

Annual Performance Report
For
Veolia Bio-energy Biomass Plant
Permit No: EPR/BP 3736HA
Year – 2018

Report produced by
Veolia Bio-energy Operations
Chilton Power Station
Chilton Industrial estate
Chilton, Co Durham
DL17 0PB

Report Issued: 15th January 2019

Veolia Bio-energy Annual Report 2018
Permit EPR/BP 3736HA

Document Control Sheet

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Plant Description

Chilton Bio-energy site is located on Chilton Way, Chilton Industrial Estate in County Durham, DL17 0PB at approximate national grid reference 428267 530295.

Chilton bio-energy incinerates life expired waste wood to raise steam to generate electricity for export to the national grid.

Chilton Bio Energy has a nominal design capacity of 13 tonnes of wood per hour, with a maximum annual consumption of 120,000 tonnes. This is at a continuous rating of approximately 312 tonnes per day based on an average net calorific value of 15 Mega Joules per kg (15 MJ/kg).

The anticipated availability of the Plant is 7,800 – 8,000 hours per annum (89% availability).

The Plant is a single line reciprocating grate process and is fuelled by road deliveries of waste wood. Heat from combusting the fuel is converted to energy through the generation of steam at 491°C, 84 bar absolute pressure and at a flow rate of 67 tonnes per hour. The high pressure 54 MW thermal input boiler incorporates a super heater pass. The steam is expanded through a steam turbine. Exhaust steam is condensed and re-circulated via a water-cooled condenser.

Chilton Bio-energy can generate 17.45 megawatts of electricity (17.45 MWe gross) of which 15.45 MWe net is available for export to the National Grid.

The incinerator can supply heat to the adjacent pellet mill using a turbine steam bleed to heat water via an intermediate heat exchanger. This process enables Chilton to be deemed a CHP plant.

Flue gases leaving the boiler are treated in an air pollution control system consisting of selective non-catalytic reduction system (SNCR), lime and Activated carbon injection and an electrostatic precipitator (ESP) followed by a three cell bag filter are used for particulate removal. The cleaned flue gases are emitted to atmosphere via a 44m high stack.

Bottom ash is collected in hoppers beneath the combustion grate and transported via covered chain conveyor to a waste skip. Residues from the air pollution control system such as fly ash are collected in hoppers and transferred pneumatically into an ash storage silo.

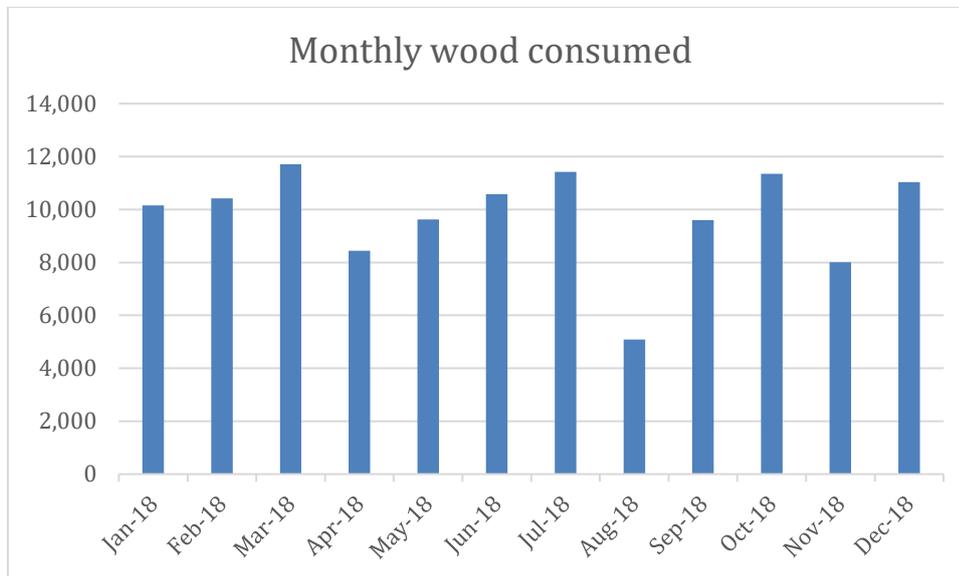
The installation generates emissions to air from the combustion process, emissions to sewer from boiler blowdown, emissions to land of uncontaminated rainwater and waste residues of bottom ash and fly ash.

SUMMARY OF PLANT OPERATION

Veolia Bio-energy Chilton power station was commissioned on 9th December 2011 and therefore 2018 was the seventh full year of operation. The principle challenges in relation to the seventh year of operation of Chilton power station have been associated with outages every 4 months in order to clean the super heater tube bundles. During Jan 2018 the plant had two separate super heater tube failures which resulted in unplanned outage time. These were rectified and a plan put in place to manufacture a full new Super heater No 3 out of fully Inconel coated material to extend the life of the super-heaters and prevent further unexpected failures. This new super heater was installed in November 2018. Super heater No 2 bottom section was also replaced with the fully coated Inconel pendants.

During this seventh year of operation Chilton power station processed **117413T** of waste wood to generate **130,015MW** of electricity.

