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Consulting Engineers Limited



**INTERTISSUE
INTERTISSUE BIOMASS BOILER
SUPPORTING INFORMATION**

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1 INTRODUCTION

Intertissue Ltd. (herein referred to as Intertissue) is developing a biomass-fuelled boiler (the Facility) to combust wood biomass fuels (herein referred to as fuel) at the Intertissue Briton Ferry paper manufacturing and processing plant on Brunel Way, Baglan Energy Park, Briton Ferry, Neath, South Wales (the Installation).

This document and its annexes contain the supporting information for the application for an Environmental Permit (EP). They should be read in conjunction with the formal application form. In Section 1, we have provided an overview of the proposed Facility. In Section 2, we have provided further information in response to specific questions in the application form.

1.1 The Applicant

Intertissue manufactures a range of paper products at paper mills in Briton Ferry and Horwich. Established in 2003, Intertissue is the company through which the Sofidel Group (herein referred to as Sofidel) focuses on the UK market.

Sofidel is a world leader in the manufacture of paper products and is the only company in its sector to have joined the World Wide Fund (WWF) for Nature Climate Savers International Programme. The programme urges large companies¹ to voluntarily implement measures to reduce greenhouse gas emissions through the development of innovative strategies and technologies which take on a leading role in reducing greenhouse gas emissions.

During the programme's first measuring period, Sofidel reduced its CO₂ emissions by 11% (broadly equivalent to the electrical consumption of about 150,000 four person family homes per annum) and has invested over €25 million in the process².

Over the second measuring period Sofidel have set a range of objectives³, including (amongst others):

- A commitment to reducing greenhouse gas emissions for each tonne of paper produced by 23% (compared with the 2009 level) by 2020. This objective is anticipated to be delivered through the construction of on-site renewable energy generation facilities. To this end, work has already commenced on facilities at: Frouard (France), Haines City (USA) and Porcari (Italy); and
- A commitment to generating 8% of the annual energy consumption from renewable sources by 2020. This is also anticipated to be achieved through the construction of on-site renewable energy generation facilities (amongst others).

The proposal to develop the biomass boiler at the Installation originates within the framework of these commitments.

In the Briton Ferry plant, Intertissue manufactures tissue paper in reels and finished products. The steam required for the tissue paper production process is currently provided by a natural gas fired boiler. The proposed biomass boiler will therefore displace the use of fossil fuels at Briton Ferry.

1.2 The Site

The Intertissue Briton Ferry site is located in the Baglan Bay within the Baglan Energy Park (BEP). The BEP covers an area of circa 180 hectares (ha) and since its construction in 2004 it has become a well-established modern industrial / business estate, which is occupied by a range of companies, including Intertissue.

¹ Companies signed up to the programme include: Catalyst (Canada), Hewlett Packard, National Geographic, Johnson & Johnson, the Coca Cola Company (all USA), Lego (Denmark), Sofidel (Italy), Sony (Japan), Volvo (Sweden) and Yingli Solar (China).

² <http://www.sofidel.it/eng/climateSavers.php>

³ http://www.sofidel.it/uploadPdf/climate_change_2015.pdf

The Intertissue site's surrounding context can be described as follows:

- The Baglan Brook water course is located immediately to the northeast, beyond which is a vacant development plot (that benefits from planning permission for a health centre and offices), and the offices / service depot occupied by Neath Port Talbot County Borough Council;
- Brunel Way is located immediately to the east, beyond which are business premises forming part of the wider BEP;
- An earth landscaping bund (including a belt of semi-mature trees) is located to the south, beyond which are railway lines associated with the neighbouring Baglan Bay Power Station (including associated overhead power lines) and vacant previously developed brownfield land (e.g. other parts of the former complex which are being promoted for a range of uses); and
- A track forming part of the Wales Coast Path is located immediately to the west and northwest, beyond which are sand dunes and salt marshes which in turn give way to the River Neath and Baglan Bay.

The Intertissue site occupies circa 32 ha of land, which was raised to create a level development platform prior to construction. The Installation comprises of a series of large interlinked buildings which extend to a height of circa 27 m (cows on the roof) together with a separate office block and supporting infrastructure that includes a security / weighbridge complex, areas of parking, internal circulation roadways, security and drainage infrastructure.

Access to the site is gained from the roundabout off Brunel Way which in turn provides a connection to the A48 / A474 and ultimately the M4. A road bridge crossing the railway line (to the south east of the paper mill site) was completed in April 2015. This forms part of the BEP link road and the Port Talbot to Swansea bus corridor. In addition, the Installation also benefits from its own railway siding which extend into the buildings.

As illustrated by the EP application drawings, the Facility would be located in the south western part of the site in an area enclosed (on three sides) by existing buildings, and covered in hard standing. Its location has been determined as a result of the need to locate the proposed development in close proximity to the building housing the paper machine's yankee dryer.

1.3 The Facility

The Facility will include the following:

- fuel reception area;
- fuel storage area;
- fuel handling systems;
- boiler housing, which contains the combustion unit, boiler, electrical room, control room and other process plant; and
- associated infrastructure including silo for wood pellet storage, vehicular and pedestrian access to the Facility and external hardstanding for vehicle manoeuvring (fuel deliveries will be segregated from the other working areas by clearly defined routes).

The Facility includes the fuel reception, fuel storage and handling, water, auxiliary fuel and air supply systems, furnace, steam boiler, facilities for the treatment of exhaust gases, on-site facilities for storage of residues, stack, devices and systems for controlling combustion operations, recording and monitoring conditions.

The nominal capacity of the Facility will be approximately 2.25 tonnes per hour (t/h) of fuel, with a nominal calorific value of 12.8 MJ/kg. It will have an estimated availability of around 8,200 hours per annum. Therefore, the plant will have a nominal design capacity of approximately 18,450 tonnes per annum.

The Facility will have a maximum capacity of up to 25,000 tonnes per annum. This will allow for variations in the net calorific value of the fuels being combusted (the range will be from 9.6 MJ/kg to 15.2 MJ/kg) and for the plant operating for more than the 8,200 hours per annum predicted.

Installation and Facility boundary drawings are presented in Annex 1.

A firing diagram demonstrating the range of fuels to be combusted is presented in Annex 1.

1.4 Listed Activity

Schedule 1, Part 2, Chapter 5: Waste Management, Section 5.1 - Incineration and Co-incineration of Waste, of the Environmental Permitting Regulations (EPRs), identifies the waste incineration and co-incineration processes which would require an Environmental Permit (EP) to operate. This identifies that Part A1 (b) activities are

The incineration of non-hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 3 tonnes per hour.

As stated previously the Facility will have a nominal design capacity of 2.25 t/h. This is less than the threshold for a Part A1(b) activity, and therefore is not relevant to the Facility.

Part 1: General, paragraph 2 of the Environmental Permitting Regulations states that:

"small waste incineration plant" means a waste incineration plant or waste co-incineration plant with a capacity less than or equal to 10 tonnes per day for hazardous waste or 3 tonnes per hour for non-hazardous waste.

The Facility will combust a mixture of exempt and non-exempt waste wood biomass fuels, in a plant with a nominal design capacity of capacity of 2.25 t/h. Therefore, the proposed waste wood biomass plant is considered to be a "small waste incineration plant".

As the waste wood biomass plant will be providing process heat to the tissue paper manufacturing process which is currently regulated by Natural Resources Wales (NRW), it will be regulated as a directly associated activity to the tissue paper manufacturing process.

1.5 Type of Variation

Environment Agency guidance titled 'Environmental Permitting Charging Scheme & Guidance', which has been adopted by NRW, identifies that there are four types of EP variation:

- (1) Administrative Variation;
- (2) Minor Technical Variation;
- (3) Substantial Variation; and
- (4) Normal Variation.

During pre-application discussions with the NRW Area Team it was indicated that the application would be a 'Substantial Variation' to the existing EP.

1.6 The Facility

The main activities associated with the Facility will be the combustion of fuel to raise steam for use in paper manufacturing and processing. The key elements of the Facility will include:

- biomass furnace;
- steam boiler;
- control room;
- electrical room;
- flue gas treatment (FGT) facility;
- emission monitoring system;
- stack;
- ash handling facility;

- fuel storage;
- fuel handling facility including moving / walking floor and fuel conveyors; and
- ancillary buildings and infrastructure including:
 - a silo for wood pellet storage;
 - external lighting;
 - roads and pedestrian routes;
 - above and/or below ground piping to take necessary utilities (e.g. process water, potable water, electricity, natural gas) to the Facility; and
 - above and/or below ground piping to export the Facility’s output materials (e.g. steam, process effluents, foul water).

The Facility will have a design thermal fuel input capacity of approximately 8 MWth through a single combustion line. As stated previously the Facility will combust fuels with a range of net calorific values – 9.6 MJ/kg to 15.2 MJ/kg. The process is illustrated in Figure 1.

