

Annual performance report for: Equitix ESI CHP (Sheff) Limited, Holbrook Community REC

Permit Number: EPR/VP3737RS

Year: 2022

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.

1. Introduction

Name and address of plant	Holbrook Community REC Rother Valley Way Holbrook Sheffield South Yorkshire S20 3RW
Description of waste input	Wood. Wooden packaging. Waste bark and cork. Sawdust, shavings, cuttings, wood, particle and veneer. Wastes from pulp, paper and cardboard production and processing Waste bark and wood.
Operator contact details if members of the public have any questions	Paul Ireland Welken House 10-11 Charterhouse Square London EC1M 6EH DDI: 020 7250 7333

2. Plant description

The current permit allows for up to 55,300 tonnes of wood fuel to be imported to the site on an annual basis, which equates to an average daily fuel consumption of 168 tonnes. This amount of wood is the equivalent of 29.4 MW thermal input spread evenly across two process lines (14.7 MW each). In normal operating conditions both lines would be operating creating a total demand for the installation of 7.009 tonnes per hour of wood fuel.

As permitted, it is anticipated that approximately 52,000 Megawatt hours (MWh) of renewable electricity will be generated per annum.

A summary of the overall process is as follows:

- Lorries will deliver the pre-prepared wood chips into the fuel hall (refer Plan H40/V3/01) and will leave by site traffic management system.
- After inspection, sampling and verification, a front-end loader (FEL) will then load the wood on to the two walking floors, which will have six push rods to feed two conveyors.

- Each conveyor will feed a hopper and ram feeder at each line that further feeds fuel into each of the thermal units/boilers.
- The heat from the boiler heats a thermal oil, Therminol 66 which in turn heats the cyclopentane in a sealed heat exchanger
- The heated cyclopentane, being a very dense liquid, is vaporised and the vapours will drive the Organic Rankine Cycle (ORC) Turbine.
- The turbine in turn provides the mechanical energy to drive the electricity generator
- The cyclopentane is cooled to a liquid phase again and re-circulated into the ORC system.
- The resultant flue gasses from the thermal unit pass through an Electrostatic Precipitator, and bag filters in order to clean the emissions and remove any particulate matter prior to the exhaust gases exiting via the flue stack.

A key design consideration is the choice of thermal oil technology in which the thermal oils and cyclopentane are sealed, (PED certified closed circuit) within a low pressure systems operating at <10bar. This creates much less vibration and noise from the generation process than conventional steam driven processes.

In terms of the heat element, the CHP system has been designed to provide 1.2 MW of useful thermal energy. This is achieved by installing heat exchangers into the exhaust gas streams of both boilers to impart thermal energy into the district heating circuits. The heat element is the secondary result of the process, with the generation of electrical energy the primary output. The design of this system ensure that electricity output remains constant and is unaffected by the thermal demands of the heat supply