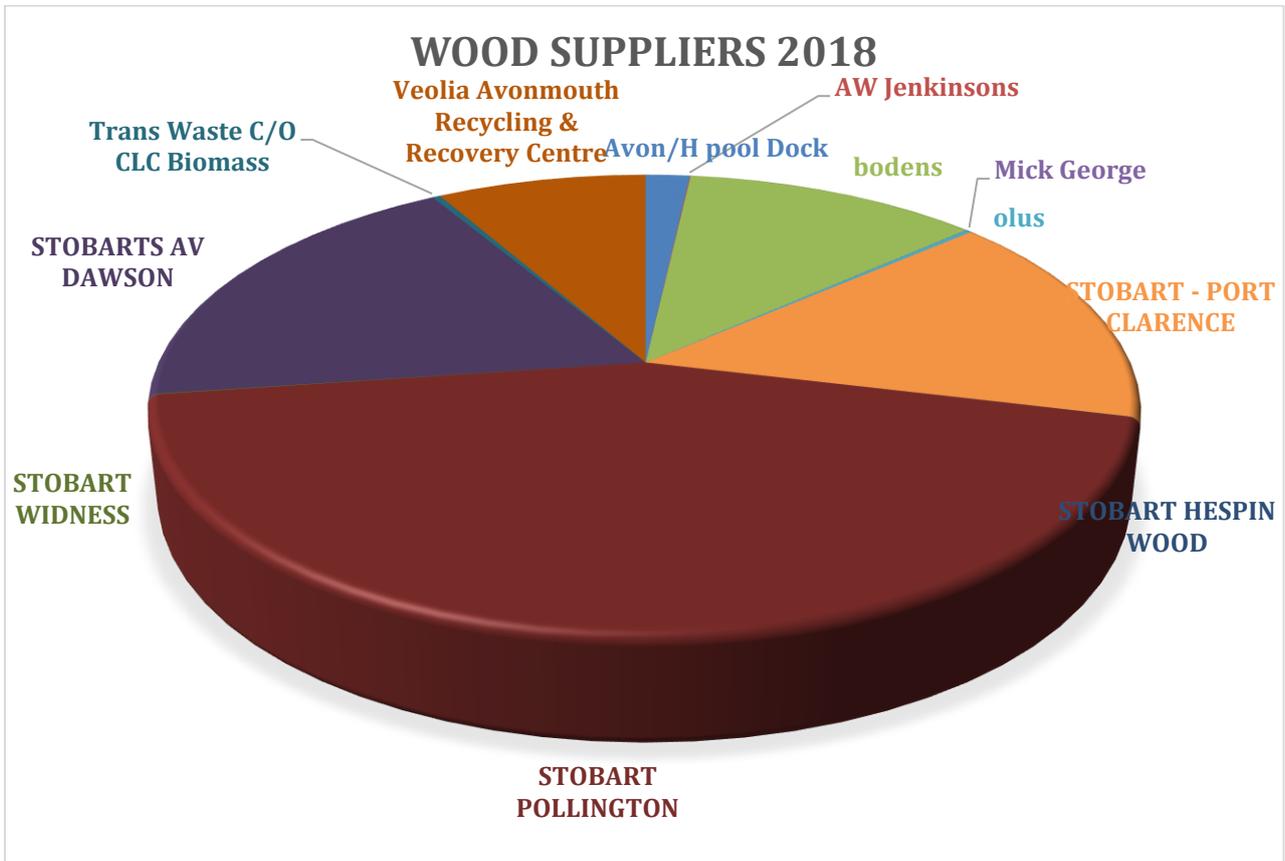
A breakdown of the waste wood received by month:-



Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
10,157	10,423	11,708	8,439	9,620	10,570	11,418	5,090	9,599	11,345	8,010	11,032

As required through the Waste Incineration directive Article 4(4) the permit identifies the types of waste by European Waste Catalogue (EWC) code.
 All waste wood received at Chilton has a EWC code of 170201.

Chilton Waste Wood Supply Origin



Total Plant Operational Hours.

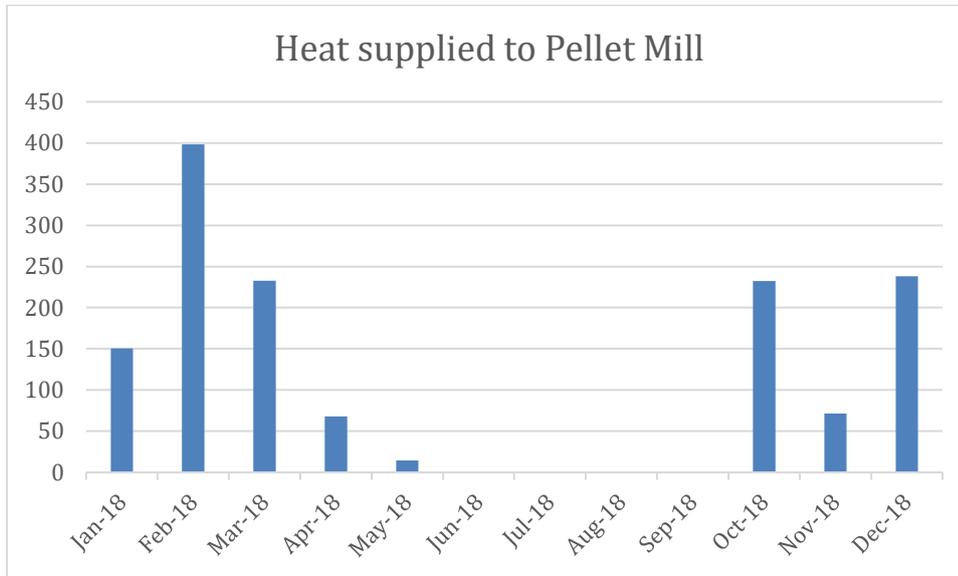
Chilton Power station maintenance is scheduled with the aid of a computerised maintenance management system. This system allows the scheduling of maintenance activities to prevent unexpected failures.

In the third year of operation unscheduled outages restricted the generation produced by the station.

Available Hours 8760

Hours On	7681
Hours Off - Scheduled	737
Hours Off - Unscheduled	342
	8760

Percentage	
Hours On %	87.7%
Hours Off - Scheduled %	9.5%
Hours Off - Unscheduled %	3.9%



Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
150.61	398.37	232.83	68.11	14.32	0	0	0	0.03	232.2	71.49	238.13

Chilton power station provides heating steam to the adjacent Pellet Mill by heating process water using steam drawn from the steam turbine bled steam system. As you can see it's a seasonal profile depending on moisture content

