Biomass Boiler Information

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In common with other types of combustion appliances, biomass boilers are potentially a source of air pollution. Pollutants associated with biomass combustion include particulate matter (PM10/PM2.5) and nitrogen oxides (NOx) emissions. These pollution emissions can have an impact on local air quality and affect human health. It is essential that any new biomass boilers meet certain emission control requirements in order to protect local air quality.

1. Development Details

a) Planning Application Reference	**tbc**
b) Name of Site	**Manor Farm**
c) Address where boiler(s) will be located	**Manor Farm, Sharnford Road, Hinckley, LE10 3AW**
d) Person completing form	Kevin O'Brien Architects
e) Contact telephone number	[redacted]

2. Particulars of the Boiler

This information on the basic design of the system will help us assess the emissions performance. Biomass boilers often produce relatively high emissions when lightly loaded, hence the question regarding an accumulation tank (heat store). The boiler manufacturer and/ or installer should be able to help you provide this information.

f) Describe the proposed biomass boiler including make, model, manufacturer, thermal capacity (kw/MW), efficiency, maximum rate of fuel consumption (kg/hr or m^3/ hr).
1 x Glen Farrow Biomass Boiler GF295 with a capacity of 295 kW max capacity. Batch fed type boiler. Combustion efficiency reaches approximately 90%. Boiler thermal efficiency is approximately 70%. Boiler fuel burn rate is 23.03 kg/hr (GF295)
g) Describe the boiler combustion system and how combustion will be optimised and controlled.
Glen Farrow GF295 boiler is designed to burn biomass fuel such as wooden logs and straw bales. The boiler is batch fed type boiler, meaning that the fuel is loaded manually through the main door into a combustion chamber. Combustion is achieved by manually lighting the fuel and with help of the burner fan the fuel keeps alight. The burner fan, located at the rear of the boiler, is forcing the air through the blower bar into the chamber to achieve intense combustion. Blower bars are positioned to direct the air underneath the fuel for primary ignition processes and deliver the air above the fuel to achieve secondary combustion. The burner fan speed

can be controlled manually with speed controller located at the control panel to suit the heat demand and achieve better combustion performance. The boiler can achieve over 1500ºC temperatures.

The combustion gases leave the chamber through the heat exchange tubes into the chimney box, where the unburnt fuel particulates settle, and up to the insulated flue, then being discharged into the atmosphere being around 200ºC.

The combustion gases are heating water jacket surrounding the chamber and heat exchange tubes. To maximize amount of harvested heat, the door is filled with water which is being circulated by a shunt pump located at the rear of the boiler.

The combustion chamber is built from 8 mm thick boiler plate which increases durability of the boiler.

The water jacket around the chamber is 60 mm wide and holds approx. 690 l of water. The boiler then is insulated using insulation board and rockwool to minimize the heat loss.

The boiler then is cladded with stainless steel cladding and prime coated and painted trimming.

h) Describe the fuel feed system.
The GF295 boiler is batch fed type boiler, meaning that the fuel is loaded manually through the main door into a combustion chamber by trained personnel. The boiler will be loaded with small amounts of fuel trying to build the fire up and keep it burning at high temperatures by introducing small amounts of fuel into hot fire when needed. Loading routine will be adjusted to meet the system demand. The control panel usually located on the side of the boiler, helps operator to monitor the temperatures and adjust the burn rate by adjusting the burner fan speed.
i) Provide details of the abatement equipment in place for controlling particulate matter (fly ash) emissions.
The boiler chamber will collect most of the ash and some of it will settle in chimney box, which will be cleaned out on a weekly basis.

j) How does the biomass boiler deal with variable heat loads –is the boiler linked to an accumulation tank?
The boiler chamber will collect most of the ash and some of it will settle in chimney box, which will be cleaned out on a weekly basis.
k) Is the biomass boiler an exempt appliance in accordance with the Clean Air Act 1993? If yes provide evidence to demonstrate the biomass boiler has been tested and certified as an exempt appliance (for example a link to the appliance on the UK Smoke Control Areas website https:/ / smokecontrol.defra.gov.uk/ appliances.php?country= scotland)
GF295 biomass boiler is not exempt appliance in smoke control areas

3. Boiler Operation and Maintenance

System efficiency and emissions performance very much depend upon regular maintenance. Your installer should be able to recommend a suitable maintenance schedule.

l) Describe arrangements for cleaning and de-ashing the boiler.
Boiler to be cleaned and de-ashed once a week manually using supplied tools. The heat exchange tubes will be cleaned weekly by brushing them with the wire bush. The boiler will be left to cool down before de-ashing and heat exchange tubes cleaning. Cooled ash will be collected into the steel container. Boiler operative will monitor levels of ash and dust deposits in the boiler while loading the boiler and decides if it needs cleaning more often. Boiler stack will be inspected weekly during the boiler cleaning and swept if necessary.
m) Provide details of the maintenance schedule associated with boiler, abatement equipment and stack. This should include frequency of boiler inspection and servicing by a trained boiler engineer.
Daily inspections including: - Check for build-up of ash in the chamber and clearing if necessary - Check the blower bars clear of ash and debris - Check the heat exchange tubes are not blocked - Check if Doors are operating as normal - The pumps for faults - Leaks on the pipework and safety pressure relief valve - Control panel operation and water temperature reading - Burner fan working and free from blockages - Heat meter operational - Area around the boiler is clear of ash and debris **Weekly inspections:** - Clear the ash of the chamber - Remove and check the blower bars - Scrape and brush the heat exchange tubes - Clear the chimney box - Check the flue for blockages and sweep if necessary - Check the burner fan for dust and debris - Check the main pumps - Check the shunt pump and flow switch operation