3. Summary of Plant Operation

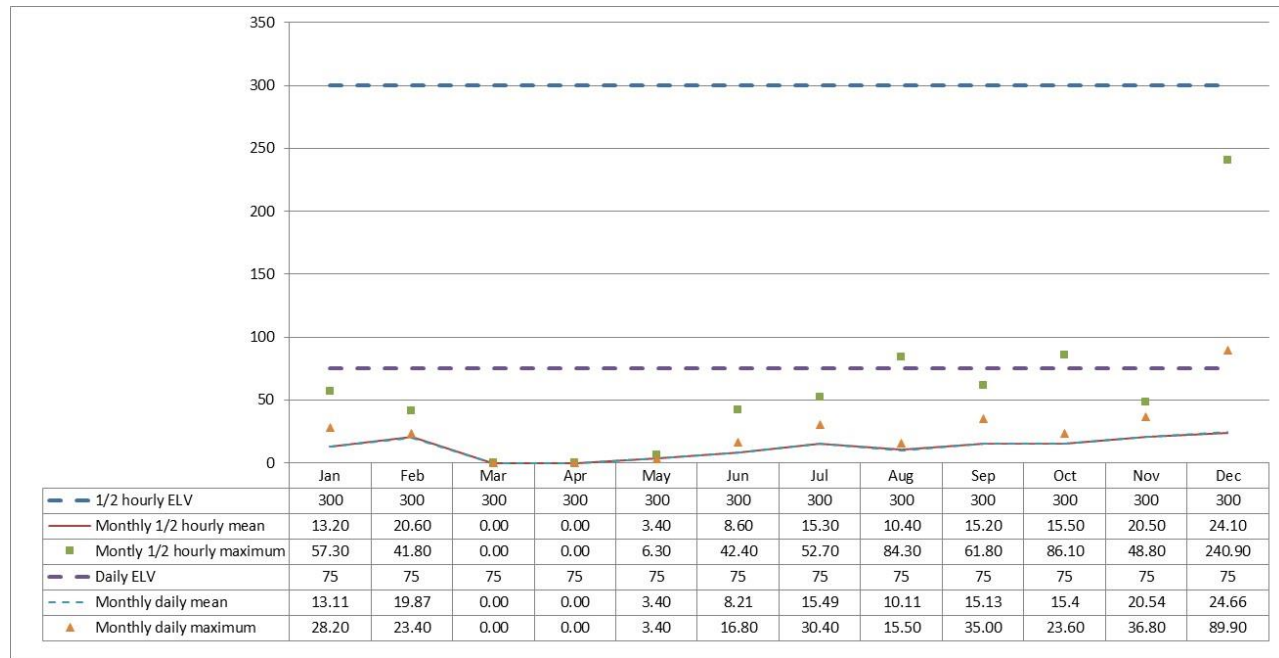
Waste wood (biomass) received	29,820 tonnes
Total waste received	29,820 tonnes
Total plant operational hours – Line A	4319.75 hours
Total plant operational hours – Line B	3930.75 hours
Total hours of “abnormal operation” (see permit for definition)	34
Total quantity of incinerator bottom ash (IBA) produced	647.25 tonnes
Disposal or recovery route for IBA	D09 – Physico-chemical treatment
Did any batches of IBA test as hazardous? If yes, state quantity	647.25 tonnes
Total quantity of air pollution control (APC) residues produced	615.56 tonnes
Disposal or recovery route for APC residues	D09 – Physico-chemical treatment
Total electricity generated for export to the National Grid	18,189.55 MWh

4. Summary of Plant Emissions

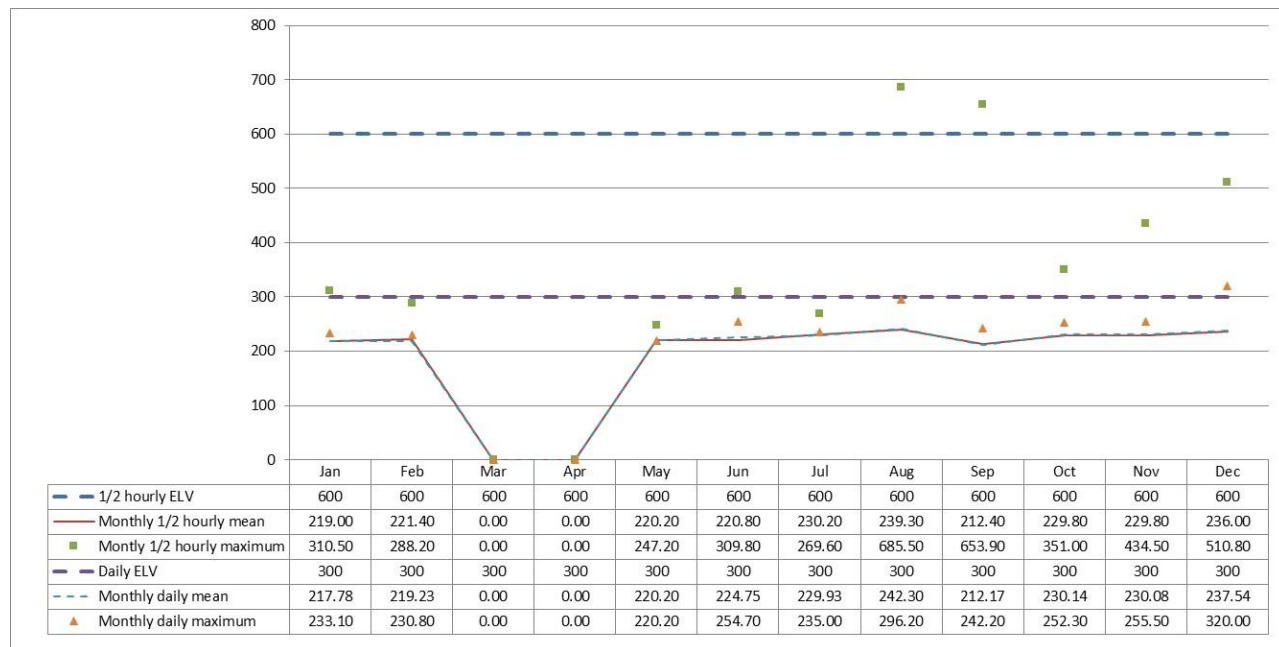
4.1 Summary of continuous emissions monitoring results for emissions to air

The following charts show the performance of the plant against its emission limit values (ELVs) for substances that are continuously monitored.