The total heat used by the Pellet mill in 2018 was 1406.09 MW

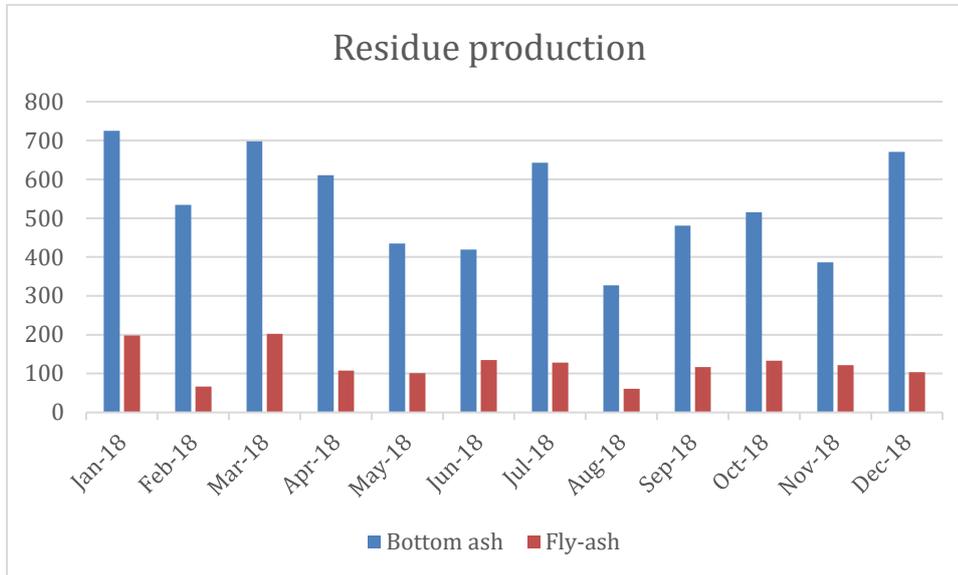
Electricity Generation Efficiency

Electricity generation efficiency (Excluding parasitic use) was 27.3 during 2018. This efficiency is based on fuel consumed when generating electricity and supplying heat

Residue Production

Veolia Bio-energy Chilton power station produces three types of residue

- Bottom ash - an inert material resulting from the combustion process. Due to the caustic nature of this ash and the absence of site storage capability this ash is transported in covered skips to a hazardous landfill site for disposal.
- Air pollution control residue – a mixture of hydrated lime and other particles captured by the waste gas treatment facilities. This material requires to be treated prior to landfill.



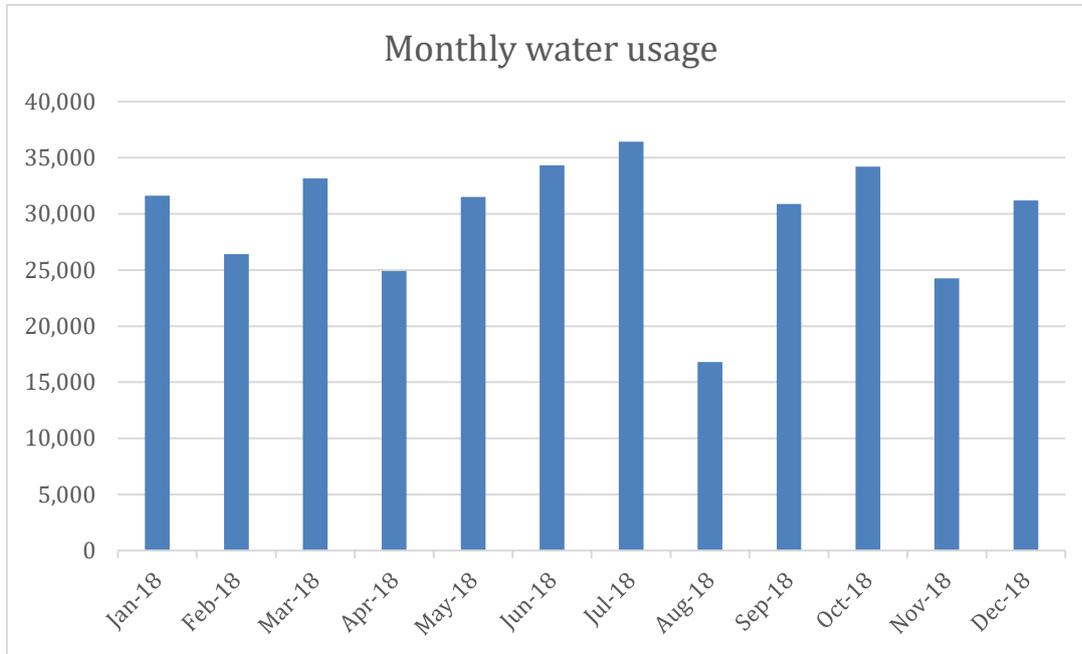
Month	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
Bottom ash	725	534	698	611	435	419	643	327	481	515	386	671
Fly-ash	198	67	202	108	101	135	128	61	117	133	122	104

Waste	Yearly total tonnes
Bottom Ash (81.3%)	6444
APC (18.6%)	1476

CHILTON WATER USAGE AND EFFLUENT DISPOSAL

Chilton Power station is supplied with town water at a maximum rate of 50T/Hr
 The majority of Chilton water use is by evaporation from the site cooling towers and by the treatment of water for steam generation.

Chilton discharges effluent within Northumbrian water consents
 The majority of Chilton effluent is derived from the control of water basin water hardness



Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
31,634	26,429	33,170	24,913	31,501	34,329	36,423	16,791	30,887	34,228	24,256	31,199

Summary of plant emissions

The monitoring requirements are set out in Section 3 and schedule 3 of the permit.
 Chilton power station is required to carry out continuous and periodic monitoring of the emission to air from Emission point A1

Measured emissions

Measured emissions	Continuously	Periodically
Sulphur dioxide	X	x
Carbon dioxide	X	x
Hydrogen chloride	X	x
Oxides of Nitrogen	X	x
Particulates	X	x
Total organic Carbon	x	x
Particulate matter	X	x
Hydrogen fluoride		x
Ammonia		x
Nitrous oxide		x
Cadmium & Thallium and their compounds (total)		x

Mercury and its compounds		x
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)		x
Dioxins / furans (I-TEQ)		x
Dioxin-like PCBs (WHO-TEQ Humans / Mammals)		x
Dioxin-like PCBs (WHO-TEQ Fish)		x
Dioxin-like PCBs (WHO-TEQ Birds)		x
Specific individual poly-cyclic aromatic hydrocarbons (PAHs), as specified in Schedule 6.		x
Dioxins / furans (WHO-TEQ Humans / Mammals)		x
Dioxins / furans (WHO-TEQ Fish)		x
Dioxins / furans (WHO-TEQ Birds)		x

Control of emissions

Measures to control of pollutants can be summarised as:

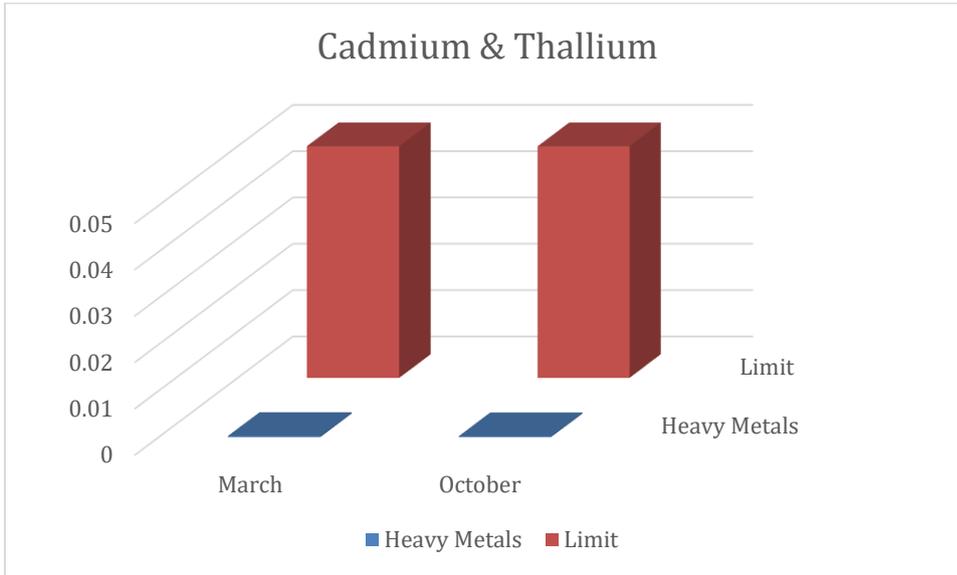
- The acidic gases (Sulphur dioxide and Hydrogen chloride) are controlled by the addition of hydrated lime into the flue gases at the FGT inlet duct
- Carbon monoxide and Total Organic Carbons are controlled through combustion air and combustion control systems
- Oxides of Nitrogen are controlled by recirculating waste gas and by the controlled injection of Urea into the combustion chamber
- Particulates are captured by the electrostatic precipitator which is over 99.9% effective for particles generated from the process and a further 100% duty three cell bag filter installed in 2017 reduces the particulates even further to a daily average not exceeding 1.5mg/Nm³
- The formation of dioxins and furans is inhibited by the removal of tramp metal in the fuel and by the injection of activated carbon at the bag filter inlet duct.

Periodical Monitoring

Within the permit there is an obligation to carry out extractive tests on the substances emitted from the incinerator chimney.

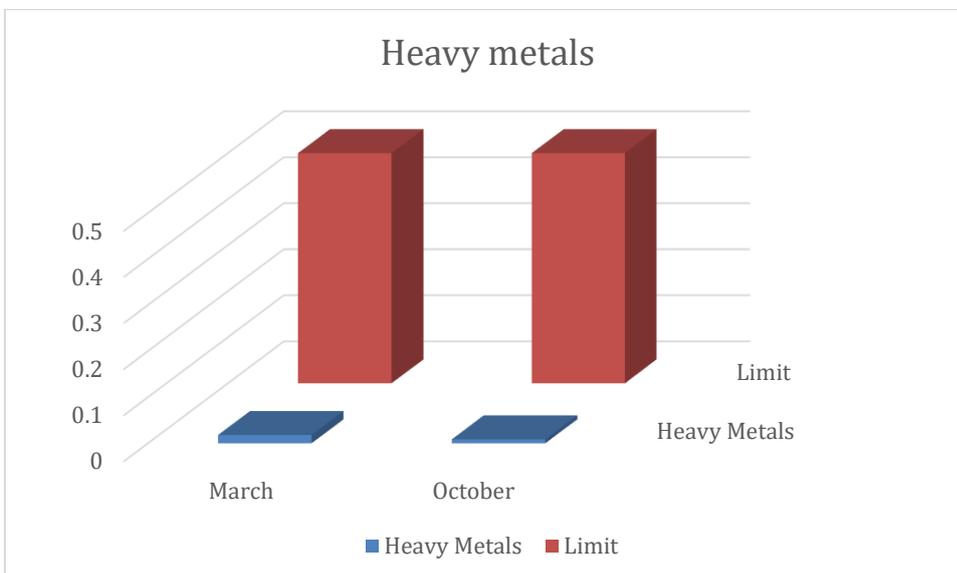
During the second year of operation bi-annual testing and reporting is carried out for Heavy Metals and their compounds, Cadmium and Thallium and their compounds, PCBs, Dioxins and Furans, Mercury and its compounds, PAHs, Hydrogen Fluoride, Ammonia and Nitrous oxide.

Cadmium and Thallium Extractive results



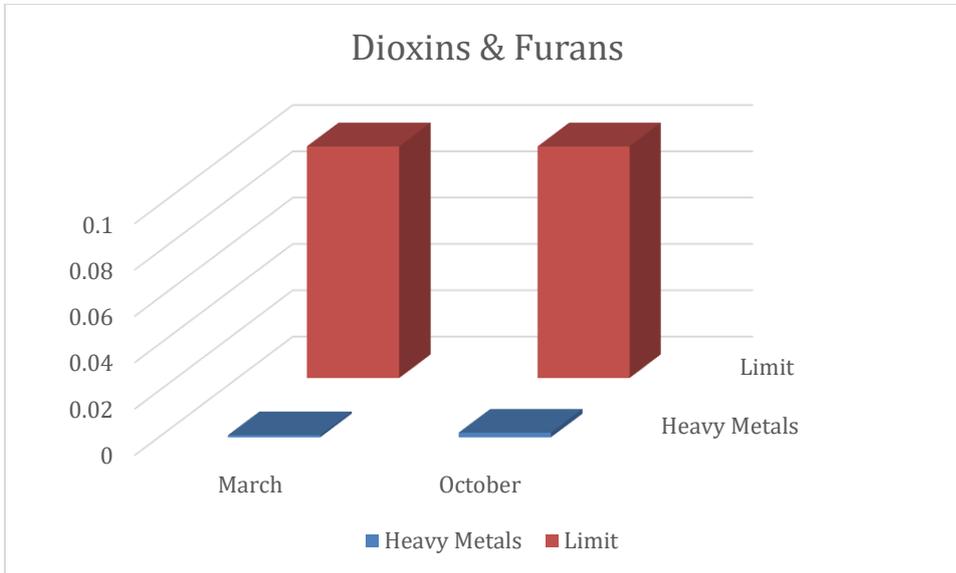
Date	March	October
Heavy Metals	0.00025	0.0002
Limit	0.05	0.05