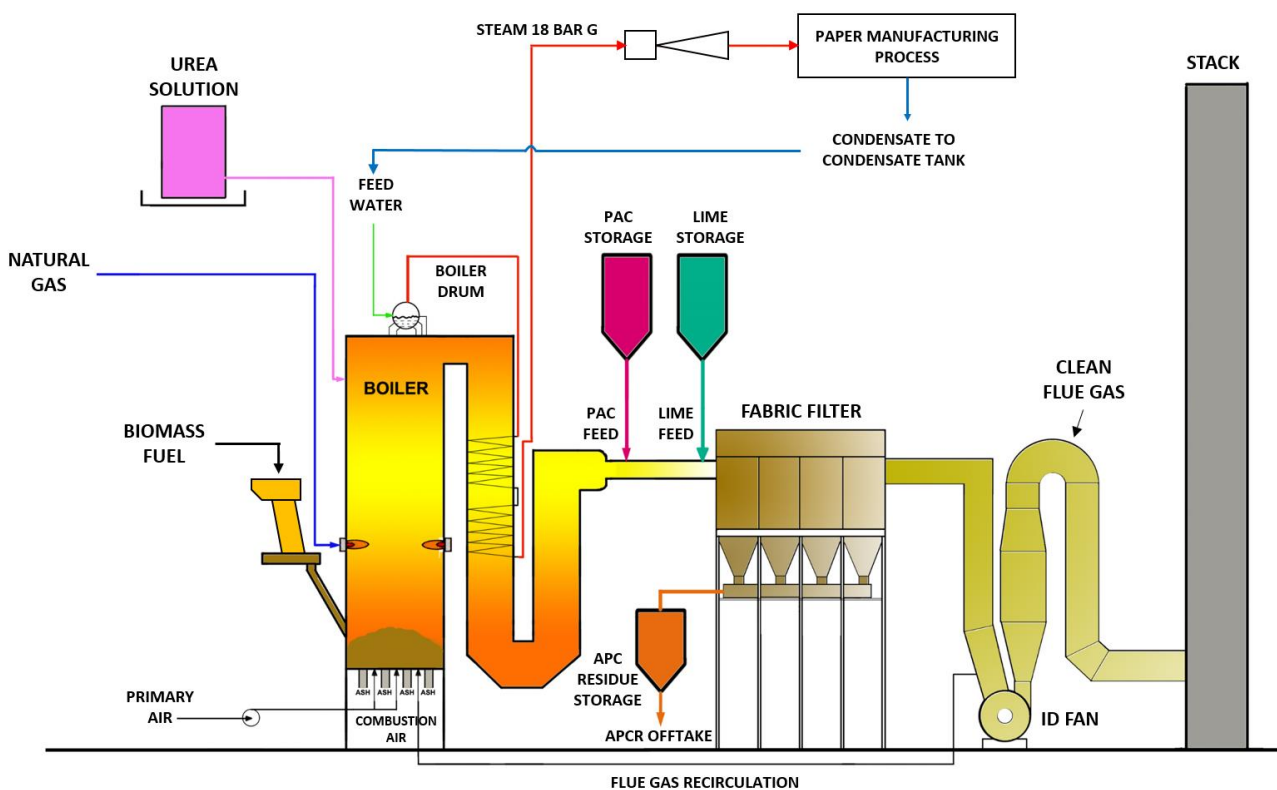


Figure 1 – Indicative process schematic

1.6.1 Raw Materials

The Facility will receive up to 25,000 tonnes per annum of pre-processed biomass fuel that will be delivered by road.

Most of the biomass to be combusted within the Facility will not be ‘exempt’ biomass as identified in Article 3 paragraph 31 of the IED. Therefore, the requirements of Chapter IV of the IED will apply to the Facility.

The Facility will also use consumables including:

- lime;
- activated carbon;
- SNCR reagent (urea or ammonia, depending on the final choice of technology supplier);

- natural gas; and
- other boiler treatment chemicals.

1.6.1.1 Fuel Reception

Fuel will be sourced from commercial, industrial, construction and demolition waste streams. The fuel will be pre-processed prior to transport to the Facility.

Incoming fuels will be delivered in covered vehicles or containers. The vehicles will be weighed via an automatic weighbridge before proceeding to the fuel storage area where they will be directed for unloading.

In order to add flexibility to the process, the Facility will also be capable of accepting wood pellets and virgin wood from forestry activities if required. Virgin wood chips will be delivered to the same storage area as the standard fuel, wood pellets will be delivered to the pellets storage silo.

There are procedures that will apply to fuel deliveries during planned and unplanned shutdowns. During a short plant shutdown, fuel will be unloaded in the designated unloading area. Fuel deliveries will be suspended for the duration of longer shutdowns.

1.6.1.2 Fuel Storage and Handling

The fuel will be unloaded directly onto the flat floor of the biomass storage building. The biomass storage building will have a capacity equivalent to approximately 5 days of fuel at full load allowing operation during an extended weekend/bank holiday without additional fuel deliveries. The eastern elevation of the storage building will be completely open to allow the maximum operational space for the delivery / transfer of fuel, and a push wall will be constructed within the building to allow fuel to be stored efficiently.

A mobile plant (e.g. front end loader) will transfer the fuel to the biomass handling building. The flat moving floor of the biomass handling building will allow the provision of intermediate storage and also the movement of wood chips toward the transfer conveyor system (installed at the back of the building) for transport to the boiler house.

Wood pellets deliveries will be taken to the pellets storage silo, from which the pellets will be fed to the boiler by means of a screw and/or pneumatic conveying system. The pellets storage silo will provide a storage capacity of approximately 65 m³.

1.6.1.3 Consumables

All consumables (hydrated lime, activated carbon, ammonia/urea and other boiler treatment chemicals) will be delivered to the Facility by road.

All liquid chemicals will be stored in controlled areas, with secondary containment facilities having a volume of 110% of the storage capacity.

Lime and activated carbon will be delivered to the plant for storage in silos and big bags respectively. Silos will be fitted with high level alarms. The tops of the silos will be equipped with vents fitted with fabric filters. The filters will be regularly cleaned and inspected for leaks.

Natural gas will be used on site for the auxiliary support burners which will be supplied from the existing gas supply to the Installation.

1.6.2 Combustion Process

The combustion system is based on grate technology (moving grate) which is a proven technology for the combustion of waste wood and biomass fuels in Europe and the UK. The fuel will be transferred into the furnace and will fall onto the grate and will burn out gradually.

The hearth, a mechanical moving grate design, will ensure continuous mixing of the fuel and hence promote good combustion. In a moving grate, the fuel is moved mechanically by means of reciprocating or rotating grate elements from the feed end, through a drying zone, a main combustion zone and, finally, a burn out zone. The purpose of the grate is to move and mix the fuel and to distribute primary combustion air evenly across the bed of material. Bottom ash (the inert burnt-out residue from the combustion process) is conveyed off the end of the grate where it is quenched with water (dry systems are also available) and transferred to a storage area for transfer off-site.

Primary air for combustion will be fed to the underside of the grate by a single inverter-driven fan. Secondary air will be injected higher in the grate to create turbulence and ensure complete combustion with minimum levels of oxides of nitrogen (NO_x). The volume of both primary and secondary air will be regulated by a combustion control system. A urea or ammonia based reagent will be injected into the combustion chamber to react with the oxides of nitrogen, chemically reducing them to nitrogen and water.

The furnace will be designed to ensure that the exhaust gases are raised to a minimum temperature of 850°C, with a minimum of 2 seconds flue gas residence time at this temperature to ensure the destruction of dioxins, furans, PAHs and other organics. An adequate air supply will also be maintained to give the correct volume of oxygen for optimum combustion. The main source of airflow will be controlled through the grate. Gas temperatures will be continually monitored and recorded, and audible and visible alarms will trigger in the control room if the temperature starts to fall towards 850°C. The control system will regulate combustion conditions and control the boiler.

The furnace will also be fitted with auxiliary burners, which will be designed for firing on natural gas. The burners will be set to operate when the temperature within the furnace drops to 860-870°C. These auxiliary burners will also be fired during plant start up and shut down.

1.6.3 Energy Recovery

The heat released by the combustion of the fuel is recovered in a proven steam boiler, either of the fire-tube type, the water-tube type or a combination of the two; with the final design depending on the selected contractor. The boiler, which is integral to the combustion chamber, will produce saturated steam at 18 barg.

The vast majority of the high pressure steam generated by the proposed development will be used to operate the yankee dryer within the paper mill. The dryer uses steam to remove excess moisture from paper pulp during its conversion into tissue paper. Whilst the steam may also be used for other on-site processes, this would be negligible. Once spent, the condensed steam would return to a feed water tank before beginning the process again (known as a closed circuit pipework system).

Hot gases from the fuel combustion will flow through the steam boiler and finally through the economiser.

1.6.4 Flue Gas Treatment

The flue gas treatment system consists of:

- Selective Non-Catalytic Reduction (SNCR);
- hydrated lime and activated carbon injection; and
- fabric filter.

Concentrations of NO_x will be regulated by the careful control of combustion air and the use of the SNCR process in which a urea or ammonia based reagent will be injected into the high temperature region of the boiler to further reduce the amount of NO_x in the gas stream.

Hydrated lime and activated carbon will be injected into the flue gases upstream of the fabric filter in order to abate acidic gases, heavy metals and any remaining dioxins and furans. The hydrated lime will abate the emission of acidic components, including hydrogen fluoride, hydrogen chloride and sulphur dioxide. The activated carbon will abate emissions of mercury, organic compounds and dioxins. The hydrated lime and activated carbon will be stored in separate silos in proximity of the FGT system.

Following the injection of lime and activated carbon, the flue gas will then pass through the fabric filter, which will remove the particulates and reaction products, collectively known as Air Pollution Control residues (APCr).

1.6.5 Ancillary Operations

The Facility will require connection to a number of existing utilities. All necessary services connections are already present at the Installation.

The existing water treatment facility for the natural gas boiler will be used to provide feed water to the Facility. Therefore no additional water treatment operations will be installed as part of the proposed development (other than pumps and above and/or below ground piping to take the water to the Facility).

The Facility would not include welfare facilities as they are already provided and easily accessible within the existing Installation.

1.6.6 Ash Handling

The main material produced by the Facility will be bottom ash. Bottom ash is the burnt-out residue from the combustion process. The fuel ash content will vary but it is anticipated that the output will be approximately 3% of the input tonnage of the waste wood by weight. It is thus predicted that approximately 550 tonnes of bottom ash will be produced per year. Bottom ash collected at the end of the combustion grate and boiler ash collected at the bottom of the boiler passes will be conveyed to a bottom ash container located within the boiler house. The bottom ash container will have a storage capacity of up to 5 days continuous operation.

The APCr will be extracted from the hopper of the bag filter unit and conveyed to a fully enclosed storage vessel which will have a 10 day operating capacity. Due to the small quantities of APCr that will be produced by the Facility, either storage silos or big bags may be used for storage of these residues prior to transfer off-site. It is proposed to provide NRW with confirmation of the facilities for the storage of APCr by way of Pre-operational Improvement Condition.

It is intended that the bottom ash and APCr would be transferred off-site to a suitably licensed waste management facility for recovery or disposal.

1.6.7 Liquid Effluent and Site Drainage

The Facility is not anticipated to generate any additional trade effluent during normal day to day activities. The effluent generated periodically through boiler blow down activities will be transferred to the existing effluent management system on the Installation, which has sufficient spare capacity to accept the volume of effluent arising from this periodic activity.

The Installation benefits from an existing drainage network (including pollution control infrastructure) which directs surface water into purpose built lagoons located on the northern and southern boundaries of the site. The lagoons discharge into the River Neath under an existing discharge consent.

The Installation comprises of existing hardstanding. Whilst the proposed development would introduce a new development it would not increase the existing impermeable surfacing and thus run-off. Surface water arising from the roof and surrounding hard standing would be collected via a new drainage system which connects to the existing surface water drainage network that supports the Installation.

1.6.8 Emissions Monitoring and Stack

An induced draught fan will draw the flue gas through the boiler and the flue gas cleaning system and release the cleaned flue gas via a 30 m stack.

A Continuous Emission Monitoring Station (CEMS) will be installed to monitor the concentrations in the flue gas before it leaves the Facility through the stack. In addition, periodic sampling and measurement will be carried out.

