant Improvements

**Summary of any efficiency improvements that have been completed within the year.**

The plant was only temporarily operational only in Q3 of 2021 in a very limited capacity after which plant was switched off pending the conclusion of the planning regularisation and appeal. The site has been subject to a number of plant engineering reliability modifications with the intention of resolving a number of reliability issues. The impact on efficiency will only be know once the plant is back on line and operational.

**Summary of any permit improvement conditions that have been completed within the year and the resulting environmental benefits.**

All Pre-operational conditions of the permit have now been completed with the final PO5 and PO6 having been signed off in January 2020.

Plant undergoing re-commissioning and was only operational in Q3 2021.

**Summary of any changes to the plant or operating techniques which required a variation to the permit and a summary of the resulting environmental impact.**

None

**Summary of any other improvements made to the plant or planned to be made and a summary of the resulting environmental benefits.**

The gasification plant has been undergoing some modifications to improve reliability and plant stability . The improvements will yield some gains in efficiency, however these will only be quantified was the plant is fully operational.

2021 Annual Reporting Residues Form 1

Permit EPR/AB3790ZB

Operator: Biomass UK No.2 Ltd

Facility: Barry Energy Production Facility

Form: Performance 1

Reporting of Residue Quality Period from: 01 January 2021 to: 31 December 2021

Residue Composition (TOC, Metals, Dioxins, etc.)																						
	TOC	Sb	Cd	Tl	Hg	Pb	Cr	Cu	Mn	Ni	As	Co	V	Zn	Dioxin/furan I-TEQ ng/kg	Dioxin / Furan WHO-TEQ ng/kg		Dioxin-like PCBs WHO-TEQ ng/kg				
	<3 %	mg/kg		Humans/mammals	Birds	Fish	Humans/mammals	Birds	Fish													
Bottom Ash (including boiler ash)																						
APC Residues	N/A																					

Reporting of Ash solubility Period from: N/A to:

Ash Solubility (Metals)													
	Sb	Cd	Tl	Hg	Pb	Cr	Cu	Mn	Ni	As	Co	V	Zn
	mg/kg												
Bottom Ash (including boiler ash)													
APC Residues													

**Operator's comments :**  
Residue testing has not been carried out in 2021. The plant was sporadically operational only in Q3 2021 and did not produce sufficient residue to justify testing.

Signed: Steve Butler Date: \_\_\_\_\_

**Emissions to Water**

<b>Summary of monitoring undertaken and compliance</b>
N/A

<b>Commentary on any specific events</b>
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<b>Date &amp; Event</b>	<b>Description</b>

2021

**Emissions to Water / Sewer**

<b>Parameter</b>	<b>Monitoring Frequency</b>	<b>Limit</b>	<b>Target</b>	<b>Max.</b>	<b>Average</b>

**Emissions to Air (periodically monitored)****Summary of monitoring undertaken, standards used and compliance**

Not applicable at this stage. QAL-2 Periodic monitoring and AST testing was not undertaken in 2021 as plant was largely non-operational. The plant has been in shutdown all year, except for a short commissioning run in Qtr 3 2021, upon re-commencement of operations QAL-2 periodic monitoring will be undertaken at the earliest opportunity.

**Results of emissions to air that are periodically monitored**

Substance	Ref. Period	Emission Limit Value	Average				
			Q1	Q2	Q3	Q4	Total
Hydrogen fluoride	min 1 hr	3 mg/m <sup>3</sup>					
Cd and Th and their compounds	30 min, max 8hrs	0.05 mg/m <sup>3</sup>					
Hg and its compounds	30 min, max 8hrs	0.05 mg/m <sup>3</sup>					
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V and their compounds	30 min, max 8hrs	0.5 mg/m <sup>3</sup>					
Dioxins & Furans (I-TEQ)	6-8hrs	0.01 ng/m <sup>3</sup>					
Dioxins & Furans (WHO-TEQ Humans / Mammals)	6-8hrs	None set ng/m <sup>3</sup>					
Dioxins & Furans (WHO-TEQ Fish)	6-8hrs	None set ng/m <sup>3</sup>					
Dioxins & Furans (WHO-TEQ Birds)	6-8hrs	None set ng/m <sup>3</sup>					
PCBs (WHO-TEQ Humans / Mammals)	6-8hrs	None set ng/m <sup>3</sup>					
PCBs (WHO-TEQ Fish)	2021	None set ng/m <sup>3</sup>					
PCBs (WHO-TEQ Birds)	6-8hrs	None set ng/m <sup>3</sup>					
Total PAHs	6-8hrs	0.001 mg/m <sup>3</sup>					
<b>Comments :</b>							

Annual Performance Report 2021

**Emissions to Air (continuously monitored)**

**Summary of monitoring undertaken, standards used and compliance**

CEMS equipment has been in calibration and operational since December 2019. Plant has been in shutdown for majority of 2021. All data therefore relates only to a short period during August and September 2021.