Heavy Metals Extractive results

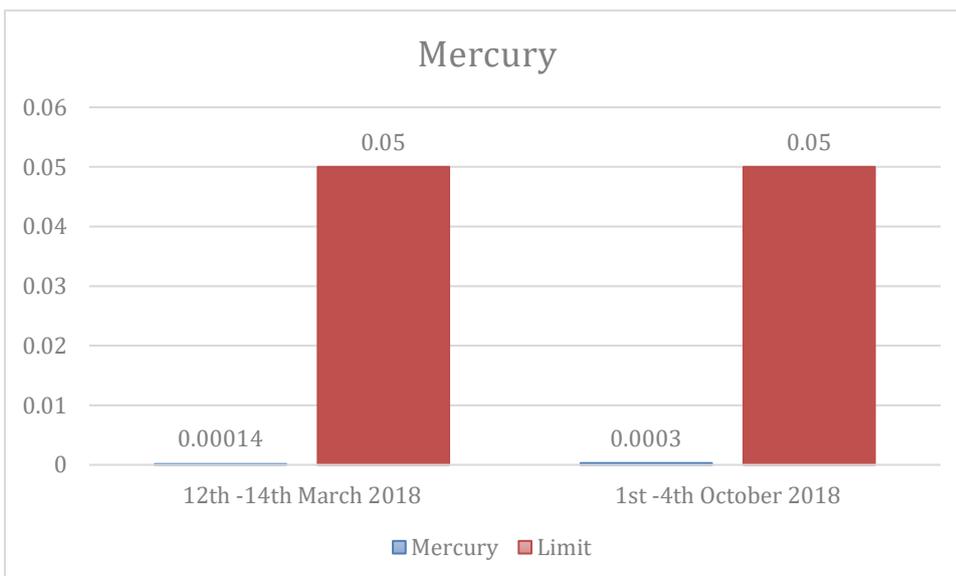


Date	March	October
Heavy Metals	0.018	0.0086
Limit	0.5	0.5

Dioxins and Furans Extractive results



Date	March	October
Heavy Metals	0.000905	0.00199
Limit	0.1	0.1



DATE	12th - 14th March 2018	1st -4th October 2018
Mercury	0.00014	0.0003
Limit	0.05	0.05

The first Bi-annual testing took place in March by Catalyst Exova. This was the third set of results since the bag filter commissioning in Feb 2017. The injection of the new activated carbon product has performed extremely well and reduced the heavy metal values considerably < as seen above>. The second set of tests were completed in October and the results were even lower since further tuning and optimisation of the Carbon dosing rig by the site operational team.

SUMMARY OF PLANT COMPLIANCE

Compliance with continuous emissions to air

Chilton Power station chimney emissions (A1) are continuously monitored by one of two sets of analysers. The display of this analysis is available to control room operators and a software package collates this information and compares it to emission limits for 1/2hr and daily average emissions and 10min average for the Carbon Monoxide.

Chilton CEMS continuously analyses for Particulates, Volatile organic carbon, Sulphur Dioxide, Oxides of Nitrogen, Carbon Monoxide and Hydrogen chloride.

These analysers are subject to weekly, quarterly and annual quality checks to ensure accuracy.

For continuous monitoring the maximum daily averages and the average daily average figures are given on the bar charts.

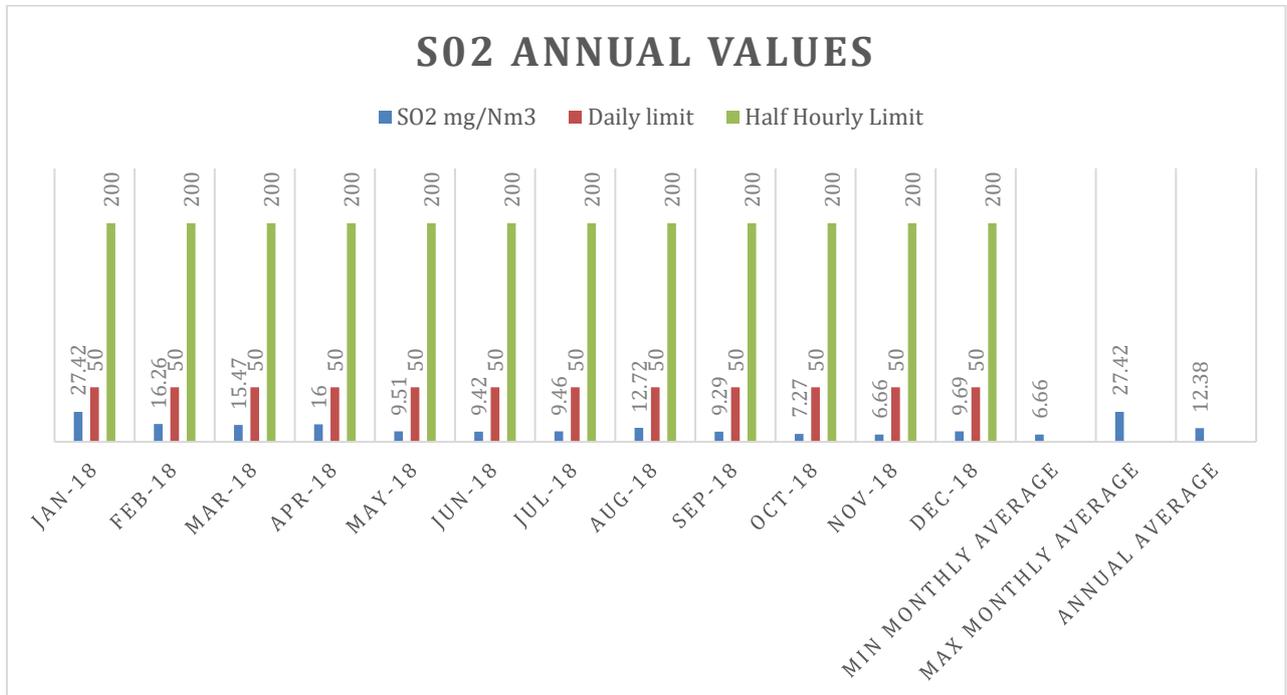
The daily average for CO was not exceeded in 2018

The daily averages for NOx and SO2, Particulates were not exceeded during the year 2018