- Grease the door bearings

6-month inspections:

- Clear/Scrape the chamber walls
- Check the blower bars manifold for blockages
- Thoroughly clean/scrape the chamber
- Sweep the chimney
- Check for rust, clear and re-paint if necessary
- Check electrical connections
- Check the pipe lagging
- Check the door rope

Boiler to be serviced by GlenFarrow biomass engineer or other competent engineer annually. Service includes checking for faults, thoroughly inspecting whole system components, repairing/replacing faulty components, cleaning the boiler, sweeping the flue, removing the rust and repainting surfaces if needed, advising customer about operational faults, etc.

GlenFarrow engineers are also available on the phone for any help or advise for the boiler operatives.

n) Describe how incidences of boiler or abatement system failure are identified & mitigated.

Boiler is fitted with number of safety devices which would stop the burner fan from running if the system is at fault. Failure would stop the oxygen feed into the chamber, starving the fire of oxygen.

4. Boiler Stack Details

The design of the stack greatly affects how pollutants produced in the boiler disperse over the surrounding area. Where the area is heavily built up, or has existing air quality issues, dispersion becomes more complicated and a computer modelling technique known as dispersion modelling may be required. Your installer should be able to provide most of the details and make a calculation on stack height and design. When dispersion modelling is required you or your installer may need to engage a specialist consultant.

o) Identify the height of the boiler exhaust stack above ground.

8.2 m

p) Identify stack internal diameter (m).

0.25 m ID

q) Provide maximum particulate matter and nitrogen oxides emission rates (mg/m^3 or g/hr) to standard reference conditions (6% oxygen, 273K, 101.3kPa).

PM - 56.5 mg/m^3; NOx 115.3 mg/m^3 @ 273K, 101.3kPa, 11% oxygen

PM –40.2 g/hr (0.02163 g/s); NOx 82.1 g/hr (0.04414 g/s) @ STP 273K, 101.3kPa,

11% oxygen PM - 85.0 mg/m³, NOx 173.5 mg/m³ @ 273K, 101.3kPa, 6% oxygen PM –60.6 g/hr (0.02320 g/s), NOx 123.5 g/hr (0.04728 g/s) @ 273K, 101.3kPa, 6% oxygen

r) Identify the exhaust gas efflux velocity (m/s).
7.8 m/s
s) Provide the grid reference of boiler exhaust stack.
SP 467927

5. Fuel Details

Emissions from a biomass boiler depend greatly on the type and quality of the fuel used. Reasonable guarantees are therefore needed that the fuel is compatible with the boiler, is of a high quality and that quality will be assured for a reasonable period of time. Your fuel supplier and installer should be able to provide this information.

t) Describe the fuel specification including origin, type of wood (chips, pellet, briquettes), nitrogen, moisture, ash content (%).
Mixed soft and hard wood with a moisture content of <23%
u) Does the fuel comply with European or equivalent fuel quality standards such as CEN/TS 335 or ONORM?
Boiler will be registered to RHI which requires fuel to be specific moisture content and quality as per RHI emission Certificate. The fuel log will be kept up to date. Fuel will comply with CEN/TS 335 (which been developed into CEN/TS 14961)
v) Describe what fuel quality control procedures will be adopted to guarantee constant fuel quality from your supplier.
The fuel moisture content will be tested before loading into the boiler. The fuel will be stored under cover.
w) Provide evidence to demonstrate that the biomass boiler combustion system is applicable to the fuel specification.
Please see the Emission Certificates attached
x) Identify where and how fuel will be stored on site (e.g. bunker or silo).
Biomass Store
y) Describe how fuel will be unloaded from the delivery vehicle into the storage facility and what control measures will be in place to reduce particulate matter emissions to atmosphere.

Fuel Will be unloaded using HIAB lorries or loading equipment available on site.

6. Building Details

The height and distance of neighbouring buildings will determine their exposure to emissions from the biomass boiler, and therefore the height of the stack needed. Your architect should be able to provide this information.

z) Record the distance of adjacent buildings from boiler exhaust stack.
8.2m E to new small shed 16.7m N to existing shed 30m NE to other farm sheds
aa) Record the height of adjacent buildings from boiler exhaust stack.
Boiler Shed 4.6m ridge New small shed to E 7.2m ridge Existing shed to N 6.7m ridge
bb) Record the dimensions of building to which the boiler exhaust stack is attached.
30.4m x 22.86m x 7.2m height to ridge
cc) Indicate the distance from the boiler exhaust stack to the nearest fan assisted intakes and openable windows.
Farm sheds as noted above; Nearest residential properties 68m ESE & 69.5m WNW