**Results of emissions to air that are continuously monitored**

Substance	Reference Period	Emission Limit Value	A1	
			Max.	Avg.
Oxides of nitrogen	Daily mean	300 mg/m <sup>3</sup>	298	211.0
	½ hourly mean	600 mg/m <sup>3</sup>	397	304.0
Particulates	Daily mean	15 mg/m <sup>3</sup>	<1	<1
	½ hourly mean	45 mg/m <sup>3</sup>	<1	<1
Total Organic Carbon	Daily mean	15 mg/m <sup>3</sup>	<1	<1
	½ hourly mean	30 mg/m <sup>3</sup>	8	1.5
Hydrogen chloride	Daily mean	15 mg/m <sup>3</sup>	7	1.0
	½ hourly mean	2021	54	6.9
Hydrogen fluoride	Daily mean	6 mg/m <sup>3</sup>	<1	<1
	½ hourly mean	1.5 mg/m <sup>3</sup>	<1	<1
Sulphur dioxide	Daily mean	75 mg/m <sup>3</sup>	5	2.8
	½ hourly mean	300 mg/m <sup>3</sup>	17	5.4
Carbon monoxide	Daily mean	75 mg/m <sup>3</sup>	37	20.6
	½ hourly mean	150 mg/m <sup>3</sup>	122	45.2
Ammonia	Daily mean	5 mg/m <sup>3</sup>	13	1.2
Nitrous oxide	Daily mean	Steve Butler	n/a	n/a

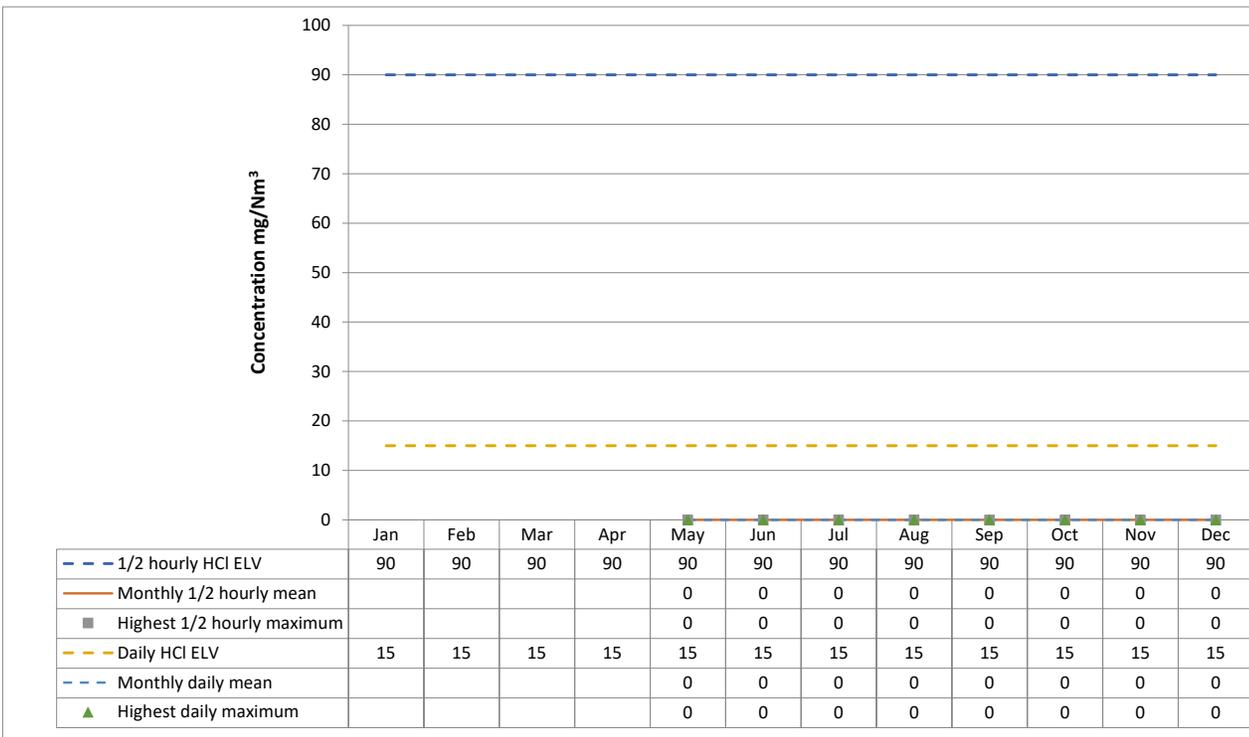
\* = delete or amend as appropriate

**Comments :**

Sample size really small - all data inputted directly from CEMS reports. Plant operated at limited capacity, for 11 days in entire year. Total wood processed