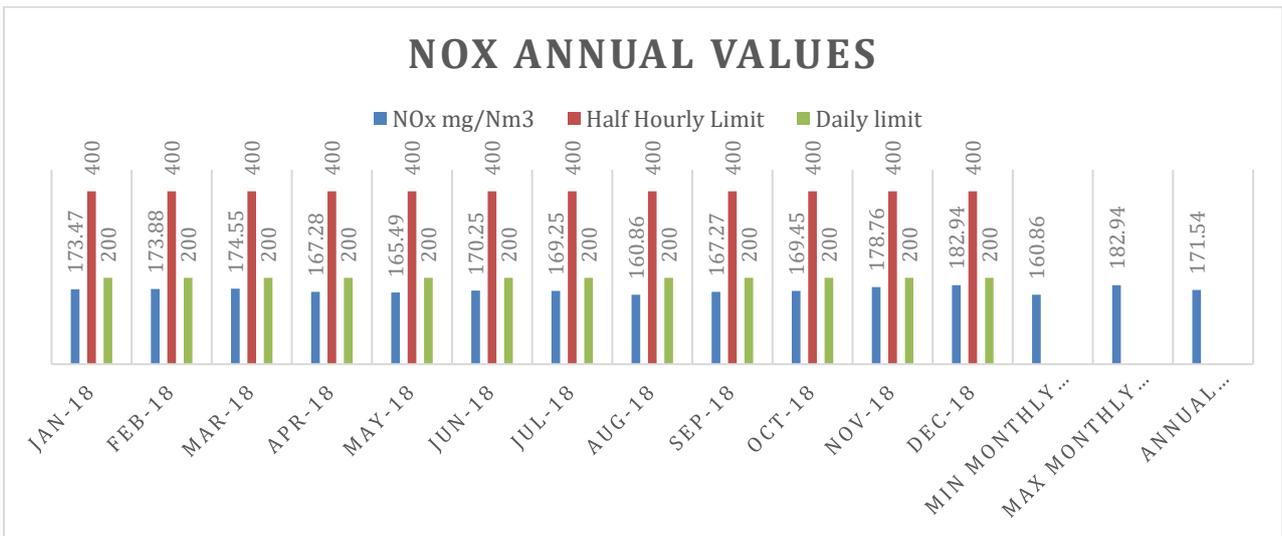
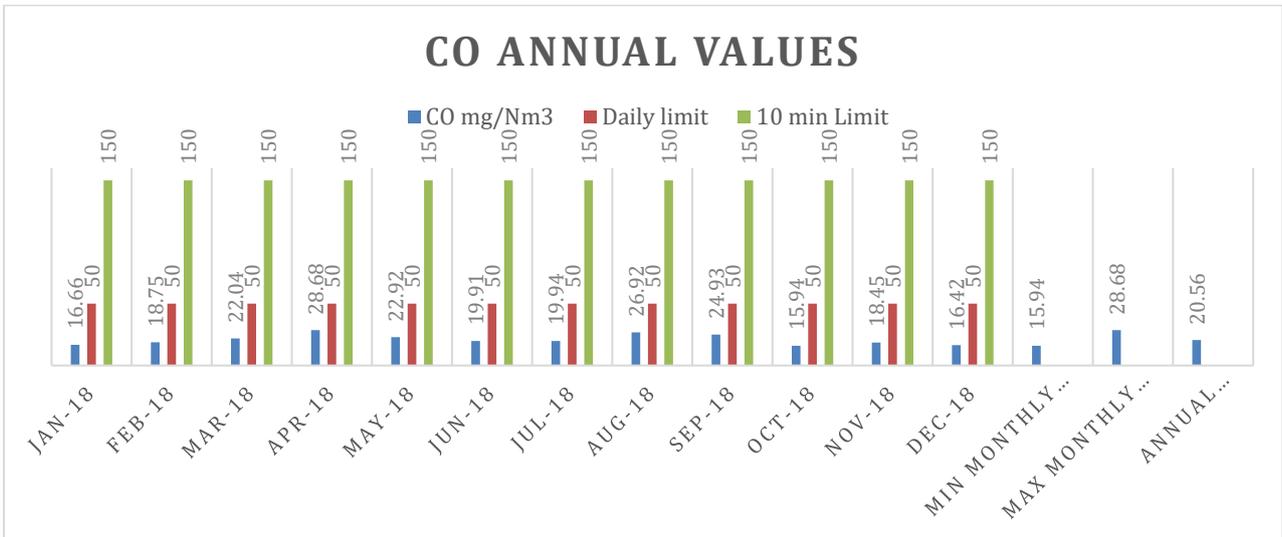
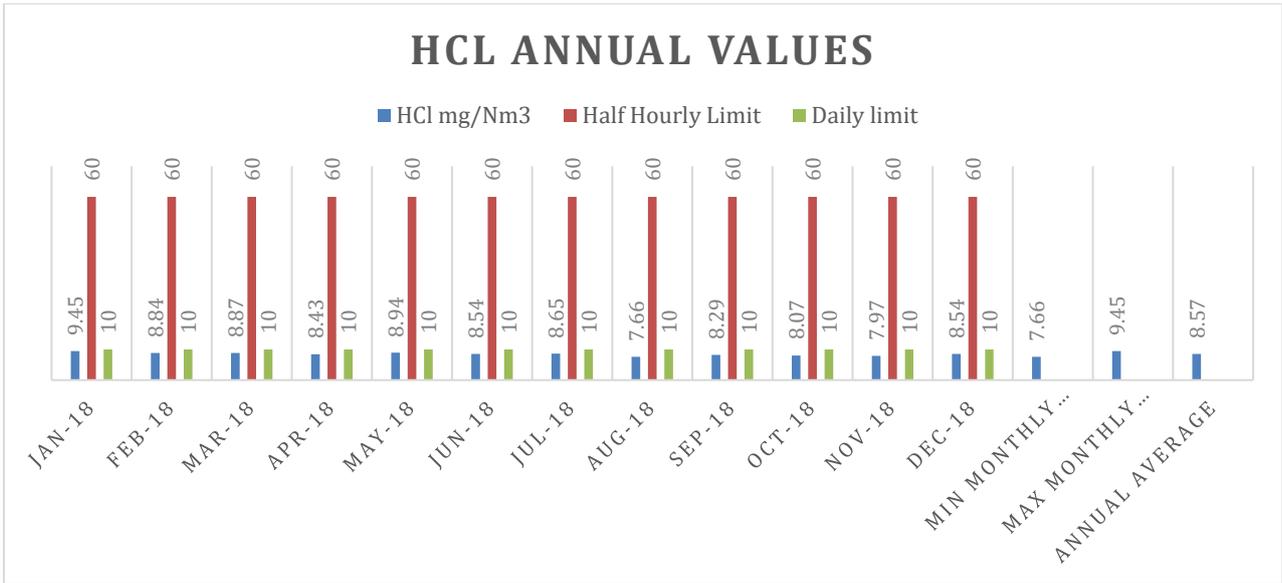
Gases monthly average report