1.7 Incineration or Co-Incineration

The Environment Agency has published guidance titled 'Guidance on when a plant is a Co-Incineration Plant'. The scenarios within the Guidance note have been considered as follows:

Q1. Does the plant produce Material Outputs?

No - The Facility does not produce material outputs.

Q2. Is energy recovered from the waste burning plant?

Yes - Energy is recovered from the plant.

Q3. Is the waste the principal source of fuel?

Yes - As stated previously, the Facility will combust a waste wood biomass fuel. Waste wood will be the principal fuel for the Facility.

Q4. Is the waste being burnt mixed waste comprising different materials?

No - The principal fuel source being combusted at the Facility will be waste wood. It is considered that waste wood will have consistent characteristics to virgin wood.

Q6. What level of Energy Recovery is achieved?

The Facility will only export electricity, so it will not achieve the required 0.8MWe per tonne of electricity or the 'good quality' CHP requirements to be considered to be a co-incineration plant, as required by this question within the guidance. This question does not take account of heat-only plants.

However, as noted in question 7, the Facility will supply heat to an energy consuming facility (the Intertissue manufacturing facility). When the Intertissue facility is not operating, the Facility will not be in operation. Taking this into consideration, the Facility should be classified as a co-incineration plant.

Therefore, applying the requirements of the Guidance, it has been concluded that the Facility is a Co-incinerator.

2 OTHER INFORMATION FOR APPLICATION FORM

2.1 Raw Materials

2.1.1 Types and Amounts of Raw Materials

Table 1 - Types & amounts of raw materials (for the Schedule 1 Activities)				
Material	Storage		Estimated Consumption (tonnes per annum)	Description
	Number of silos/tanks	Storage facility		
SNCR reagent	1	Tank	150	Assumed urea solution
Lime	1	Silo	125	Dry, hydrated or conditioned
Activated Carbon	1	Big bags	8.5	Powdered
Other boiler treatment chemicals	-	-	<4	Corrosion inhibitor, scale inhibitor, biocide, ion exchange resins (sodium hydroxide, sulphuric acid)
Natural gas	-	-	500 MWh	Natural gas from existing Installation's connection

Table 2 - Raw materials and their effect on the environment

Product	Chemical composition	Expected quantity	Units	Environmental medium			Impact potential	Comments
				Air	Water	Land		
Natural gas	CH ₄	500	MWh/annum	100	0	0	Low impact	Used for plant start-ups and maintaining good combustion conditions in the boiler. Plant combustion products released to atmosphere after passing through flue gas treatment plant.
SNCR reagent (assumed urea solution)	CH ₄ N ₂ O	150	tpa	100	0	0	Low impact	Urea converts to ammonia. Subsequently reacts with nitrogen oxides to form nitrogen, oxygen, and water vapour. Any unreacted ammonia is released to atmosphere at low concentrations, and is continuously monitored.
Lime	Ca(OH) ₂ >95%	125	tpa	0	0	100	Low impact	Injected lime is removed with the APC residues at the bag filter and disposed of as hazardous waste at a suitable licensed facility.
Activated Carbon	C	8.5	tpa	0	0	100	Low impact	Injected carbon is removed with the APC residues at the bag filter and disposed of as hazardous waste at a suitable licensed facility.

Various other materials will be required for the operation and maintenance of the Facility, including:

- hydraulic oils and silicone-based oils;
- gas emptying and filling equipment;
- refrigerant gases for the air conditioning plant;
- CO₂ / fire-fighting foam agents; and
- test and calibration gases.

These will be supplied to standard specification offered by main suppliers. All chemicals will be handled in accordance with COSHH Regulations as part of the quality assurance procedures and full product data sheets will be available on site.

Periodic reviews of all materials used will be made in the light of new products and developments. Any significant change of material, where it may have an impact on the environment, will not be made without firstly assessing the impact and seeking approval from NRW.

The Operator will maintain a detailed inventory of raw materials used on site and have procedures for the regular review of new developments in raw materials.

2.1.2 Reagent Storage

A range of chemical substances and hazardous materials, including SNCR reagents, lime and activated carbon, will be stored on site. These materials will be stored in accordance with current guidance. All liquid chemicals will be stored in controlled areas, with secondary containment facilities having a volume of 110% of the stored capacity.

The SNCR system will use urea or ammonia solution as the reagent. The reagent and boiler water treatment chemicals will be stored in suitable containers or stainless steel bunded storage tanks provided with a pressure relief valve and vent scrubber system, as appropriate. In the event of a spillage, the bunds will retain the liquid.

Lime and activated carbon, used within the Air Pollution Control process, will be stored within separate storage silos and "big bags" and will be dosed with separate dosing controls. Silos will be fitted with high level alarms. The top of the silos will be equipped with a vent fitted with a fabric filter. The filter will be cleaned and inspected for leaks regularly.

Boiler water treatment chemicals will be used to control water hardness, pH and scaling and will be delivered in sealed containers and stored in the existing water treatment areas.

Natural gas will be used on site for the auxiliary support burners. The gas will be provided by the existing Installation's gas connection.

2.1.3 Raw Materials Selection

2.1.3.1 Reagent Selection

Acid Gas Abatement

There are several reagents available for acid gas abatement. Sodium hydroxide (NaOH) or hydrated lime (Ca(OH)₂) can be used in a wet scrubbing system. Quicklime (CaO) can be used in a semi-dry Air Pollution Control system. Sodium bicarbonate (NaHCO₃) or dry lime (referred to as hydrated lime) can be used in a dry Air Pollution Control system.

The reagents for wet scrubbing and semi-dry abatement are not considered, since these abatement techniques have been eliminated by the BAT assessment in Annex 5 (section 4). The two alternative reagents for a dry system – lime and sodium bicarbonate – are therefore assessed further.

The level of abatement that can be achieved by both reagents is similar. However, the level of reagent use and therefore residue generation and disposal is different and requires a full assessment following the methodology in Horizontal Guidance Note H1. The assessment is detailed in Annex 5 section 4 and is summarised in the table below.

Item	Unit	NaHCO₃	Ca(OH)₂
Mass of reagent required	kg	109.0	67.0
Mass of residue generated	kg	84.0	85.0
Cost of reagent	£/tonne	155	94
Cost of residue disposal	£/tonne	150	125
Overall Cost	£/ kmol	29.50	16.90
Ratio of costs		1.74	-

Note: Data based on abatement of one kmol of Hydrogen Chloride

In summary, there is a small environmental benefit for using sodium bicarbonate, in that the mass of residues produced is smaller. However, there are a number of significant disadvantages.

- (1) The sodium bicarbonate residue has a higher leaching ability than lime-based residue, and therefore may require additional treatment prior to disposal, making it more expensive to dispose of.
- (2) The reaction temperature for sodium bicarbonate doesn't match as well with the optimum adsorption temperature for activated carbon, which will be dosed at the same time as the acid gas reagent.
- (3) The costs of sodium bicarbonate are approximately 75% higher than using a lime system.

Taking into consideration the above, the use of lime is considered to represent BAT for the Facility.

NO_x Abatement

An SNCR system can be operated with dry urea, urea solution, or aqueous ammonia solution. There are advantages and disadvantages with all options.

- Urea is easier to handle than ammonia; the handling and storage of ammonia can introduce additional risk.
- Dry urea needs big-bags handling whereas urea solution can be stored in silos or tanks and delivered in tankers.
- Ammonia tends to give rise to lower nitrous oxide formation than urea. Nitrous oxide is a potent greenhouse gas.
- Ammonia emissions (or 'slip') can occur with all reagents, but good control will limit this.
- The Sector Guidance on Waste Incineration considers all options as suitable for NO_x abatement.

Due to the advantages and disadvantages of both reagents, both reagents are considered to represent BAT. The technology provider for the Facility has not been determined. It is proposed to provide NRW with confirmation of the proposed NO_x abatement reagent by way of a Pre-operational Improvement Condition.

2.1.3.2 Auxiliary Fuel

As stated in Article 50 (3) of the Industrial Emissions Directive:

Each combustion chamber of a waste incineration plant shall be equipped with at least one auxiliary burner. This burner shall be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below the temperatures set out in paragraph 2 [850°C]. It shall also be used during plant start-up and shut-down operations in order to ensure that those temperatures are maintained at all times during these operations and as long as unburned waste is in the combustion chamber.

The auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil as defined in Article 2(2) of Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels, liquefied gas or natural gas.

Therefore, as identified by the requirements of the IED, the only available fuels that can be used for auxiliary firing are:

- (1) natural gas;
- (2) liquefied gas (LPG); or
- (3) gas oil.

Auxiliary burner firing is only required intermittently, i.e. during start-up, shut-down, transition operation mode, and when the temperature in the combustion chamber falls to 850°C.

Natural gas can be used for auxiliary firing. As stated previously, auxiliary firing will only be required intermittently. When auxiliary firing, large volumes of gas would be required. These would need to be supplied from a high-pressure gas main, which already exists within the site.

LPG is a flammable mixture of hydrocarbon gases. It is a readily available product, and can be used for auxiliary firing. As LPG turns gaseous under ambient temperature and pressure, it is required to be stored in purpose built pressure vessels, which would need to be installed on site.

A gas oil tank would also require installation at the site. It is acknowledged that gas oil is classed as flammable. The combustion of gas oil will lead to emissions of sulphur dioxide, however these emissions can be minimised as far as reasonably practicable through the use of low sulphur gas oil.

Based on the above considerations, the use of natural gas is considered to represent BAT for the Facility. The existing natural gas main will be available as an auxiliary fuel supply.

2.1.4 Incoming Fuel

The Facility is capable of combusting a fuel with a Net Calorific Value (NCV) of 9.6 MJ/kg to 15.2 MJ/kg. The nominal design capacity of the Facility is 2.25 tonnes per hour of fuel with an NCV of 12.8 MJ/kg. The expected operational availability is 8,200 hours per annum (93.6%), which is regarded as typical for this type of installation. Therefore, the nominal design capacity for the Facility is approximately 18,450 tonnes per annum.

The plant is designed to operate continuously throughout the year, 7 days a week, 24 hours a day, with the exception of plant shutdowns. Planned and unplanned shutdown time periods will vary from year to year.

However, the annual fuel input capacity could increase or decrease depending on the availability of the plant. If the Facility performed above average and/or operated above the nominal availability during the year, it could be required to shut down unnecessarily if there was no 'headroom' allowance in the annual permitted tonnage.