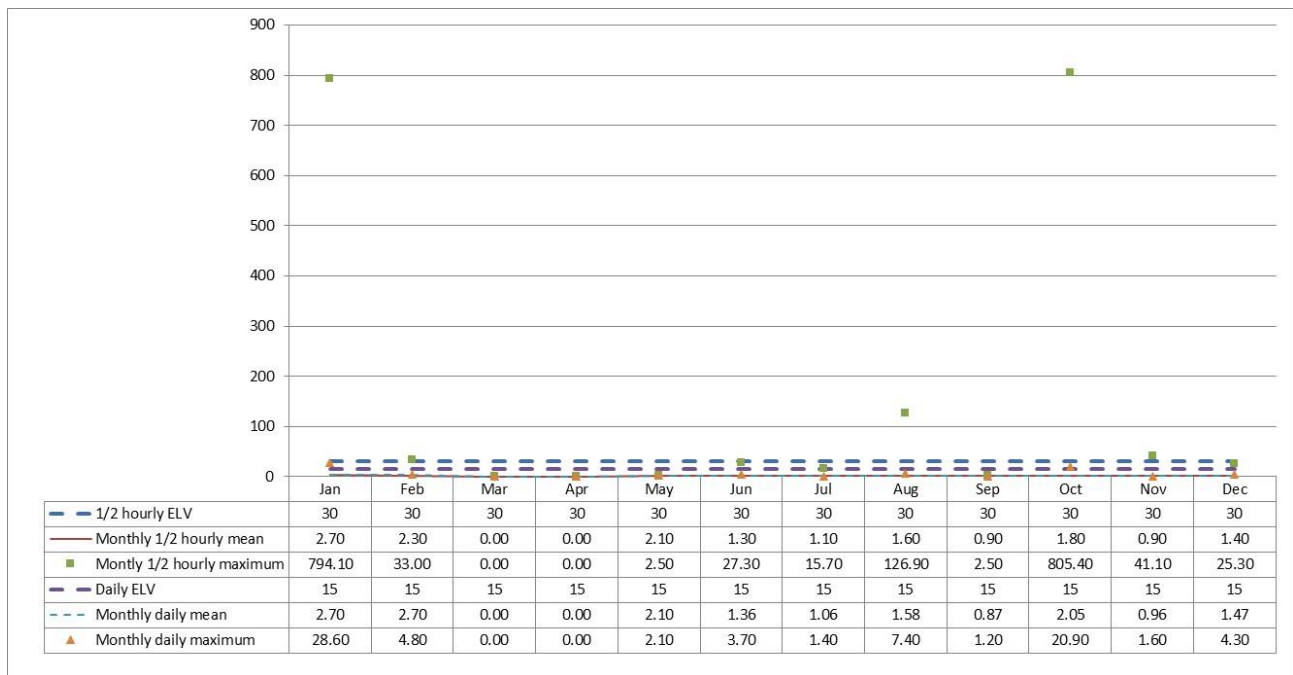
4.1.1 Line A – Sulphur dioxide



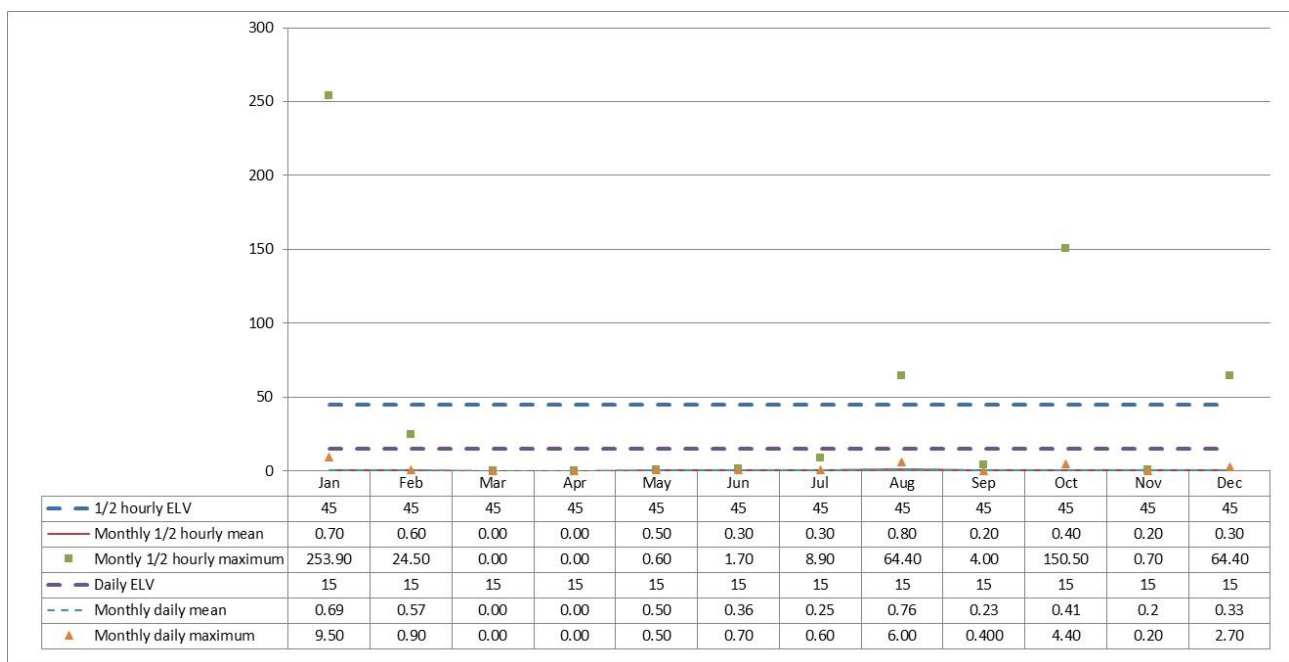
4.1.2 Line A – Oxides of nitrogen



