Brooks Bros. (UK) Limited
The Timber Yard
Off Runsell Lane
Danbury
Essex
CM3 4PG

Part B Permit Variation
Technical Application
EPR-005
November 2023

ehrc

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The small print:

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Introduction

The Environmental Health Resource Centre Limited (**ehrc**) has been instructed by Brooks Bros. (UK) Limited (the Operator) to prepare an application for the variation of environmental permit EPR-005 for a clean waste wood biomass boiler. This technical summary is structured to follow the format of the variation application form:

B.2.1 Proposed changes

B.2.1.1 Proposed change to the activities undertaken

The actual activities proposed by the change will be as follows:

Activity	Schedule 1 reference
Timber and wood-based products manufacturing	Section 6.6, Part B (a) (ii)
Directly Associated Activity	**Schedule 1 reference**
Waste wood combustion	Section 5.1, Part B (a) (v)

Table 1: Activities undertaken

B.2.1.2 Proposed change to the installation

The operator proposes to install and operate one Talbott MWE 600 clean waste wood boiler.

B.2.1.2.1 Technical details: waste wood fuel

As with the current regulated Part B waste wood combustion activity, the proposed fuel for the biomass will be 'own arisings' of clean waste hardwood, softwood, particleboard (with or without affixed veneer) and wooden packaging, collected via the sites extraction systems to a fuel storge silo.

European Waste Classification Codes	Description	Further restriction
03 01 05	Sawdust, shavings, cuttings, wood, particle board and veneer that is fixed to the board, other than those mentioned in 03 01 04	No chemical treatments applied
15 01 03	Wooden packaging	Visibly clean wooden packaging, including pallets, no chemical treatments applied

Table 2: Acceptable waste codes

Suppliers product data sheets are available for inspection the Operator to confirm that all proposed fuels **do not** contain halogenated organic compounds or heavy metals as a result of treatment with wood preservatives or coatings.

B.2.1.2.2 Technical details: plant & equipment

The Operator proposes to operate one Talbott biomass appliance as follows:

Appliance	Approx. Disposal rate	Input	Output	Fuelling
Talbott MWE 600 Boiler	150 kg/hr	708 kW	600 kW	Automatic

Table 3: Biomass boiler details

Figure 1: Biomass boiler example

The proposed appliance has been specially developed for industrial wood waste combustion and will be housed in a new-purpose-built boiler house. In summary, the system will comprise:

- Talbott's ATEX certified fuel store with fuel handling
- Fully enclosed transfer systems and feed screws
- Automatic ignition system
- Fully lined combustion chamber with water-cooled refractory brickwork
- Stoichiometrically designed three stage combustion grate with regulated combustion air supply
- PID controlled flue gas recirculation
- Fully modulating microprocessor-operated lambda controlled combustion
- Ceramic filter flue gas abatement plant
- 13m chimney stack with double skin stainless steel inner flue, 0.4m diameter coned down to 0.27m at the terminal point for 15m/s efflux velocity.
- Automatic ash removal
- Heat dissipator

The foreseeable emissions are detailed in the following section.

B.2.2 Foreseeable emissions

Foreseeable emissions to air from the appliance at start-up, normal operating conditions, shut-down and other than normal operating conditions (OTNOC) are characterised and quantified as follows:

Foreseeable Emission	Characterisation	Start-up/shut-down	Quantification		Other than normal operating conditions
			Anticipated release[1]	Emission limit[2]	
Smoke	Contained	Slight white smoke possible	No smoke darker than shade 1 on the Ringelmann scale		No smoke darker than shade 1 on the Ringelmann scale
Particulate matter	Filtered release	Initial filter bypass	13.3 mg/Nm^3	90 mg/Nm^3	Controlled shutdown in event of filter failure
Carbon monoxide	Contained	Not possible to quantify, however a controlled process	77 mg/Nm^3	375 mg/Nm^3	Not possible to quantify during OTNOC conditions. The residual fuel will burn out limiting the duration of emissions
Nitrogen oxides	Contained		234 mg/Nm^3	600 mg/Nm^3	
VOC	Contained		4.2 mg/Nm^3	30 mg/Nm^3	
HCN	Contained		<0.67 mg/Nm^3	7.5 mg/Nm^3	
Formaldehyde	Contained		<0.44 mg/Nm^3	7.5 mg/Nm^3	
Particulate matter (collected fly ash and bottom ash)	Potential fugitive	No visible emission	No visible emission	No visible emission	None: contained by boiler house
Particulate matter (wood dust)	Potential fugitive	No visible emission	No visible emission	No visible emission	Localised dust not escaping installation boundary

1. Environmental Monitoring Consultants stack emissions test, Chilfen Joinery March 2023, Report Number: 2325.
2. Numerical emission limits at the following conditions: dry gas at a temperature of 273.15 K, a pressure of 101.3 kPa, and an oxygen concentration of 6 vol-%.