Moreover, there will also be fluctuations in the net calorific value of the incoming fuel. If the net calorific value of the fuel received is lower than expected, the plant will operate at a higher mechanical throughput than its nominal design capacity. In this case, it again could be required to shut down unnecessarily before the end of the year if there was no 'headroom' allowance in the annual permitted tonnage.

To allow for the above (i.e. higher availability or lower CV fuel), the maximum capacity of the Facility is approximately 25,000 tonnes per annum. This is the maximum capacity of the Facility as stated within Application Form Part C3.

2.1.4.1 Fuel to be Combusted

The fuel to be combusted within the Facility will be a mix of 'exempt' (wood pellets and virgin wood from forestry activities) and 'non-exempt' biomass as identified in paragraph 31 of the IED. Therefore, the 'waste incineration' requirements as detailed in Chapter IV of the IED will apply to the Facility.

Principally the fuels to be combusted will be 'non-exempt' biomass. These fuels will be sourced from commercial, industrial, construction and demolition waste streams. Non-recycled fuels will be sourced from forestry activities. The fuel will be pre-processed off-site before being transported to the Facility. There will be no chipping of fuel at the site.

The table below presents the 'non-exempt' biomass fuels to be combusted within the Facility.

Table 4 – EWC codes to be combusted	
EWC Code	Description of Fuels
WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING	
<i>Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing</i>	
02 01 07	wastes from forestry
02 01 09	agrochemical waste other than those mentioned in 02 01 08
WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD	
<i>Wastes from wood processing and the production of panels and furniture</i>	
03 01 01	Waste bark and cork
03 01 05	Sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04
<i>Wastes from pulp, paper and cardboard production and processing</i>	
03 03 01	Waste bark and wood
WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED	
<i>Packaging (including separately collected municipal packaging waste)</i>	
15 01 03	Wooden packaging
CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)	
<i>Wood, glass and plastic</i>	
17 02 01	Wood
WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE	
<i>Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified</i>	
19 12 07	Wood other than that mentioned in 19 12 06
MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	
<i>Separately collected fractions</i>	
20 01 38	Wood other than that mentioned in 20 01 37

Checks will be made on the paperwork accompanying each delivery to ensure that only fuels for which the plant has been designed will be accepted. During fuel unloading operations, the operator will undertake a visual inspection of the fuel to confirm it complies with the specifications of the supporting paperwork.

Any unacceptable materials will be rejected and stored in a designated area within the fuel reception area. The Environmental Management System (EMS) will include procedures to control the inspection, storage and onward disposal of unacceptable waste.

2.1.4.2 Fuel Delivery, Reception and Handling

The procedures used will comply with the Indicative BAT requirements in the Sector Guidance Note, including the measures listed below.

- The weight and EWC code for each fuel delivery to the Facility will be recorded and records retained in accordance with the Installation's management systems.
- A high standard of housekeeping will be maintained in all areas and suitable equipment to clean up spilled materials will be provided and maintained.
- Loading and unloading of vehicles will take place in designated areas provided with impermeable hard standing. These areas will have appropriate falls to the drainage system.
- Fire fighting measures will be designed by consultation with the Local Fire Officers, with particular attention paid to the fuel handling and storage equipment.
- Delivery and reception of fuel will be controlled by a management system that will identify all risks associated with the reception of fuel and shall comply with all legislative requirements, including statutory documentation.
- Inspection procedures will be employed to ensure that any fuels which would prevent the facility from operating in compliance with its permit are segregated and placed in a designated storage area pending removal.
- The fuel will be pre-processed biomass (woodchips and wood pellets).
- All fuel will be delivered to site in covered vehicles.
- Fuel reception and handling equipment, building and procedures will be designed to minimise fugitive emissions from loading/unloading areas.
- External conveyors (if any) for the transfer of fuels within the Facility will be covered.

2.1.5 Waste Minimisation Audit (Minimising the Use of Raw Materials)

A number of specific techniques will be employed to minimise the production of residues. All of these techniques meet the Indicative BAT requirements from the Sector Guidance Note on Waste Incineration.

2.1.5.1 Feedstock Homogeneity

Improving feedstock homogeneity can improve the operational stability of the plant, leading to reduced reagent use and reduced residue production. The Facility will be designed to combust biomass fuel which has been processed off-site. Pre-processing the fuel off-site will ensure that the fuel is homogenous when it is delivered to the Facility.

2.1.5.2 Dioxin & Furan Reformation

As identified within the sector guidance for the Incineration of Waste (EPR5.01), there are a number of BAT design considerations required for the boiler. The boiler has been designed to minimise the formation of dioxins and furans as follows:

- Slow rates of combustion gas cooling will be avoided via boiler design to ensure the residence time is minimised in the critical cooling section and avoid slow rates of combustion gas cooling to minimise the potential for de-novo formation of dioxins and furans.

- The gas residence time in the critical temperature range will be minimised by ensuring high gas velocities exist in these sections. Additional NO_x control measures up stream of the boiler and the residence time and temperature profile (between 450 and 200°C) of flue gas will be considered during the detailed design phase to ensure that dioxin formation is minimised throughout the process.
- Transfer surfaces will be above a minimum temperature of 170°C subject to other reaction considerations.
- Computational Fluid Dynamics (CFD) will be applied to the design, where considered appropriate, to ensure gas velocities are in a range that negates the formation of stagnant pockets / low velocities.
- Minimising the volume access in the critical cooling sections will ensure high gas velocities.
- Boundary layers of slow moving gas along boiler surfaces will be prevented via design and a regular maintenance schedule to remove build-up of any deposits that may have occurred.

2.1.5.3 Furnace Conditions

Furnace conditions will be optimised in order to minimise the quantity of residues arising for further disposal.

2.1.5.4 Flue Gas Treatment Control

Close control of the flue gas treatment system will minimise the use of reagents and hence minimise the residues produced. SNCR reagent dosing will be optimised to prevent ammonia slip.

Lime usage will be minimised by trimming reagent dosing to accurately match the acid load from the CEMS system. Variable lime dosing rates will be rapidly and precisely varied to match the acid load. The plant preventative maintenance regime will include regular checks and calibration of the lime dosing system to ensure optimum operation. The bag filter is designed to build up a filter cake of unreacted acid gas reagent, which acts as a buffer during any minor interruptions in dosing.

Activated carbon dosing will be based on flue gas volume flow measurement. The activated carbon dosing screw speed frequency control responds automatically to the increase and decrease of flue gas volume. Maintaining a steady concentration of activated carbon in the flue gas and consequently on the filter bags will maintain the adsorption rate for gaseous metals and dioxins.

Activated carbon and lime will have independent storage and dosing systems.

2.1.5.5 Waste Management

Details of waste management arrangements and procedures can be found in Section 2.7. In particular, bottom ash and residues from the flue gas treatment system will be stored and disposed of separately.

2.1.6 Water Use

2.1.6.1 Overview

The main use of water at the Facility will be make up water for the boiler. Other water consuming processes include the following:

- SNCR injection nozzles;
- water/steam soot blowers; and

- wet ash quenching system and conveyor (if allowed for in the design of the selected contractor; dry systems are also available).

The key points listed below should be noted.

- The water system has been designed with the key objective of minimal consumption of potable water.
- Most of the steam produced will be recycled as condensate. The remainder will be lost as system losses, blow down to prevent build-up of sludge and chemicals, through soot blowing and through continuously flowing sample points.
- The Facility is not anticipated to generate any additional trade effluent during normal day to day activities. Effluent generated periodically through boiler blow down activities would be transferred to the existing effluent management system on the Installation, which has sufficient spare capacity to accept the volume of effluent arising from this periodic activity.
- The foul sewer systems and storm water systems (surface drainage) for the Facility will be connected to the wider Installation's site existing sewer and drainage systems.

2.1.6.2 Potable and Amenity Water

There will be no change to the Potable and Amenity water facilities associated with the introduction of the Facility to the Installation (other than pumps and piping to take the water to the Facility).

2.1.6.3 Process Water

It is anticipated that the Facility will consume approximately 25 m³/day of water, mostly used to produce demineralised water will be used to compensate for boiler blow down losses. The Facility will use the existing water treatment plant. Due to the substitution of the gas boiler with the proposed development there would be little change in the consumption of water.

Washdown water consumption will be minimised by the use of trigger controls on all wash hoses.

Waste water will be directed to the existing Installation's effluent management system. Under normal operating conditions, waste water will be generated from the following processes:

- regeneration of the resins in the demineralised water treatment plant or concentrate from the reverse osmosis system. This is an existing process currently used to produce demineralised water for the natural gas boiler;
- process effluent collected in site drainage system (e.g. boiler blowdown);
- condensate from the condensate tank;
- effluent generated through washing and maintenance procedures; and
- water run-off collected from the bottom ash quench. This stream will only exist if a wet ash system is used.

2.2 Emissions

2.2.1 Point Source Emissions to Air

The full list of proposed emission limits for atmospheric emissions is shown in Table 5. This includes the information requested in Table 2 of the Application Form Part C3. The emission limits presented in the table below are based on the relevant co-incineration emission limits as defined in Annex 4, Part 4 of the IED.

Table 5 – Proposed Emission Limits				
Parameter	Units	Half Hour Average	Daily Average	Periodic Limit
Emission Point A6 – Biomass Boiler				
Particulate matter	mg/Nm ³	45	15	-
VOCs as TOC	mg/Nm ³	30	15	-
Hydrogen chloride	mg/Nm ³	90	15	-
Hydrogen fluoride	mg/Nm ³	3	1.5	-
Carbon monoxide	mg/Nm ³	150	75	-
Sulphur dioxide	mg/Nm ³	300	75	-
Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	mg/Nm ³	600	300	-
Cadmium & thallium and their compounds (total)	mg/Nm ³	-	-	0.05
Mercury and its compounds	mg/Nm ³	-	-	0.05
Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	mg/Nm ³	-	-	0.5
Dioxins & furans ITEQ	ng/Nm ³	-	-	0.1
<i>All expressed at 6% oxygen in dry flue gas at 0°C and 1 bar-a.</i>				

2.2.2 Fugitive Emissions to Air

In addition to the point source emissions to air, there will be potential fugitive emissions to air from refilling of raw material storage tanks such urea. These will be vented to the tanker during refilling. Bulk liquid storage tanks will be fitted with high level controls and alarms.

Lime and activated carbon will be delivered to the plant for storage in silos and “big bags” respectively. Silos will be fitted with high level alarms. The tops of the silos will be equipped with vents fitted with fabric filters. The filters will be regularly cleaned and inspected for leaks. The “big bags” are provided with discharge systems designed to avoid fugitive emissions to air.