Report for Stream One for 2018

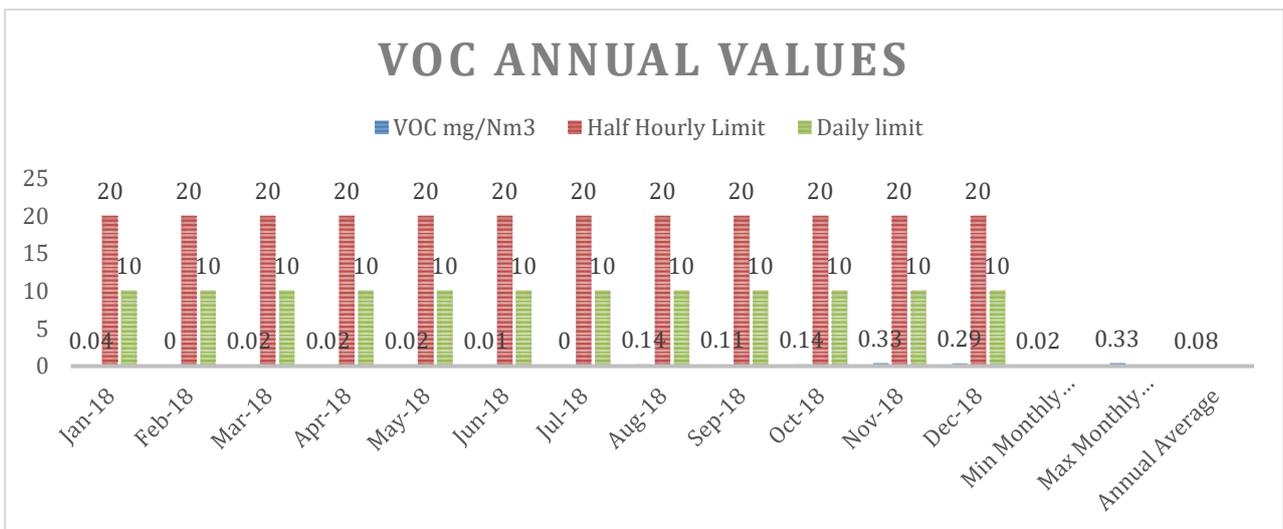
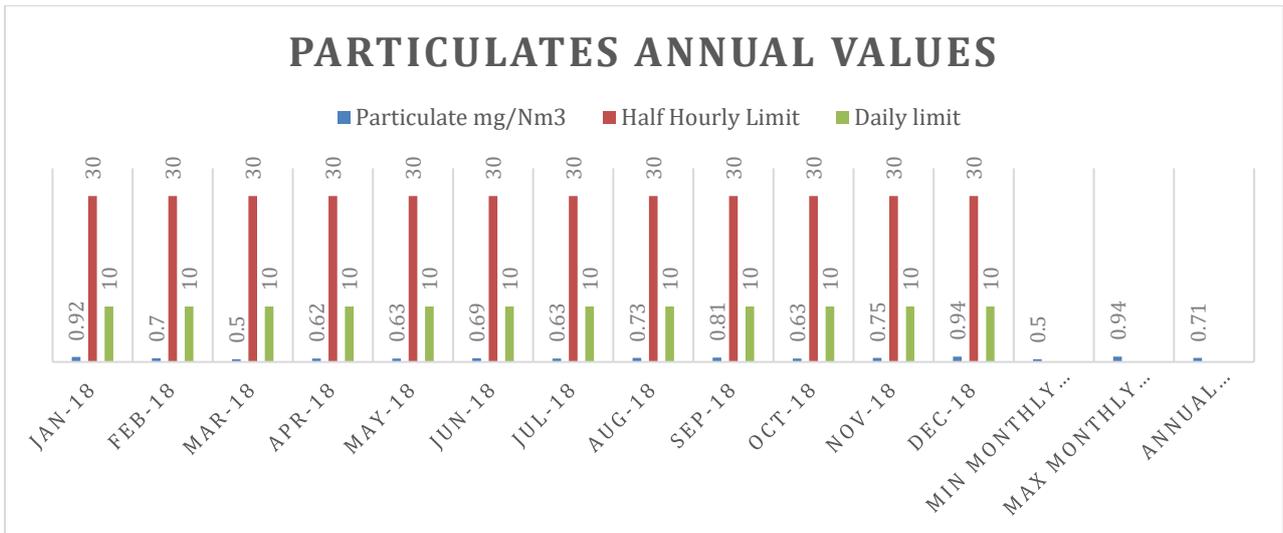
	SO2 mg/Nm3	N2O mg/Nm3	HCl mg/Nm3	HF mg/Nm3	CO mg/Nm3	NOx mg/Nm3	NH3 mg/Nm3	Particulate mg/Nm3	VOC mg/Nm3
January 2018	27.42	3.40	9.45	0.00	16.66	173.47	0.10	0.92	0.04
February 2018	16.26	3.23	8.84	0.01	18.75	173.88	0.01	0.70	0.00
March 2018	15.47	4.37	8.87	0.03	22.04	174.55	0.09	0.50	-0.02
April 2018	16.00	7.80	8.43	0.05	28.68	167.28	2.39	0.62	-0.02
May 2018	9.51	2.57	8.94	0.02	22.92	165.49	0.98	0.63	-0.02
June 2018	9.42	1.21	8.54	0.00	19.91	170.25	0.02	0.69	0.01
July 2018	9.46	1.56	8.65	0.00	19.94	169.25	0.00	0.63	0.00
August 2018	12.72	3.13	7.66	0.00	26.92	160.86	0.23	0.73	0.14
September 2018	9.29	2.09	8.29	0.00	24.93	167.27	0.32	0.81	0.11
October 2018	7.27	0.41	8.07	0.01	15.94	169.45	0.00	0.63	0.14
November 2018	6.66	0.44	7.97	0.01	18.45	178.76	0.01	0.75	0.33
December 2018	9.69	0.38	8.54	0.01	16.42	182.94	0.00	0.94	0.29
Min Monthly Average	6.66	0.38	7.66	0.00	15.94	160.86	0.00	0.50	-0.02
Max Monthly Average	27.42	7.80	9.45	0.05	28.68	182.94	2.39	0.94	0.33
Percentile Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual Average	12.38	2.46	8.57	0.01	20.56	171.54	0.31	0.71	0.08



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There were three Co half hourly spikes during 2018 which resulted in a schedule 5 part A/B been submitted.