**Monitoring of Hydrogen Chloride emissions Whole Installation**

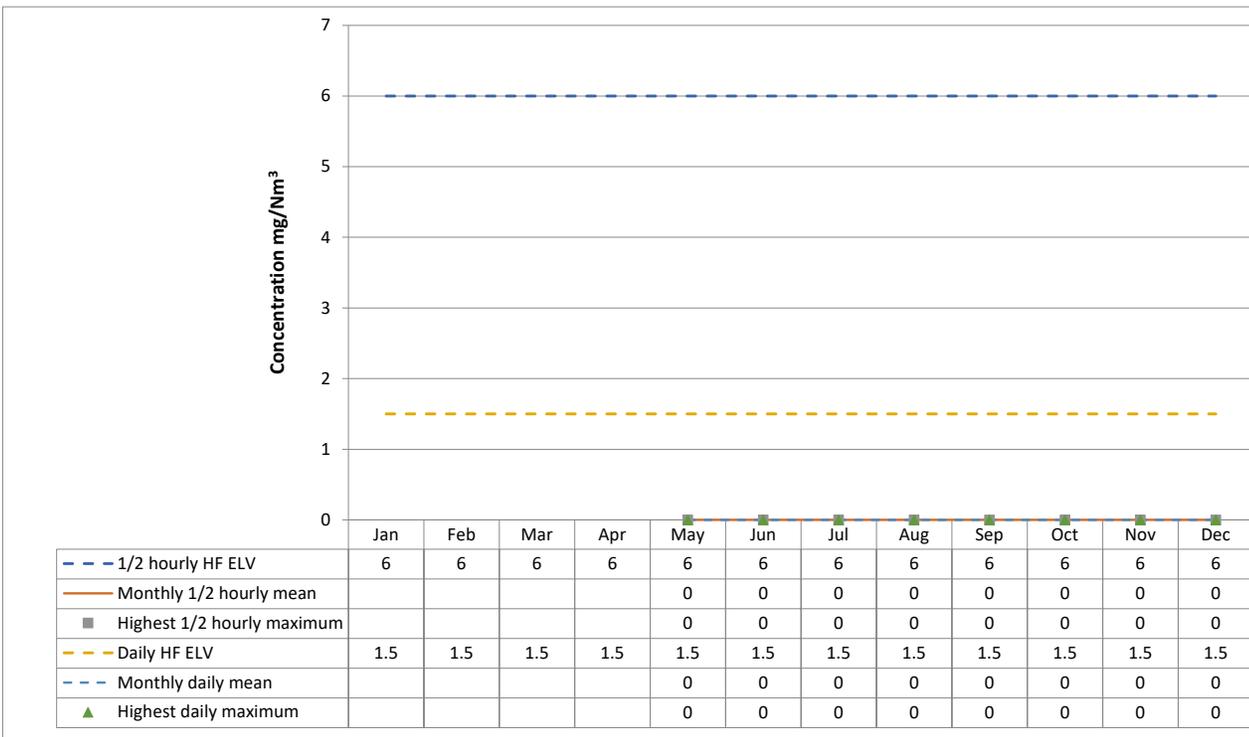
mg/Nm <sup>3</sup>	1/2 Hourly Reference Periods			Daily Reference Periods		
	1/2 hourly HCl ELV	Monthly 1/2 hourly mean	Highest 1/2 hourly maximum	Daily HCl ELV	Monthly daily mean	Highest daily maximum
2021						
Jan	90			15		
Feb	90			15		
Mar	90			15		
Apr	90			15		
May	90	-	-	15	-	-
Jun	90	-	-	15	-	-
Jul	90	-	-	15	-	-
Aug	90	-	-	15	-	-
Sep	90	-	-	15	-	-
Oct	90	-	-	15	-	-
Nov	90	-	-	15	-	-
Dec	90	-	-	15	-	-