Fugitive dust emissions will be controlled as described below:

- Biomass material will be delivered as wood chip in covered vehicles;
- Material will be stored in a sheltered storage area;
- External conveyors (if any) for the transfer of biomass will be covered;
- Biomass will be stored in accordance with the developing industry standards; and
- Ground surface damping may be used to prevent vehicle movements producing yard dust problems and mobile “mist air” water based dust suppression is used to suppress material movement generated dust. These are typically only necessary in summer months or during extremely dry periods. If necessary foam / water will be added to the material at the point it is transferred into the fuel reception (this is the stage at which most dust is produced).

2.2.3 Point Source Emissions to Water and Sewer

Surface water run-off from all external areas of hardstanding (roads and storage areas) will be discharged into the surface water system. The Installation benefits from an existing drainage network (including pollution control infrastructure) which directs surface water into purpose built lagoons located on the northern and southern boundaries of the site. The lagoons discharge into the River Neath under an existing discharge consent.

The Installation site comprises existing hardstanding. Whilst the proposed development would introduce a new operational facility, it would not increase the existing impermeable surfacing and thus run-off. Surface water arising from the roof and surrounding hard standing would be collected via a new drainage system which connects to the existing surface water drainage network that supports the site.

There will be no changes to the discharges to water from the Installation associated with the introduction of the Facility.

Process effluents from the Facility will be recirculated through the Installation's existing effluent management system. All excess effluents which cannot be recirculated will be collected in the existing waste water system, prior to discharge to the long sea outfall to Swansea Bay in accordance with the Installation's existing Trade Effluent Consent.

2.2.4 Contaminated Water

External areas of hardstanding will be provided with kerbed containment, where appropriate, to prevent any potential spills from causing pollution of the ground/groundwater and surface water.

All chemicals will be stored in an appropriate manner incorporating the use of bunding and other measures (such as acid and alkali resistant coatings) to ensure appropriate containment. The potential for accidents, and associated environmental impacts, is therefore limited.

Adequate quantities of spillage absorbent materials will be made available on-site, at an easily accessible location(s), where liquids are stored. A site drainage plan, including the locations of foul and surface water drains and interceptors, will be made available on-site.

Off-loading of chemicals will take place within areas of concrete hardstanding with falls to a gully and/or a sump.

Storage tanks will be bunded at 110% of the tank capacity and the offloading point will be fully contained with the appropriate capacity to contain any spills during fuel or urea delivery.

Process water drains within the Facility will drain to the existing effluents management system.

Site drainage for external areas will be fitted with a shut-off alarm, linked to the fire detection systems to contain any contaminated water from fire fighting from external areas. Additional storage will be available from site kerbing.

In accordance with the EMS, spillages will be reported to the site management and a record of the incident will be made. The relevant authorities (NRW/ Health and Safety Executive) will be informed if spillages/leaks are significant.

The effectiveness of the Emergency Plan for spillages is subject to Management Review and will be reviewed following any major spillages and revised as appropriate.

2.2.5 Odour

The storage and combustion of pre-processed wood biomass is not considered to give rise to emissions of odour.

2.3 Monitoring Methods

2.3.1 Emissions Monitoring

Sampling and analysis of all pollutants including dioxins and furans will be carried out to CEN or equivalent standards (e.g. ISO, national, or international standards). This ensures the provision of data of an equivalent scientific quality.

The plant will be equipped with modern monitoring and data logging devices to enable checks to be made of process efficiency.

The three main objectives of monitoring are:

- to provide the information necessary for safe and efficient plant operation;
- to warn the operator if any emissions deviate from predefined ranges; and
- to provide records of emissions and events for the purposes of demonstrating regulatory compliance.

2.3.1.1 Monitoring Emissions to Air

The following parameters at the stack will be monitored and recorded continuously using a Continuous Emissions Monitoring System (CEMS):

- oxygen;
- carbon monoxide;
- hydrogen chloride;
- sulphur dioxide;
- nitrogen oxides;
- nitrous oxide;
- ammonia;
- VOCs; and
- particulates.

In addition, the water vapour content, temperature, and pressure of the flue gases will be monitored so that the emission concentrations can be reported at the reference conditions required by the Industrial Emissions Directive.

The continuously monitored emissions concentrations will also be checked by an independent testing company at frequencies agreed with NRW.

The following parameters will also be monitored by means of spot sampling at frequencies agreed with NRW:

- hydrogen fluoride;
- heavy metals; and
- dioxins and furans.

The methods and standards used for emissions monitoring will be in compliance with Environment Agency Guidance Note S5.01 and the Industrial Emissions Directive. In particular, the CEMS equipment will be certified to the MCERTS standard and will have certified ranges which are no greater than 1.5 times the relevant daily average emission limit.

It is anticipated that:

- HCl, CO, SO₂, NO_x (NO, N₂O and NO₂) and NH₃ will be measured by an FTIR-type multi-gas analyser;
- VOCs will be measured by an FID-type analyser;
- particulate matter will be measured by an opacimeter; and
- oxygen will be monitored by a zirconium probe.

Sampling and analysis of all pollutants, including dioxins and furans, will be carried out to CEN or equivalent standards (e.g. ISO, national, or international standards). This ensures the provision of data of an equivalent scientific quality.

The frequency of periodic measurements will comply with the Industrial Emissions Directive as a minimum. The flue gas sampling points, techniques and the sampling platform will comply with Environment Agency Technical Guidance Notes M1 and M2.

Reliability

IED Annex VI Part 8 Paragraph 1.2 allows a valid daily average to be obtained only if no more than 5 half-hourly averages during the day are discarded due to malfunction or maintenance of the continuous measurement system. The IED also requires that no more than 10 daily averages are discarded per year.

These reliability requirements will be met primarily by selecting MCERTS certified equipment.

Calibration will be carried out at regular intervals as recommended by the manufacturer and by the requirements of BS EN 14181. Regular servicing and maintenance will be carried out under a service contract with the equipment supplier.

Start-up and shut-down

The emission limit values under the Industrial Emissions Directive do not apply during start-up and shutdown. Therefore, a signal would be sent from the main plant control system to the CEMS package to indicate when the plant is operational and burning biomass fuel. The averages would only be calculated when this signal was sent, but raw monitoring data would be retained for inspection.

Start-up ends when all the following conditions are met.

- The temperature within the combustion chamber is greater than 850°C
- The flue gas cleaning plant, control systems, monitoring equipment, grate and ash extractors are all running.
- Exhaust gas O₂ is less than 15% (wet measurement); and
- The fuel feeding system is loading fuel into the boiler.

Shutdown begins when all of the following conditions are met.

- The fuel feeding system is not loading fuel into the furnace.
- The flue gas treatment systems are running.
- Exhaust gas O₂ is equal to or greater than 15% (wet measurement); and
- The auxiliary burner is maintaining the temperature at greater than 850°C within the boiler.

2.3.1.2 Monitoring Emissions to Land

Disposal of residues to land will comply with all relevant legislation.

2.3.1.3 Monitoring Emissions to Water

There will be no changes to the discharges to water from the Installation associated with the introduction of the Facility. Therefore there will be no changes in monitoring of emissions to water associated with this EP Variation.

2.3.1.4 Monitoring of Process Variables

The following process variables have particular potential to influence emissions.

- At least the daily and annual fuel throughput will be recorded to enable comparison with the design throughput.

- Combustion temperature will be monitored at a suitable position to demonstrate compliance with the requirement for a residence time of 2 seconds at a temperature of at least 850°C.
- The oxygen concentration will be measured at the outlet from the boiler.
- The differential pressure across the bag filters will be measured, in order to optimise the performance of the cleaning system and to detect bag failures.

Additionally, water use will be monitored and recorded regularly at various points throughout the process to help highlight any abnormal usage.

2.4 Technology Selection

2.4.1 Combustion Technology

It is proposed that the combustion technology for the plant will be a moving grate. Moving grate systems are relatively simple and well proven. The Incinerator Sector Guidance Note EPR5.01 discusses a number of alternative technologies for the combustion of waste, including waste biomass.

Moving Grate Furnaces

As stated in the Sector Guidance Note, these are designed to handle large volumes of solid fuels including biomass fuels. Moving Grate Furnaces are therefore regarded as being an appropriate combustion technology for the Facility.

Fixed Hearth

Whilst fixed hearth combustion systems are suited to low volumes of consistent waste, such as that proposed for the Facility, fixed hearth designs can have difficulty in meeting the Chapter IV (Waste Incineration and Co-incineration) IED standards as stated in the Sector Guidance Note. This is mainly due to the semi-batch nature of the fuel travel on the grate and de-ashing operations. On this basis, fixed hearth systems are not considered to represent BAT for the Facility.

Pulsed Hearth

Pulsed hearth technology has been used for the combustion of solid fuels. However pulsed hearth installations have had difficulties in achieving reliable and effective burnout of fuel and it is considered that the burnout criteria required by Chapter 4 of the IED would be difficult to achieve. Pulsed Hearth Furnaces are therefore not regarded as being an appropriate combustion technology for the Facility.

Rotary Kiln

Rotary Kilns have been proven to achieve good fuel agitation and associated burn-out rates. Rotary kilns have been demonstrated to achieved good results with clinical waste, however they have had limited application in the UK.

Rotary Kilns operate at high temperature and are considered BAT for hazardous waste and lower throughput mixed feeds. The high temperatures promote NO_x formation which may require additional abatement. The tumbling action of the kilns can generate high concentrations of fine particles which may require a secondary combustion chamber and additional abatement.

Rotary Kilns are regarded as being an appropriate combustion technology for the Facility.

Pyrolysis/Gasification

Various technology suppliers are developing pyrolysis and gasification systems. While pyrolysis and gasification systems which generate a syngas can theoretically take advantage of gas engines or gas turbines, which are more efficient than a standard steam turbine cycle, the syngas would require cleaning and filtration prior to combustion if burnt in an engine. This gives no benefit for a heat-only plant.

The losses associated with making the syngas and the additional electricity consumption of the site would mean that the overall efficiency is no higher than for a traditional combustion plant and for this type of biomass fuel generating only heat would generally be lower. This implies that a traditional combustion plant will have a more beneficial effect on climate change.

Pyrolysis and gasification are therefore not regarded as being appropriate energy recovery technologies for the Facility.

Fluidised Bed

Fluidised bed combustion can sometimes lead to slightly lower NOx generation, although injection of ammonia solution is still required to achieve the emission limits specified in the Industrial Emissions Directive. Fluidised bed technologies are designed to treat biomass fuels, such as that proposed for the Facility and are therefore regarded as being an appropriate combustion technology for the Facility.