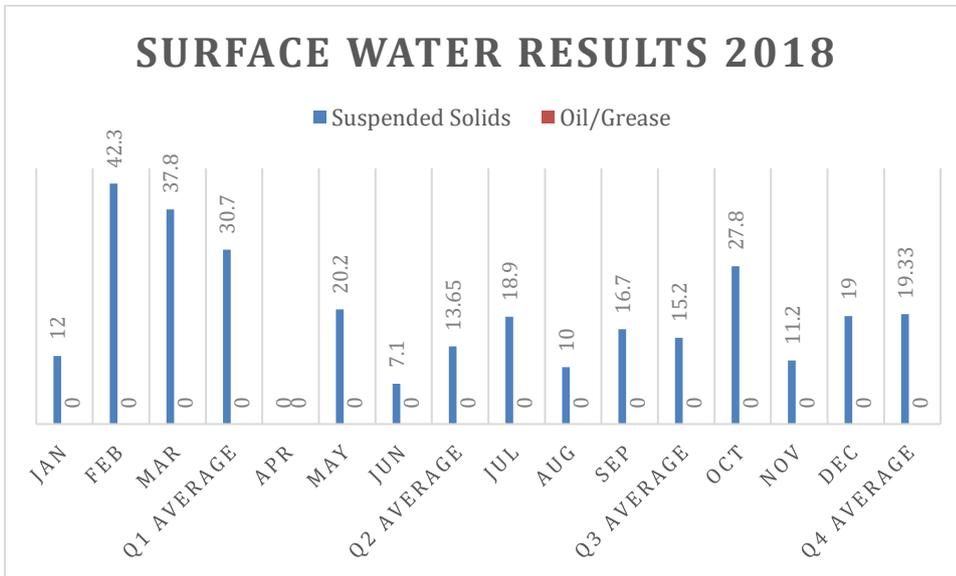
Log of reportable releases to the EA during 2018 operations							
Date	Time	Compound	Value	Calculated KG	Reason for Breach	Date Schedule 5 submitted	By Whom
17/1/2018	16:00-16:29	Carbon Monoxide	147.15	3.1269375	Low O2	18/1/2018	S.Hodgson
21/4/2018	16:00-16:29	Carbon Monoxide	252.94	5.374975	Low O3	21/4/2018	S.Hodgson
5/7/2018	03:30-03:39	Carbon Monoxide	284.77	6.0513625	Relative time delay on grate limits	5/7/2018	S.Hodgson
		(mean flue gas flow =			85 kNm3/hr	Approx	
				Co 10 minute averages log			
Date	Time	Amount in a day max 7	Value	Calculated KG	Reason for limit excursion	Date Schedule 5 submitted	By Whome
01-10-2018	02-20-02-30	1	183.45	3.8983125	Grate stopped	N/A only 1 for the day	N/A
17-11-2018	18:00-18:09	1	213.1	4.528375	Spike	N/A only 1 for the day	N/A
18-11-2018	17:50-17:59	1	174.56	3.7094	Spike	N/A only 1 for the day	N/A
20-11-2018	11:00-11:09	1	157.25	3.3415625	Spike	N/A only 1 for the day	N/A
20-11-2018	13:00-13:09	2	153.04	3.2521	Spike	N/A only 2 for the day	N/A
21-11-2018	05:40-05:49	1	1124	23.885	Spike	N/A only 1 for the day	N/A
27-12-2018	12:30-12:39	1	190.51	4.0483375	Low O2	N/A only 1 for the day	N/A

Chilton surface water is sampled and reported for suspended solids and hydrocarbons

The flow of surface water is very low as it is only the site rain run off that is emitted.

We have sampled this surface water regardless of flow rate and as a result have exceeded the suspended solids permitted limits. This is when the sample has been taken after a major down pour. The surface leaves the site via a surface water penstock valve which can be used in the need of an emergency.

	Jan	Feb	Mar	Q1 average	Apr	May	Jun	Q2 average
Suspended Solids	12	42.3	37.8	30.7	0	20.2	7.1	13.65
Oil/Grease	<5	<5	<5	<5	<5	<5	<5	<5
	Jul	Aug	Sep	Q3 average	Oct	Nov	Dec	Q4 average
Suspended Solids	18.9	10	16.7	15.2	27.8	11.2	19	19.33
Oil/Grease	<5	<5	<5	<5	<5	<5	<5	<5



Chilton analysis for hydrocarbons in surface water has remained at < 5mg/l throughout the year 2018. The suspended solids limit is 20mg/l

Effluent water discharge

Effluent discharge consents are monitored and regulated by the Northumberland Water Board

SUMMARY OF PLANT IMPROVEMENTS

The Bag filter has performed exceptionally well during 2018 and has enabled the plant to run at full load without issues with particulates during soot blowing activities.

Super heater No 2 bottom pendant sections was replaced in the September outage with a fully Inconel 645 coated base material. This will protect the steel from corrosion attack and soot blow erosion

No 3 Super heater pendants were also removed and replaced in November 2018 in order to increase the life expectancy of the tubes.

Inconel overlay applied to more furnace membrane tubes within the combustion zone to protect the base material from chlorine attack.

Tile trial installed to the furnace combustion chamber north and south walls to see if refractory costs could be reduced and a longer life sustained by the tile option. Ongoing monitoring to determine the results in 2019 outage inspections.

SUMMARY OF CHANGES OF THE PLANT OR OPERATING TECHNIQUES WHICH REQUIRED A VARIATION TO THE PERMIT.

During 2018 a permit variation was submitted to change the current monitoring of carbon Monoxide from half hourly to 10 minute average values and limits. The permit was approved 5th October and instigated onsite. The logging of any 10 minute averages are detailed above.

Complaints

There were no complaints during the year of 2018