**Comments :**  
 Plant operational sporadically in January - April 2020. Shut down since April 2020.

Monitoring of Hydrogen Fluoride emissions Whole Installation

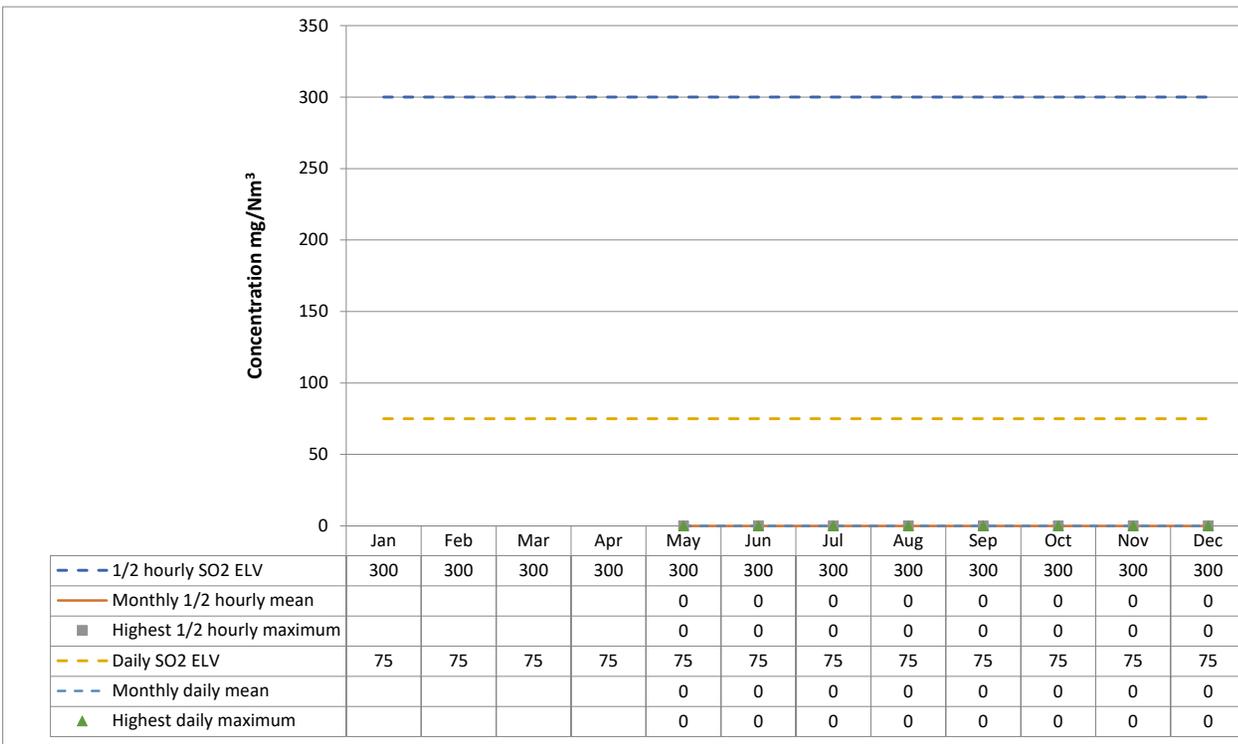
mg/Nm <sup>3</sup>	1/2 Hourly Reference Periods			Daily Reference Periods		
	1/2 hourly HF ELV	Monthly 1/2 hourly mean	Highest 1/2 hourly maximum	Daily HF ELV	Monthly daily mean	Highest daily maximum
2021						
Jan	6			1.5		
Feb	6			1.5		
Mar	6			1.5		
Apr	6			1.5		
May	6	-	-	1.5	-	-
Jun	6	-	-	1.5	-	-
Jul	6	-	-	1.5	-	-
Aug	6	-	-	1.5	-	-
Sep	6	-	-	1.5	-	-
Oct	6	-	-	1.5	-	-
Nov	6	-	-	1.5	-	-
Dec	6	-	-	1.5	-	-



**Comments :**  
 Plant operational sporadically in January - April 2020. Shut down since April 2020.

Monitoring of Sulphur dioxide emissions Whole Installation

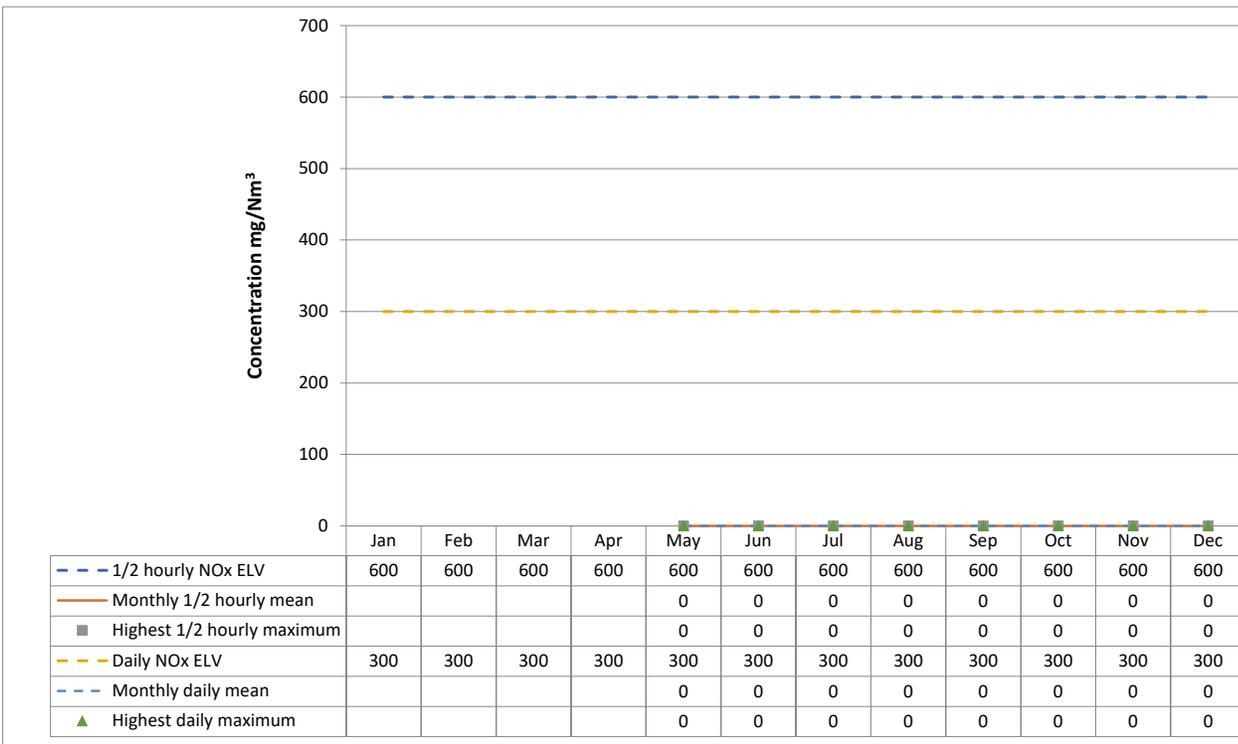
mg/Nm <sup>3</sup>	1/2 Hourly Reference Periods			Daily Reference Periods		
	1/2 hourly SO2 ELV	Monthly 1/2 hourly mean	Highest 1/2 hourly maximum	Daily SO2 ELV	Monthly daily mean	Highest daily maximum
2021						
Jan	300			75		
Feb	300			75		
Mar	300			75		
Apr	300			75		
May	300	-	-	75	-	-
Jun	300	-	-	75	-	-
Jul	300	-	-	75	-	-
Aug	300	-	-	75	-	-
Sep	300	-	-	75	-	-
Oct	300	-	-	75	-	-
Nov	300	-	-	75	-	-
Dec	300	-	-	75	-	-