A BAT assessment of a grate, fluidised bed and kiln combustion technologies has been carried out in Annex 5. The conclusions are summarised below.

2.4.1.1 **Conclusions**

The table below compares the three appropriate combustion technology options. This assessment considers the available technologies for the proposed nominal design capacity.

Table 6 – Comparison, Combustion Options				
Parameter	Unit	Grate	Fluidised Bed	Kiln
Global Warming Potential	tpa CO ₂ eq.	1,160	1,270	1,290
Urea	tpa	150	70	130
Total residues	tpa	800	1,100	800
Total reagents and disposal annual cost	£ p.a.	77,000	92,000	77,000

The annualised costs for all options are similar. The rotary kiln has a higher global warming potential than the grate and fluidised bed and a higher urea consumption than the fluidised bed. For these reasons the rotary kiln is not considered to be BAT for the Facility.

Both the grate and fluidised bed will produce similar quantities of ash, although the fluidised bed produces more fly ash.

Overall, the lower annualised costs associated with a grate system outweigh the additional material costs and higher ammonia consumption. On this basis a grate system is considered to represent BAT for the Facility.

2.4.2 NOx Reduction System

NOx levels will primarily be controlled by monitoring the combustion air supply. Selective non-catalytic NOx reduction (SNCR) methods will also be installed, using urea or ammonia solution as a reagent.

The use of Selective Catalytic Reduction (SCR) has also been considered. In this technique, the reagent is injected into the flue gases immediately upstream of a reactor vessel containing layers of catalyst. The reaction is most efficient in the temperature range 200 to 350°C. The catalyst is expensive and to achieve a reasonable working life, it is necessary to install the SCR downstream of the flue gas treatment plant. This is because the flue gas treatment plant removes dust which would otherwise cause deterioration of the catalyst.

Since the other flue gas cleaning reactions take place at an optimum temperature of around 140°C, the flue gases have to be reheated before entering the SCR. The catalytic reactor also creates additional pressure losses to be compensated by a bigger exhaust fan, reducing the overall energy efficiency of the Facility.

2.4.2.1 Flue Gas Recirculation (FGR)

FGR involves the recirculation of a proportion of the flue gases into the combustion chamber to replace some of the secondary air.

The supplier of the combustion technology has not yet been selected. FGR is not a bolt-on abatement technique. Some suppliers of the furnace have designed their combustion systems to operate with FGR and these suppliers can gain benefits of reduced NOx generation from the use of FGR. Other suppliers have focussed on reducing NOx generation through the control of primary and secondary air and the furnace design, and these suppliers gain little if any benefit from the use of FGR.

It should be noted that, whilst FGR does improve the performance of a combustion system, it does not reduce NOx emissions to the levels required by the waste incineration requirements of the IED and so it would not alleviate the need for additional abatement.

2.4.2.2 Conclusion

A BAT assessment of both SNCR and SCR has been carried out in Annex 5 with an additional assessment of FGR plus SNCR. This assessment considers the available technologies for the proposed nominal design capacity. The conclusions are summarised below.

Parameter	Units	SNCR	SCR	SNCR+FGR
Total NO _x abated	tpa	15	32	11
POCP		- 1,000	- 300	- 1,000
Global Warming Potential	tpa CO ₂ eq	80	150	100
Urea	tpa	150	140	110
Total Annualised Cost	£ p.a.	40,000	307,000	56,000

As can be seen from the table above, applying SCR to the Facility:

- increases the annualised costs by more than £260,000;
- abates an additional 17 tonnes of NOx per annum;

- reduces the benefit of the facility in terms of the global warming potential by a minimum of 70 tonnes of CO₂; and
- reduces urea consumption by a minimum of approximately 10 tonnes per annum.

This gives an effective additional annual cost of approximately £16,000 per additional tonne of NO_x abated when compared to SNCR or £12,000 per additional tonne of NO_x abated when compared to SNCR + FGR. The additional costs associated with an SCR system are not considered to represent BAT for the Facility. Therefore, SNCR is considered to represent BAT for the Facility.

The two SNCR options, with and without FGR, are very similar. FGR results in a reduction of reagent consumption, but requires more power to operate, and therefore it has a higher global warming potential and slightly higher total annualised costs.

The choice of whether to include FGR is supplier dependent. A technology provider has not been appointed and will be determined through a robust procurement process. On this basis, and since the differences between the two options are small, the use of FGR for the proposed installation will be considered during the tendering process.

If the selected technology supplier has an established track record of using this technique and can demonstrate the benefits, in terms of energy efficiency and environmental performance, of applying it to its technology, then FGR will be included within the design.

We would propose that a Pre-operational Improvement condition is included within the EP to allow the Operator to confirm whether the design will include FGR prior to the commencement of commissioning.

2.4.3 Acid Gas Abatement System

There are currently three technologies widely available for acid gas treatment in the UK.

- Wet scrubbing, involving the mixing of the flue gases with an alkaline solution of sodium hydroxide or hydrated lime. This has a good abatement performance, but it consumes large quantities of water, produces large quantities of liquid effluent which require treatment and has high capital and operating costs. It is mainly used in the UK for hazardous waste incineration plants where high and varying levels of acid gases in the flue gases require the buffering capacity and additional abatement performance of a wet scrubbing system.
- Semi-dry, involving the injection of lime as a slurry into the flue gases in the form of a spray of fine droplets. The acid gases are absorbed into the aqueous phase on the surface of the droplets and react with the lime. The fine droplets evaporate as the flue gases pass through the system, cooling the gas. This means that less energy can be extracted from the flue gases in the boiler, making the steam cycle less efficient. The lime and reaction products are collected on a bag filter, where further reaction can take place.
- Dry, involving the injection of solid lime into the flue gases as a powder. The lime is collected on a bag filter to form a cake and most of the reaction between the acid gases and the lime takes place as the flue gases pass through the filter cake. In its basic form, the dry system consumes more lime than the semi-dry system. However, this can be improved by recirculating the flue gas treatment residues, which contain some unreacted lime and reinjecting this into the flue gases.

Wet scrubbing is not considered to represent BAT for this type of wood burning plant, due to the production of a large volume of hazardous liquid effluent.

The dry and semi-dry systems can easily achieve the emission limits required by the Industrial Emissions Directive and both systems are in operation on plants throughout Europe. Both can be considered to represent BAT by the Environment Agency Sector Guidance Note EPR 5.01. The advantages and disadvantages of each technique are varied which makes assessment complex; therefore, the assessment methodology described in Horizontal Guidance Note H1 has been used and is detailed in Annex 5.

The table below compares the options for acid gas treatment, using lime as the selected reagent identified in Section 2.1.3.1. This assessment considers the available technologies for the proposed capacity.

Table 8 – Comparison Table, Acid Abatement Options			
Parameter	Unit	Dry	Semi-Dry
SO ₂ abated	tpa	5	5
HCl abated	tpa	10	10
POCP	t-ethylene eq	31	31
Total site water use	tpa	3,265	4,000
Global Warming Potential	tpa CO ₂	220	210
APC Residues, incl. fly ash	tpa	250	240
Annualised Cost	£ p.a.	602,000	646,000

The overall performance of the two technical options is similar and therefore either could be considered to represent BAT for the Facility. However, whilst the dry solution generates slightly more APC residues, it has a lower Global Warming Potential, water consumption and annualised costs. A dry system is considered to represent BAT for the Facility.

2.4.4 Particulate Abatement

The Facility will use a fabric filter for the control of particulates. There are a number of alternative technologies available, but none offer the performance of the fabric filter. Fabric filters represent BAT for this type of wood burning installation for the reasons listed below.

- Wet scrubbers are not capable of meeting the same emission limits as fabric filters.
- Electrostatic precipitators are also not capable of abating particulates to the same level as fabric filters. They could be used to reduce the particulate loading on the fabric filters and so increase the acid gas reaction efficiency and reduce lime residue production, but the benefit is marginal and would not justify the additional expenditure, the consequent increase in power consumption and significant increase in the foot-print of the Facility.
- Ceramic Filters have not been proven for this type of wood combustion plant, and are more suited to high temperature filtration.

Fabric filters are therefore considered to represent BAT for the removal of particulates.

2.5 Specific requirements of the Industrial Emissions Directive (2010/75/EU)

This section contains information how the plant will comply with the Waste Incineration requirements of the Industrial Emissions Directive (IED).

Chapter IV of the IED includes 'Special Provisions for Waste Incineration Plants and Waste Co-incineration Plants'. Review of provisions for waste incineration as presented in the IED has identified that the following requirements could be applicable to the Facility:

- Article 46 – Control of Emissions;
- Article 47 – Breakdown;
- Article 48 – Monitoring of Emissions;
- Article 49 – Compliance with Emission Limit Values;
- Article 50 – Operating Conditions;
- Article 52 – Delivery & Reception of Waste;
- Article 53 – Residues; and
- Article 55 – Reporting & public information on waste incineration plants and waste co-incineration plants.

Articles 51 (Authorising to change operating conditions) and 54 (Substantial change) will not apply to this application. In addition, the requirements of Article 55 (Reporting & public information on waste incineration plants and waste co-incineration plants) will apply to the competent authority (NRW), not the applicant.

A table showing compliance with the Waste Incineration requirements of the Industrial Emissions Directive is presented below.

Table 9 – Summary Table for IED Compliance	
IED Reference	Demonstrating Compliance
Article 22, paragraph (2)	Not applicable, as the application is not for a new Installation.
Article 44 paragraph (a)	Refer to Section 2.1.4 of the Supporting Information
Article 44 paragraph (b)	Not applicable as the Facility will generate heat to be used within the Installation.
Article 44 paragraph (c)	Refer to Section 2.7 of the Supporting Information.
Article 44 paragraph (d)	Refer to Section 2.7 of the Supporting Information.
Article 46, paragraph 1	A stack height assessment was developed and submitted in support of the planning application. This demonstrated that a stack height of 30 m would be appropriate for emissions from the Facility to safeguard human health and the environment.
Article 46, paragraph 2	As presented in section 2.2.1, the Facility has been designed to achieve the relevant emission limits within the IED.
Article 46, paragraph 3	There will be no discharges to water from the cleaning of waste gases from the Facility, therefore paragraph 3 will not apply.
Article 46, paragraph 4	There will be no discharges to water from the cleaning of waste gases from the Facility, therefore paragraph 4 will not apply.
Article 46, paragraph 5	As detailed in section 2.2.4, the Facility has been designed to prevent the release potentially polluting substances into soil, surface water and groundwater. The containment arrangements for contaminated fire water have been detailed in section 2.2.4.