Table 4: Foreseeable emissions

The anticipated released from the boiler chimney passed the biomass screening assessment required by the planning process, confirming that emissions at or below permitted limits are unlikely to cause the exceedance of any air quality objective. The screening assessment is provided as Appendix B. The Best Available Techniques for controlling emissions and minimising OTNOC are detailed in the next section.

B.2.3 Best Available Techniques

The proposed technology and other techniques for preventing or, where that is not practicable, reducing the emissions are detailed as follows:

B.2.3.1 Control of particulate matter (wood dust)

The waste wood fuel for combustion will be stored in a newly constructed fuel silo. The silo will be equipped with viewing windows to provide a visual gauge of capacity and to prevent overfilling. The system will be fully contained to prevent the emissions of wood dust.

B.2.3.1 Control of smoke and combustion products

Smoke emissions are minimised as far as practicable at start-up via the inclusion of an automatic fully staged ignition system, which removes the need for employee fire lighting intervention. The process uses a hot air blower system to start the combustion process, and then temperature and oxygen triggers ramp up the fuel feed and secondary air flow.

Figure 2: Biomass boiler control panel screenshot

Smoke and other combustion products (CO, VOC, NOx etc) are all effectively controlled during normal operation by efficient combustion. The boiler automatic "oxygen trim" system controls the combustion air supply dynamically to maintain optimum oxygen concentrations to ensure the efficient combustion and the minimisation of carbon monoxide and NOx. The PID control system modulates fuel flow and air supply based on heat demand and information from the Lambda O_2 sensor and combustion thermocouples.

At controlled shut-down, the boiler will automatic fuel stop at low O_2 level for controlled burn-out.

The boiler is also equipped with PLC controls with large colour touch screen HMI (figure 2), including full remote monitoring and maintenance via LAN connection. Real time trending data includes:

- Boiler output and flow temperature
- Boiler return flow
- Combustion temperature
- Flue temp
- Oxygen
- Under pressure

In the event of any significant problem with the combustion process, the appliance is equipped with safety circuits to initiate a controlled shut-down. In the event of an uncontrolled shut down, for example power failure or other catastrophic system failure, remaining fuel will burn out in the retort and smoke emissions will be dispersed by the tall chimney.

B.2.3.1 Control of particulate matter (boiler)

The proposed appliance will be equipped with two sets of combustion exhaust gas particulate filters system equipped with ultra-low pressures drop ceramic fibre filter elements with micro-porous finish.

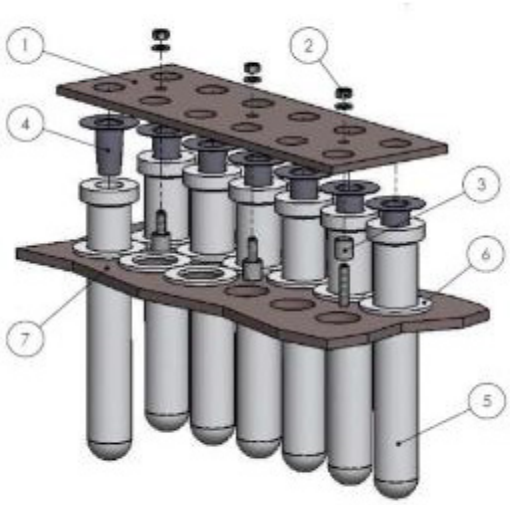

Figure 3: Ceramic filter elements

A reverse-jet clean down system will ensure that the filter elements do not become blinded. The clean-down interval and pressure will be pre-set by the manufacturer at boiler commissioning.

Fly ash will be collected in quick release bins at the base of the filter. Fly ash to be disposed of as controlled waste as currently.

Any issue with the filtration system, such as bypass, will be shown on the boiler control panel.