**Comments :**  
 Plant operational sporadically in January - April 2020. Shut down since April 2020.

Monitoring of Oxides of Nitrogen emissions Whole Installation (A1)

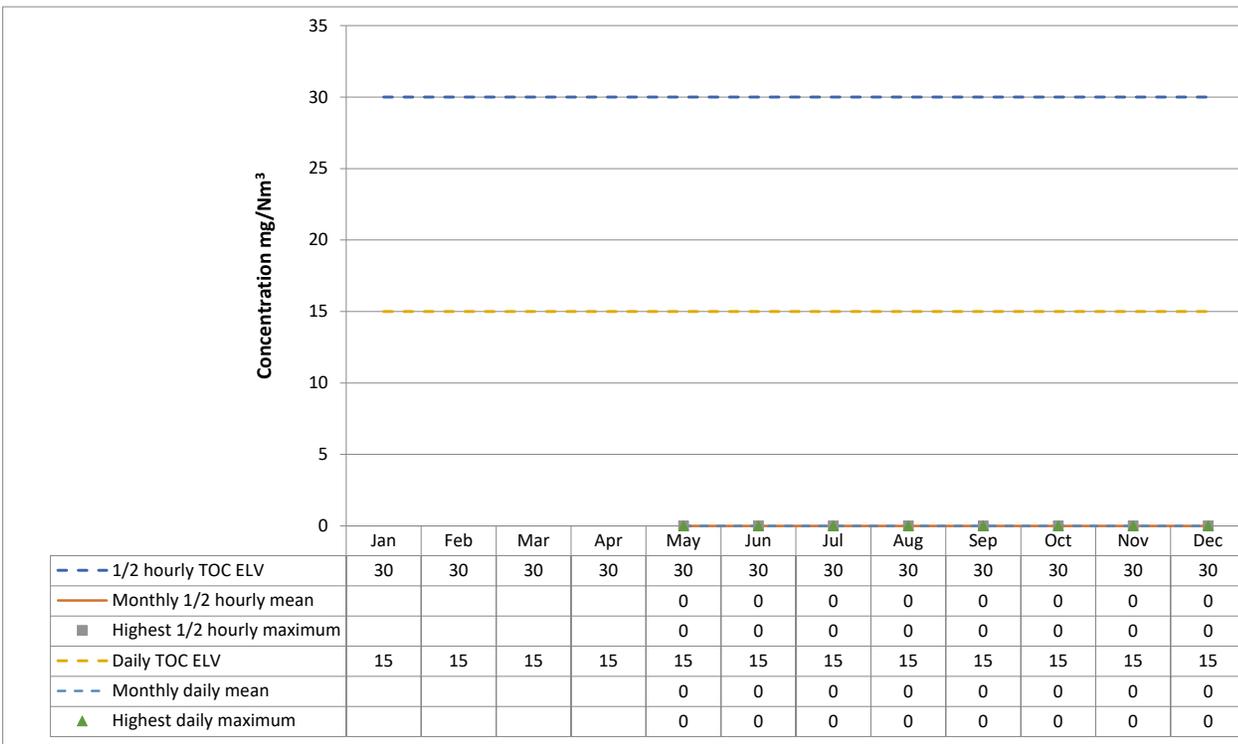
mg/Nm <sup>3</sup>	1/2 Hourly Reference Periods			Daily Reference Periods		
	1/2 hourly NOx ELV	Monthly 1/2 hourly mean	Highest 1/2 hourly maximum	Daily NOx ELV	Monthly daily mean	Highest daily maximum
2021						
Jan	600			300		
Feb	600			300		
Mar	600			300		
Apr	600			300		
May	600	-	-	300	-	-
Jun	600	-	-	300	-	-
Jul	600	-	-	300	-	-
Aug	600	-	-	300	-	-
Sep	600	-	-	300	-	-
Oct	600	-	-	300	-	-
Nov	600	-	-	300	-	-
Dec	600	-	-	300	-	-