Table 9 – Summary Table for IED Compliance	
Article 46, paragraph 6	The Facility will comply with the abnormal operation requirements in accordance with the EP.
Article 47	The Facility will comply with the breakdown requirements in accordance with the EP.
Article 48, paragraph 1	<p>As detailed in the Section 2.3 of this report the plant will have a CEMS which will continuously record the following pollutants within Annex VI:</p> <ul style="list-style-type: none"> • Carbon monoxide; • Hydrogen chloride; • Sulphur dioxide; • Nitrogen oxides; • VOCs; and • Particulates. <p>In addition, the following parameters will also be monitored by means of spot sampling the following pollutants within Annex VI:</p> <ul style="list-style-type: none"> • Hydrogen fluoride; • Heavy metals; and • Dioxins and furans. <p>In addition, the water vapour content, temperature and pressure of the flue gases will be monitored so that the emission concentrations can be reported at the reference conditions required by the sector guidance.</p>
Article 48, paragraph 2	As detailed in section 2.3.1.1, calibration will be carried out at regular intervals as recommended by the manufacturer and by the requirements of BS EN14181. Regular servicing and maintenance will be carried out under a service contract with the equipment supplier.
Article 48, paragraph 3	As detailed in section 2.3.1.1, the location of sampling points will be installed in accordance with the requirements of Environment Agency Technical Guidance Notes M1 and M2.
Article 48, paragraph 4	The operator will submit all relevant emissions monitoring reports in accordance with the requirements of the EP.
Article 48, paragraph 5	At the time of submitting this application, the operator is not aware of there being recognised measurement techniques for the continuous measurement of heavy metals and dioxins and furans. Therefore, paragraph 5 does not apply to this application.
Article 49	The Facility has been designed with monitoring equipment which will be used to demonstrate compliance with the emission limits within Part 4 of Annex V of the IED. As required by the permit, reports will be submitted to the Environment Agency which will demonstrate compliance with the EP.
Article 50, paragraph 1	The Facility is a co-incineration facility, so this requirement does not apply.

Table 9 – Summary Table for IED Compliance

Article 50, paragraph 2	As detailed in section 2.3.1.4, there will be process monitoring to ensure that the combustion temperature will be monitored at a suitable position to demonstrate compliance with the requirement for a residence time of 2 seconds at a temperature of at least 850°C.
Article 50, paragraph 3	The Facility will have auxiliary burners, which will burn natural gas, as detailed in section 2.1.3.2. As detailed in section 2.3.1.4, the auxiliary burners will maintain the temperature at 850°C and will also be used for start-up and shutdown.
Article 50, paragraph 4	The Facility will meet the indicative BAT requirements outlined in the Incinerator Sector Guidance Note for waste charging and the specific requirements of the IED. The combustion control and feeding system will be in accordance with the requirements of the IED. The conditions within the furnace will be continually monitored to ensure that optimal conditions are maintained and that the mandatory IED emission limits are not exceeded. The fuel charging and feeding systems will be interlocked to prevent fuel charging when the furnace temperature is below 850°C, both during start-up and if the temperature falls below 850°C during operation. The fuel charging and feeding systems will also be interlocked to prevent fuel charging if the emissions to atmosphere are in excess of an emission limit value due to disturbance or failures of the abatement equipment.
Article 50, paragraph 5	Not applicable as the Facility will generate heat to be used within the Installation.
Article 50, paragraph 6	It is not intended to incinerate infectious clinical waste within the Facility. Therefore, this requirement will not apply.
Article 50, paragraph 7	The operator will ensure that the appropriate management structure and management systems are in place proper to commencement of operation of the Facility.
Article 52, paragraph 1	The fuel reception and handling arrangement for the Facility are presented in section 2.1.4.2.
Article 52, paragraph 2	The fuel delivery, reception and handling arrangements for the Facility are presented in section 2.1.4.2.
Article 52, paragraph 3	The Facility has not been designed to incinerate hazardous waste. Therefore, this requirement will not apply to the Facility.
Article 52, paragraph 4	The Facility has not been designed to incinerate hazardous waste. Therefore, this requirement will not apply to the Facility.
Article 52, paragraph 5	The operator does not wish to apply for any exemptions from any of the requirements stated within. Therefore, this requirement will not apply to the Facility.
Article 53, paragraph 1	The proposed arrangements for residues generated by the Facility are detailed in section 2.7.

Table 9 – Summary Table for IED Compliance

Article 53, paragraph 2	The arrangements for the containment of dusts from the transport and intermediate storage of dry residues generated by the Facility are detailed in sections 2.7.2 and 2.7.3 and Annex 4 – Environmental Risk Assessment.
Article 53, paragraph 3	Prior to the commencement of any transfer of residues generated by the Facility, they will be tested to ensure that they are acceptable to receiving facility.

2.6 Energy Efficiency

2.6.1 General

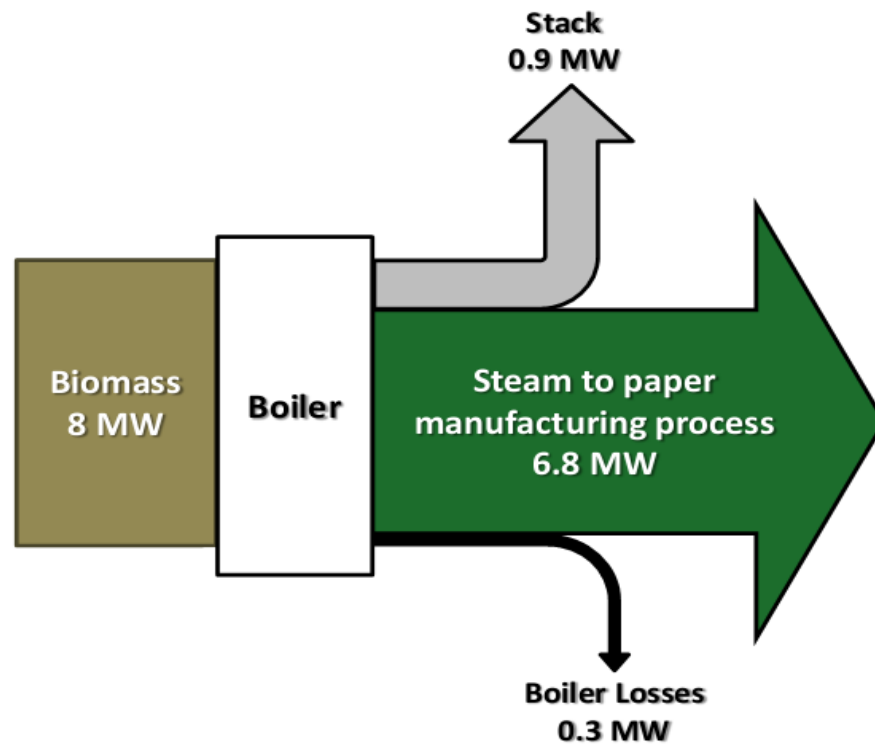
The vast majority of the high pressure steam generated by the Facility will be used to operate the yankee dryer within the paper mill. The dryer uses steam to remove excess moisture from paper pulp during its conversion into tissue paper. Whilst the steam may also be used for other on-site processes, this would be negligible.

The Facility will have an efficiency of approximately 85% (energy contained in the steam divided by energy contained in the fuel).

In considering the energy efficiency of the Facility, due account has been taken of the requirements of the Environment Agency's Horizontal Guidance Note H2 on Energy Efficiency.

2.6.2 Basic Energy Requirements

An indicative Sankey Diagram for the Facility is presented below:



Based on 2.25 tonnes per hour of biomass with a net CV equal 12.8 MJ/kg

Figure 2 – Indicative Sankey diagram

The Facility will have a nominal design capacity of approximately 2.25 tonnes per hour of fuel, with a net calorific value of 12.8 MJ/kg. Assuming an operational availability of 8,200 hours per annum, the nominal design capacity of the plant is approximately 18,450 tonnes per annum.

2.6.2.1 Energy Consumption and Thermal Efficiency

The boiler will have a thermal efficiency of approximately 85%.
The plant ancillary systems will consume approximately 8.5 MWh/day.

2.6.2.2 Operating and Maintenance Procedures

An O&M manual will be developed for the Facility. The O&M procedures will include the following aspects.

- Good maintenance and housekeeping techniques and regimes across the whole plant.
- Plant Condition Monitoring will be carried out on a regular basis. This will ensure, amongst other things, that motors are operating efficiently, insulation and cladding are not damaged and that there are no significant leaks.

Operators will be trained in energy awareness and will be encouraged to identify opportunities for energy efficiency improvements.

2.6.2.3 Energy Efficiency Measures

An energy efficiency plan will be built into the operation and maintenance procedures of the plant ensuring maximum, practical, sustainable, safe and controllable energy generation.

During normal operation, procedures will be reviewed and amended, where necessary, to include improvements in efficiency as and when proven new equipment and operating techniques become available. These will be assessed on the implementation cost compared with the anticipated benefits.

2.6.3 Further Energy Efficiency Requirements

In accordance with the requirements of the Industrial Emissions Directive, heat should be recovered as far as practicable. The Facility will have a thermal efficiency of approximately 85% and will utilise all heat generated for use within the Installation's paper manufacturing process.

2.7 Residue Recovery and Disposal

2.7.1 Introduction

The main residue streams arising from the Facility are:

- bottom ash from the combustion process (Residue Type RT1);
- APC residue and fine ash particles (Residue Type RT2); and
- Unacceptable fuel at the fuel reception area.

As described below, the waste recovery and disposal techniques will be in accordance with the indicative BAT requirements. The main wastes to be generated from the operation of the Facility are summarised in Table 11.

2.7.2 Air Pollution Control residues

APCr are predominantly composed of calcium as hydroxide, carbonate, sulphate, and chloride/hydroxide complexes. Silicon, aluminium, iron, magnesium, and fluorine are also present in addition to traces of dioxins and the following heavy metals: zinc, lead, manganese, copper, chromium, cadmium, mercury, and arsenic.

It may be possible to send the residue to an effluent treatment contractor, to be used to neutralise acids and similar materials or to be used in the production of concrete building products. Using the residues in this way would avoid the use of primary materials. If this option is not practicable then it will be sent to a secure landfill for disposal as a hazardous waste.

2.7.3 Bottom Ash

Boiler ash will be mixed with bottom ash. The mixture of boiler ash and bottom ash is a non-hazardous waste which can be typically be recycled in the manufacture of blocks. If the boiler ash were to be mixed with the APCr, the mixture would be defined as hazardous waste and this would restrict the ability of the operator to recycle the boiler ash.