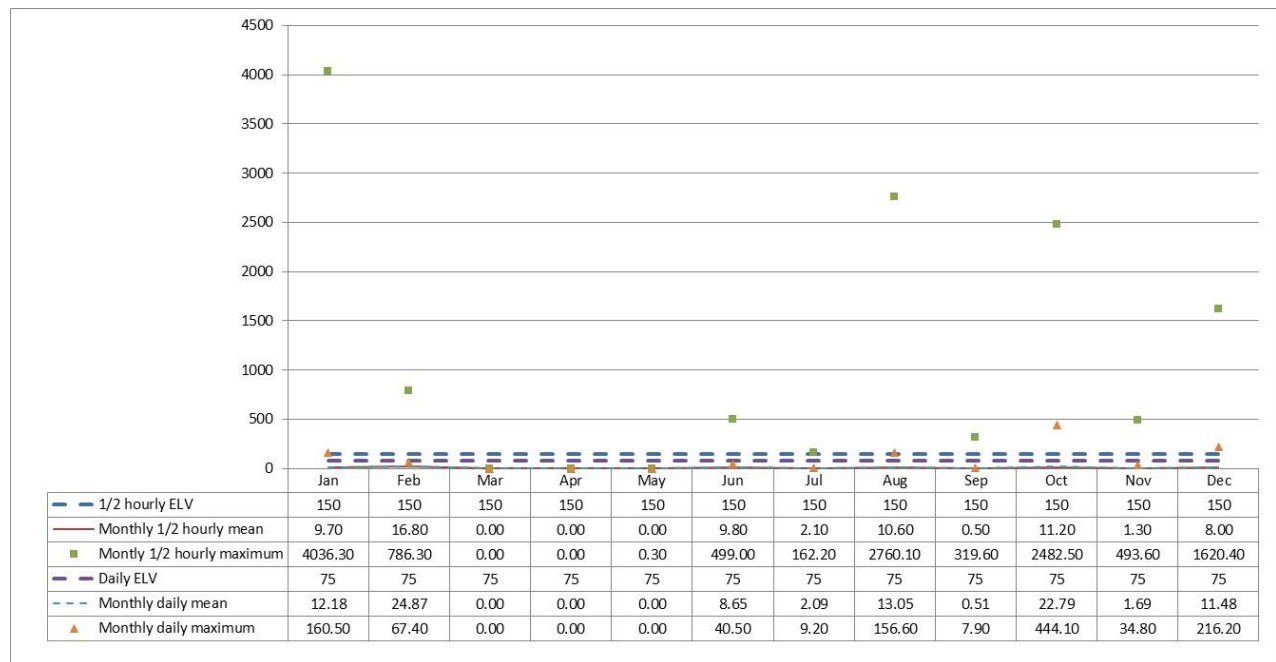
4.1.3 Line A – Total organic carbon



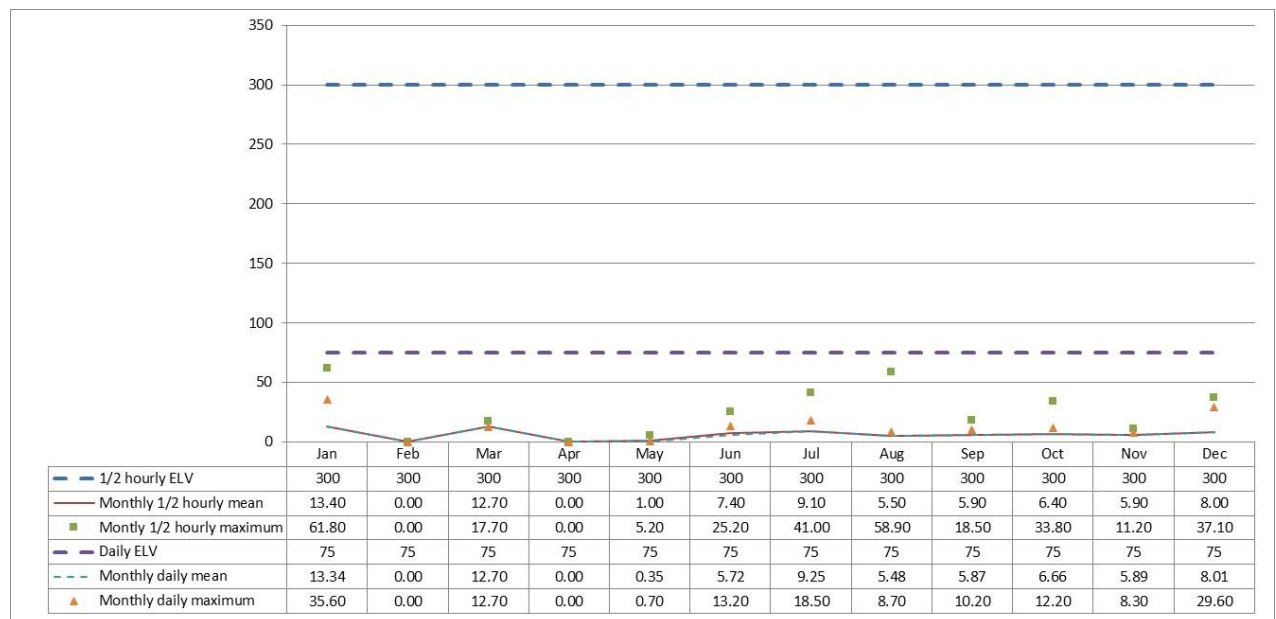
4.1.4 Line A – Particulates



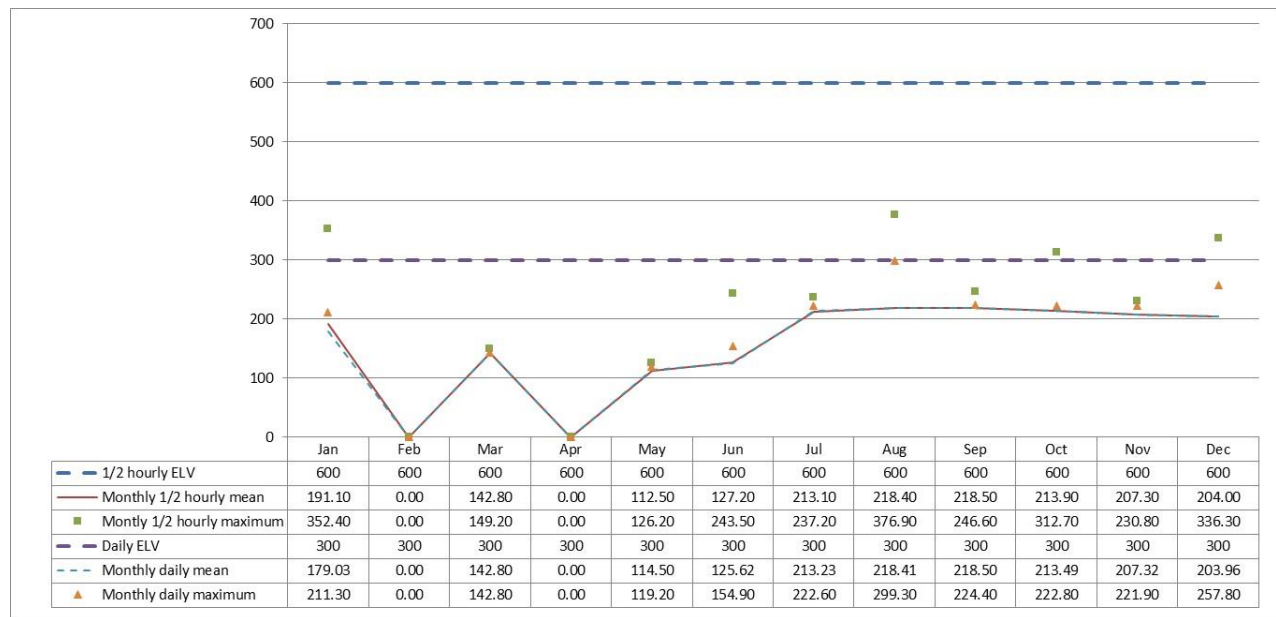