**Comments :**  
 Plant operational sporadically in January - April 2020. Shut down since April 2020.

Monitoring of Total organic carbon emissions Whole Installation

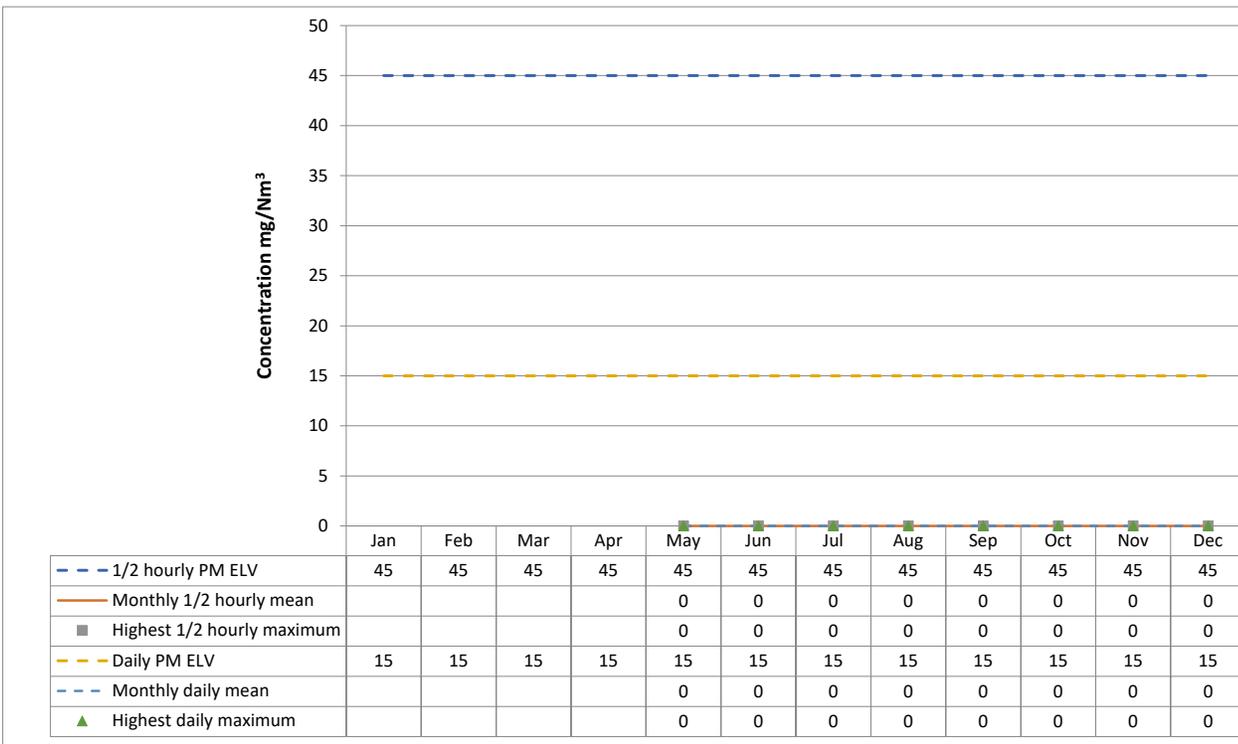
mg/Nm <sup>3</sup>	1/2 Hourly Reference Periods			Daily Reference Periods		
	1/2 hourly TOC ELV	Monthly 1/2 hourly mean	Highest 1/2 hourly maximum	Daily TOC ELV	Monthly daily mean	Highest daily maximum
2021						
Jan	30			15		
Feb	30			15		
Mar	30			15		
Apr	30			15		
May	30	-	-	15	-	-
Jun	30	-	-	15	-	-
Jul	30	-	-	15	-	-
Aug	30	-	-	15	-	-
Sep	30	-	-	15	-	-
Oct	30	-	-	15	-	-
Nov	30	-	-	15	-	-
Dec	30	-	-	15	-	-