Intertissue will investigate options for the recovery of the bottom ash at any facilities in the local area. If a suitable recovery option cannot be identified the bottom ash will be transferred to a suitable licensed waste management facility.

Table 10 below shows the typical trace components found in bottom ash from biomass fuelled facilities.

Table 10 - Typical Composition of Bottom Ash		
Component	Unit	Average
Total Organic Carbon	%	0.1
Total cadmium	mg/kg	0.4
Total mercury	mg/kg	0.5
Total chromium	mg/kg	9.7
Total copper	mg/kg	32
Total lead	mg/kg	3.4
Total nickel	mg/kg	9.4
Thallium	mg/kg	1.0
Manganese	mg/kg	6824
Arsenic	mg/kg	1.0
Antimony	mg/kg	1.0
Cobalt	mg/kg	4.2
Vanadium	mg/kg	40
Zinc	mg/kg	22
Tin	mg/kg	1.0
Dioxin/Furan (ITEQ)	ng/kg	3.7

2.7.4 Unacceptable fuel

Small quantities of unacceptable fuel (oversize materials, biomass contaminated with plastic, metals, etc.) will be removed from the main fuel stream by the plant operators at the fuel reception area. This material will be collected into skips for final disposal/reuse.

2.7.5 Summary

The table below summarises the expected quantities and properties of the main residue streams.

Table 11 – Key residue streams

Source/ material	Properties of residue	Storage location/ volume stored	Annual quantity of residue - estimated	Disposal route and transport method
Fly ash / APCr	Fly ash and APC residues, which may contain unreacted lime.	APCr silos (or "big bags")	250 tonnes per annum	Recycled or disposed of in a licensed site for hazardous waste. Transport occurs by road vehicle. Either silos or big bags may be used for storage prior to transfer off-site.
Bottom ash	Grate ash, grade riddling, boiler ash. This ash is relatively inert, classified as non-hazardous.	Container in bottom ash storage area	550 tonnes per annum	Sent to a suitable licensed recovery facility to be used for the manufacture of blocks for the construction industry.
Unacceptable fuel	Oversize biomass items, biomass contaminated with plastics, metals, etc., out-of-specification materials	Fuel reception area	Assumed up to 200 tonnes per annum	Sent to a suitable licensed facility for recovery or disposal.

2.8 Management

2.8.1 Introduction

Intertissue is an experienced operator of large scale industrial processes. Intertissue's commitment to their socio-environmental responsibilities is demonstrated by operating their existing facilities to the highest environmental, health and safety and professional standards. This will be reflected in the proposed Facility by using the most up-to-date international and national regulations, standards and guidance that govern the good design and construction of such plants.

An effective management system will be employed as outlined in the Environment Agency Regulatory Guidance Note RGN 5 – Operator Competence.

2.8.2 Management Systems

Intertissue will incorporate the Facility's management arrangements into the existing ISO 14001-accredited Environmental Management System (EMS). This management system will define the Facility's management structure, as well as setting out the roles and responsibilities of all staff. It is proposed that there should be an Improvement Condition in the permit for Intertissue to extend the existing EMS to include the operation of the proposed Facility within 6 months of Operation of the plant.

In addition, the site will work to the Construction (Design and Management) Regulations during the construction and commissioning period.

2.8.2.1 Operations and Maintenance

The Facility will be provided with documented operations and maintenance systems covering all aspects of the process whose failure could impact on the environment.

The maintenance system will include auditing of performance against the requirements arising from the above and reporting the result of audits to senior management.

2.8.2.2 Competence, Training and Awareness

The documented management systems will include training requirements for all relevant staff which cover

- awareness of the regulatory implications of the Permit for the activity and their work activities;
- awareness of all potential environmental effects from operation under normal and abnormal circumstances;
- awareness of the need to report deviation from the Permit; and,
- prevention of accidental emissions and action to be taken when accidental emissions occur.

The skills and competencies necessary for key posts will be documented and records of training needs and training received for these post maintained. The key posts will include contractors and those purchasing equipment and materials.

The potential environmental risks posed by the work of contractors will be assessed and instructions provided to contractors about protecting the environment while working on site.

Where industry standards or codes of practice for training exist (e.g. WAMITAB) they will be complied with.

2.9 Closure

2.9.1 Introduction

The Facility is designed for an operational life of approximately 30 years but its actual operational lifetime is dependent on a number of factors including the cost of the fuel, the cost of operating the facility and the demand of heat for the manufacturing process. When the Facility has reached the end of its operational life, it may be adapted for an alternative use or demolished as part of a redevelopment scheme and cleared and left in a fit-for-use condition.

2.9.2 General

At the end of the economic life of the plant, the development site and buildings may be converted to other uses or form part of an appropriate landscape restoration plan. The responsibility for this may well rest with other parties if the Facility is sold. However, Intertissue recognises the need to ensure that the design, the operation and the maintenance procedures facilitate decommissioning in a safe manner without risk of pollution, contamination or excessive disturbance.

To achieve Intertissue will prepare a closure plan for the Facility and incorporate it into the existing Installation's site closure plan. The following is a summary of the measures to be considered within the closure plan to ensure the objective of safe and clean decommissioning.

2.9.2.1 General Requirements

- Underground tanks and pipework to be avoided except for supply and discharge utilities such as towns water, sewerage lines and gas supply;
- Safe removal of all chemical and hazardous materials;
- Adequate provision for drainage, vessel cleaning and dismantling of pipework;
- Disassembly and containment procedures for insulation, materials handling equipment, material extraction equipment, fabric filters and other filtration equipment without significant leakage, spillage, dust or hazard;
- The use of recyclable materials where possible;
- Methodology for the removal/decommissioning of components and structures to minimise the exposure of noise, disturbance, dust and odours and for the protection of surface and groundwater;
- Soil sampling and testing of sensitive areas to ensure the minimum disturbance (sensitive areas to be selected with reference to the initial site report).

2.9.2.2 Specific Details

- A list of recyclable materials/components and current potential outlet sources;
- A list of materials/components not suitable for recycle and potential outlet sources;
- A list of materials to go to landfill with current recognised analysis, where appropriate;
- A list of all chemicals and hazardous materials, location and current containment methods;
- A Bill of Materials detailing total known quantities of items throughout the facility such as:
 - Steelwork;
 - Plastics;

- Cables;
- Concrete and Civils Materials;
- Oils;
- Chemicals;
- Consumables;
- Contained Water and Effluents; and
- Bottom Ash and APC Residues.

2.9.2.3 Disposal Routes

Each of the items listed within the Bill of Materials will have a recognised or special route for disposal identified; e.g. Landfill by a licensed contractor, disposal by high sided, fully sheeted road vehicle or for sale to a scrap metal dealer, disposal by skip/fully enclosed container, dealer to collect and disposal by container.

2.10 Improvement programme

2.10.1 Pre-operational conditions

Intertissue would propose the following conditions. Some of these are typically included for this type of installation and others were suggested in earlier parts of this document.

- Submit a written report to the Environment Agency on the commissioning of the Facility. The report will summarise the environmental performance of the plant as installed against the design parameters set out in the Application.
- Submit a written report to the Environment Agency describing the performance and optimisation of the Selective Non-Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NO_x) emissions within the emission limit values described in this permit with the minimisation of nitrous oxide emissions. The report will also confirm and justify the selection of the reagent to be used within the SNCR system. This will include provision of procedures for the safe handling and management of the reagent.
The report will include an assessment of the level of NO_x and N₂O emissions that can be achieved under optimum operating conditions.
- Submit a written summary report to the Agency to confirm by the results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified within the EP complies with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2, and QAL3.
- Submit a report which confirms whether FGR has been included within the final design of the Facility.

In addition, Intertissue would propose that the facilities for the storage of APCr prior to transfer off-site are confirmed with NRW prior to the commencement of commissioning.

2.10.2 Commissioning conditions

Prior to commissioning of the Facility, Intertissue will comply with the typical Pre-operational Conditions which will be included for this type of installation, as follows:

- Submit to NRW for approval a protocol for the sampling and testing of bottom ash for the purposes of assessing its hazardous status. Sampling and testing shall be carried out in accordance with the protocol as approved.

- Provide a written commissioning plan, including timelines for completion, for approval by NRW. The commissioning plan shall include the expected emissions to the environment during the different stages of commissioning, the expected durations of commissioning activities and the actions to be taken to protect the environment and report to NRW in the event that actual emissions exceed expected emissions. Commissioning shall be carried out in accordance with the commissioning plan as approved.

2.10.3 ISO14001 accreditation

Intertissue will ensure that the Installation's management structure and EMS accredited to ISO 14001 are applied to the Facility.

2.10.4 Post Commissioning

Following commissioning of the Facility, Intertissue will comply with the typical Improvement Conditions which will be included for this type of installation, as follows:

- carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the furnace whilst operating under the anticipated most unfavourable operating conditions. Results shall be submitted to NRW.
- provide a written proposal to NRW, for carrying out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air, identifying the fractions in the PM10 and PM2.5 ranges. The report will detail a timetable for undertaking the tests and producing a report on the results.

Annex 1 [Site Drawings](#)

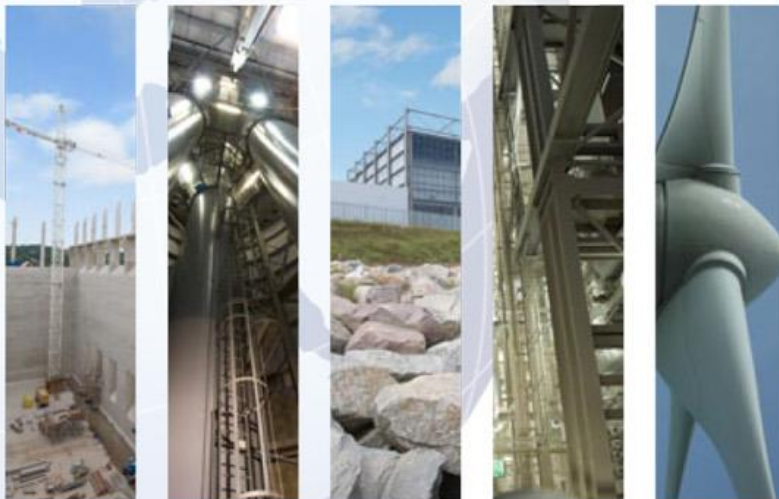
Annex 2 [Noise Assessment](#)

Annex 3 [Environmental Risk Assessment](#)

Annex 4 [Air Quality Assessment](#)

Annex 5 [BAT Assessment](#)

Annex 6 [Climate Change Levy Agreement](#)



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