4.1.5 Line A – Carbon monoxide



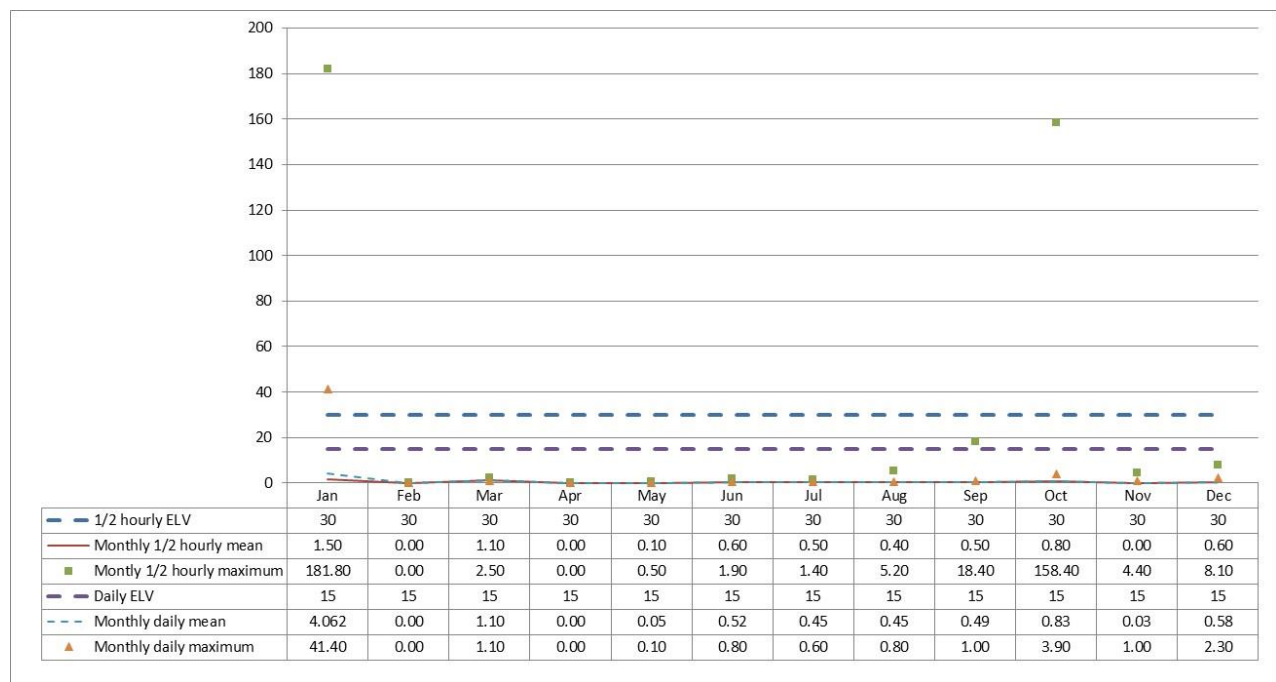
4.1.6 Line B – Sulphur dioxide



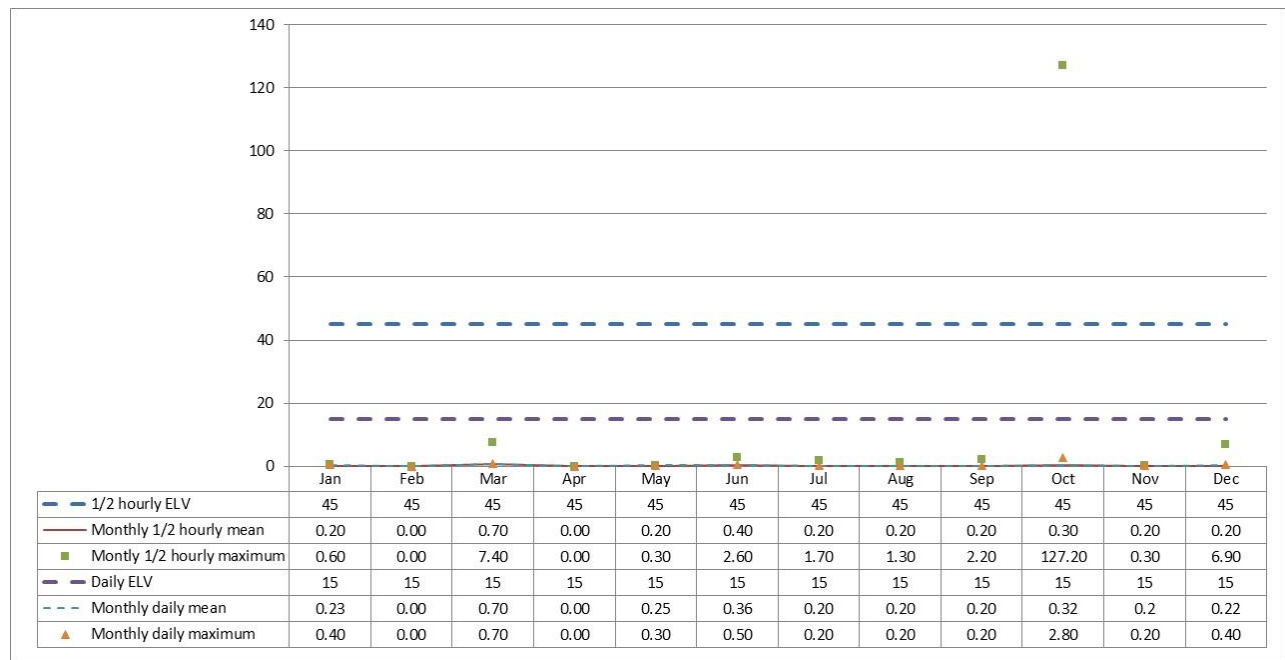