**Comments :**  
 Plant operational sporadically in January - April 2020. Shut down since April 2020.

Monitoring of Particulate matter emissions Whole Installation

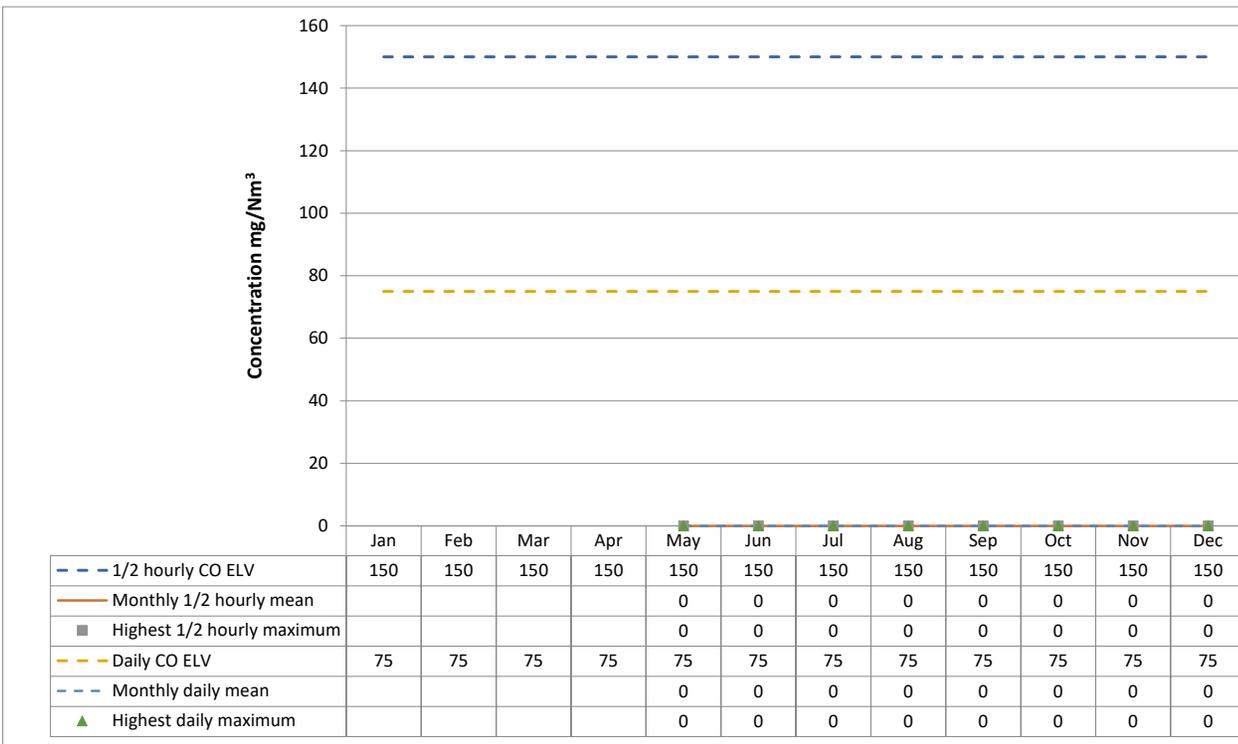
mg/Nm <sup>3</sup>	1/2 Hourly Reference Periods			Daily Reference Periods		
	1/2 hourly PM ELV	Monthly 1/2 hourly mean	Highest 1/2 hourly maximum	Daily PM ELV	Monthly daily mean	Highest daily maximum
2021						
Jan	45			15		
Feb	45			15		
Mar	45			15		
Apr	45			15		
May	45	-	-	15	-	-
Jun	45	-	-	15	-	-
Jul	45	-	-	15	-	-
Aug	45	-	-	15	-	-
Sep	45	-	-	15	-	-
Oct	45	-	-	15	-	-
Nov	45	-	-	15	-	-
Dec	45	-	-	15	-	-



**Comments :**  
 Plant operational sporadically in January - April 2020. Shut down since April 2020.

Monitoring of Carbon Monoxide (half hourly) Whole Installation

mg/Nm <sup>3</sup>	1/2 Hourly Reference Periods			Daily Reference Periods		
	1/2 hourly CO ELV	Monthly 1/2 hourly mean	Highest 1/2 hourly maximum	Daily CO ELV	Monthly daily mean	Highest daily maximum
2021						
Jan	150			75		
Feb	150			75		
Mar	150			75		
Apr	150			75		
May	150	-	-	75	-	-
Jun	150	-	-	75	-	-
Jul	150	-	-	75	-	-
Aug	150	-	-	75	-	-
Sep	150	-	-	75	-	-
Oct	150	-	-	75	-	-
Nov	150	-	-	75	-	-
Dec	150	-	-	75	-	-



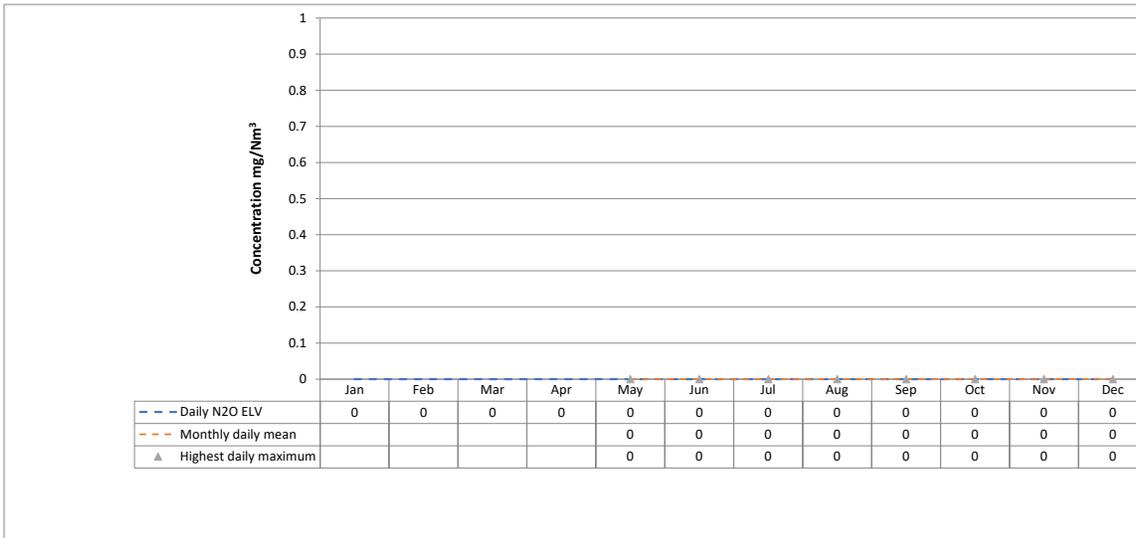
**Comments :**  
 Plant operational sporadically in January - April 2020. Shut down since April 2020.