B.2.4 Monitoring

The appliance will meet the relevant emission limits detailed in Environmental permitting technical guidance PG5/1(21), and the Operator's proposed monitoring methods to confirm compliance with relevant emission limits are detailed in Table 5.

Substance/parameter	Emission limit value (mg/Nm^3)[1]	Monitoring frequency	Monitoring standard
Carbon monoxide	375	Annual extractive monitoring	EN 15058
Dust	90		EN 13284-1
Oxides of Nitrogen (NO and NO_2 as NO_2)	600		EN 14792
TVOC	30		EN 12619
HCN	7.5		US EPA OTM29
Formaldehyde	7.5		A modified version of US EPA Method 316 is the preferred method for measuring formaldehyde publication [2]
Smoke	Ringelmann Shade 1	Daily when in operation	Visual assessment

Notes:

[1] Emission limit values (ELVs) for emissions to air refer to values of concentration, expressed as mass of emitted substance per volume of waste gas under standard conditions (dry gas at a temperature of 273.15K, a pressure of 101.3 kPa, and an oxygen concentration of 6 vol-%), and expressed in the unit mg/Nm^3.

[2] For practical reasons (for example on very small ducts), it may be acceptable to measure formaldehyde using a method based on BS CEN/TS 13649.

Table 5: Emission limits and monitoring

The emissions sampling port will be located in the stack in accordance with guidance: Monitoring stack emissions: measurement locations (this guidance was formerly called M1).

The Operator does not propose to implement any 'in stack' CEM devices due to the advanced primary combustion controls, and the proposal to cease combustion operations if the ceramic filter fails (excluding start-up and shut down).

It is envisaged that the first round of extractive emissions measurements will be undertaken within 6 months of the permit being granted or within 6 months the start of operation.

B.2.5 Management Techniques

The Operator proposes a slight revision to the weekly environmental log sheet to include a daily check for ceramic filter bypass. A draft proposed updated log sheet is included as Appendix C.

B.2.6 Air Emissions Risk Assessment

Chelmsford City Council requested that the Operator undertake an Air Emissions Risk Assessment for the confirmation of proposed stack height, that being 13m above ground level attached to a building with a ridge height of 5.4m. The Environment Agency 'Air emissions risk assessment for your environmental permit' methodology has been used in this assessment, including the downloadable H1 tool. The air emissions risk assessment process is as follows:

1) Calculate the environmental concentration of each substance you release into the air – known as the process contribution (PC).
2) Identify PCs with insignificant environmental impact so that they can be 'screened out' – this means that you do not have to assess them any further.
3) For substances not screened out in step 2, calculate the predicted environmental concentration (PEC) for each substance you release to air – the PEC is the PC plus the concentration of the substance already present in the environment.
4) Identify emissions that have insignificant environmental impact – these can be screened out.
5) Get 'detailed modelling' (also known as detailed assessment or computer modelling) done for the emissions you cannot screen out.
6) Check if you need to do any other risk assessments. The Environment Agency sometimes refers to the following stages of air emissions risk assessment:
   - 'stage 1' – this is steps 1 and 2
   - 'stage 2' – this is steps 3 and 4

Where process emissions can be screened out from either stage of the assessment process, detailed dispersion modelling is not required. The Air emissions risk assessment has confirmed that the proposed appliance served by a ceramic filter and 13m stack should not lead to the exceedance of any Local Air Quality Objectives, and detailed dispersion modelling is not required.

B.2.7 Revised permit conditions

The Operator understands that new permit conditions will need to be agreed, but requests that the following emission limits be applied to the biomass appliance:

Substance/parameter	Emission limit value (mg/Nm^3)[1]	Monitoring frequency
Carbon monoxide	375	Annual extractive monitoring
Dust	90	
Oxides of Nitrogen (NO and NO_2 as NO_2)	600	
TVOC	30	
HCN	7.5	
Formaldehyde	7.5	
Smoke	Ringelmann Shade 1	Daily visual assessment when in operation

Table 6: Requested Emission limits and monitoring

Appendices:

Appendix A - Maps, plans and drawings
Appendix B - Air Emissions Risk Assessment
Appendix C - Proposed weekly log sheet

Appendix A - Maps, plans and drawings

Appendix B - Biomass screening assessment

Appendix C - Revised weekly log sheet