4.1.7 Line B – Oxides of nitrogen



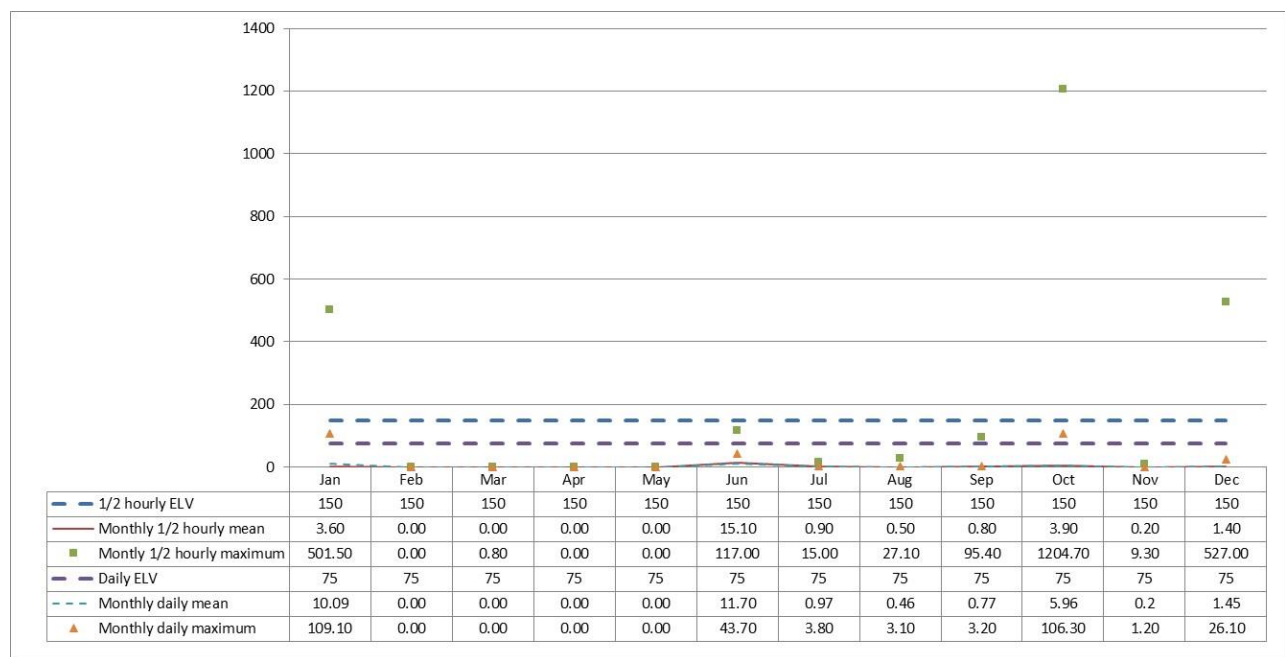
4.1.8 Line B – Total organic carbon



4.1.9 Line B – Particulates



4.1.10 Line B – Carbon monoxide



4.2 Summary of periodic monitoring results for emissions to air

The table below shows the results of periodically monitored substances.