Monitoring of Nitrous Oxide emissions

2021	Daily Reference Periods		
	Daily N2O ELV	Monthly daily mean	Highest daily maximum
Jan	0		
Feb	0		
Mar	0		
Apr	0		
May	0	-	-
Jun	0	-	-
Jul	0	-	-
Aug	0	-	-
Sep	0	-	-
Oct	0	-	-
Nov	0	-	-
Dec	0	-	-

Monitoring of Nitrous Oxide (Per Combustion Line

2021	mg/Nm <sup>3</sup>	Monthly daily mean	Monthly daily maximum
A1	Jan		
	Feb		
	Mar		
	Apr		
	May	-	-
	Jun	-	-
	Jul	-	-
	Aug	-	-
	Sep	-	-
	Oct	-	-
	Nov	-	-
	Dec	-	-
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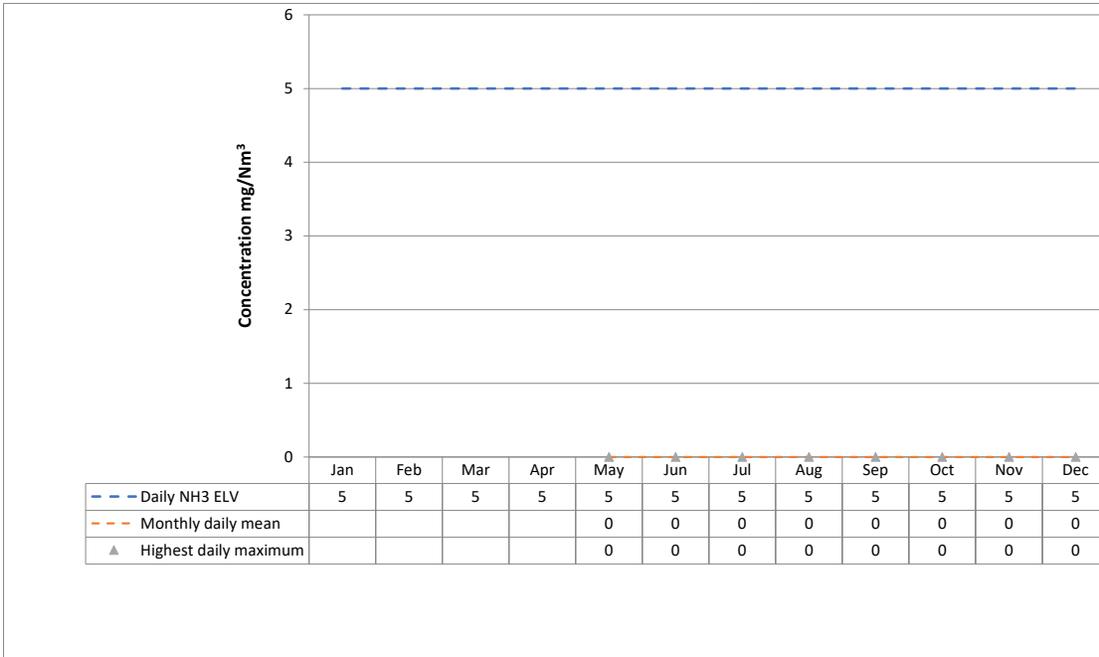
**Comments :**  
 An indicated ELV value of zero in the table above means that no nitrous oxide limit is set in the permit.

Monitoring of Ammonia emissions

mg/Nm <sup>3</sup>	Daily Reference Periods		
	Daily NH3 ELV	Monthly daily mean	Highest daily maximum
2021			
Jan	5		
Feb	5		
Mar	5		
Apr	5		
May	5	-	-
Jun	5	-	-
Jul	5	-	-
Aug	5	-	-
Sep	5	-	-
Oct	5	-	-
Nov	5	-	-
Dec	5	-	-

Monitoring of Amm Per Combustion Line

2021	mg/Nm3	Monthly daily mean	Monthly daily maximum
A1	Jan		
	Feb		
	Mar		
	Apr		
	May	-	-
	Jun	-	-
	Jul	-	-
	Aug	-	-
	Sep	-	-
	Oct	-	-
	Nov	-	-
	Dec	-	-
	Annual	#DIV/0!	



**Comments :**  
 Plant operational sporadically in January - April 2020. Shut down since April 2020.