Substance	Emission limit value	Results – Point A1	
		03/08/2022	
Mercury and its compounds	0.05 mg/m ³	Offline	
Cadmium & thallium and their compounds (total)	0.05 mg/m ³	Offline	
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/m ³	Offline	
Dioxins and furans (I-TEQ)	0.1 ng/m ³	Offline	
Hydrogen Fluoride	3 mg/m ³	Offline	

Substance	Emission limit value	Results – Point A2	
		03/08/2022	
Mercury and its compounds	0.05 mg/m ³	0.00078 mg/m ³	
Cadmium & thallium and their compounds (total)	0.05 mg/m ³	0.0014 mg/m ³	
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	0.5 mg/m ³	0.097 mg/m ³	
Dioxins and furans (I-TEQ)	0.1 ng/m ³	0.0635 mg/m ³	
Hydrogen Fluoride	3 mg/m ³	4.6 mg/m ³	

4.3 Summary of monitoring results for emissions to water

There are no emissions to water from the process other than clean surface water.

5. Summary of Permit Compliance

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

Date	Summary of notification or non-compliance	Reason	Measures taken to prevent reoccurrence
02/08/2022	Notification for periodic HF exceedance on A2.	No reason identified.	This is the first exceedance of HF. Previous HF results have been between 0.02 – 0.3 mg/m ³ below the ELV of 5 mg/m ³ .
30/12/2022	Notification for daily NOx ELV and Half Hourly CO Exceedance on A1.	CO Issue caused by loss of fuel feed system on Line B due to failed hydraulic hose. The furnace temperature lowered	Gas burner is awaiting replacement parts after engineer visit. This would prevent low firebox temperatures when any

Date	Summary of notification or non-compliance	Reason	Measures taken to prevent reoccurrence
		rapidly due to a failed gas burner. The four 30 min ELV limits were very high and then followed 22 invalid data half hours but wood feed was not occurring at the time. Due to high readings before the invalid data and only 22 valid readings after the daily average was breached. NOx issue caused for the exact same reason with regards valid and invalid data but levels were high due to high O2 readings and lower temperatures in the firebox until wood feed restarted.	abnormal operation is present. Supplier being chased to expedite.
31/12/2022	Notification for daily HCL and SO2 ELV Exceedance on A1.	Issue originated from events on 30/12/22. Daily ELV occurrences on NOx and CO caused the Furnaces to stop the wood fuel feed and go to Gas Burner mode. Due to Gas burner failure and fear of burn back on the Ram feeders in the fuel supply hopper, the operator manually fed wood into the firebox grate. There was also a faulty thermocouple reading which gave the impression that the firebox was up to temperature when in fact it was below Lime injection levels. Manual injection of wood periodically caused a rise in HCL & SO2 emissions. There is an interlock on the system that inhibits the Lime/Carbon dosing system when the firebox is in any mode except Heating mode. As both of these conditions were evident, then there was no Lime/Carbon dosing resulting in a breach of the HCL & SO2.	Gas burner is awaiting spares after engineer visit. This would prevent low firebox temperatures when any abnormal operation is present. New Operators to be taken through extra training. The logic is also under review with regards the lime dosing at lower temperatures.

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

Date of complaint	Summary of complaint	Reason for complaint including whether substantiated by the operator or the EA	If substantiated, measures to prevent reoccurrence
	None		

6. Summary of plant improvements

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

All improvement conditions have been completed.

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.

No changes or variations considered in this annual report.

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

2022's successful bang and clean trial has led to the development and (assuming financial approval) installation of a new online cleaning system in the economiser and boiler of one line. This is aimed at keeping the units clean off ash fouling and improved heat exchange efficiency.

There will be the start and completion of significant turbine modifications to eliminate the source of oil leakage into the generator. This will initially be through piping modifications but there is a back-up plan of an additional pump and lube oil system modification if the piping proves unsuccessful.

An SNCR white paper is being developed to look at improvement in urea dosing to address ammonia slippage and use the urea more efficiently to comply with Reg 61 proposed changes.

Other improvements and modifications we are undertaking on site will improve plant availability and uptime. This year's outage will be the most expensive and significant thus far to reset the lock on a number of assets maintenance cycles.