800kW Dual Fuel (Wood Chip & Pellet) Mansfield, Nottinghamshire. Case Study 1

Garibaldi School is a large Comprehensive community school in Clipstone, just outside of Mansfield in Nottinghamshire. It is a distributed multi-block campus, with a mixture of fan coil and radiator heating. The majority of this is fed from a central boilerhouse via underground pipework infrastructure.

The previous oil fired heating system installed in the early 1980's was due for replacement. Nottinghamshire County Council, keen to implement low carbon renewable energy systems, decided that the school would be offered the opportunity to shift to carbon neutral Biomass heating.

The decision to opt for a Biomass system, as opposed to natural gas, was taken by the Head and the school governors in early 2003. Work began on the design of the new system in May 2003.

The existing oil installation was removed during the school summer holidays and work began on the modification of the site to accept the new boilers and fuelstore. The boilers were delivered and installed in September 2003 and commissioned in October 2003.

The installation consists of two RRK 400kW boilers each with electric ignition, fully modulating capacity control (20%-100%), Lambda O^2 regulation, and exhaust cyclones. The boilers are fed via a common fuel delivery system consisting of a VB10 dosing silo, a series of TS220 augers and a KA100/55 5m diameter fuel extraction/agitation system. Fuel is stored in an 80m^3 Brice Baker silo sited just outside of the Boilerhouse in what was the oil tank compound. The boilers are capable of running on chip fuel up to 35% moisture content and on wood pellets.

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How it Works

Wood fuel stored in the silo is delivered into the boilerhouse by two sequential augers fitted with fill level control systems. The agitator fitted into the silo operates by slowly sweeping the material around and across the extract auger trough as required.

From the delivery augers, the material then enters a dosing silo which holds about 1m^3 of fuel and provides the onward distribution to the two separate boilers. The dosing silo is connected to two dosing augers, one for each boiler. After each dosing auger there is a rotary valve which meters the fuel into the stoker augers fitted to each boiler.

The boilers are controlled and monitored by a PLC (programmable logic controller) that accurately measures the boiler temperature, combustion pressure and exhaust O_2 levels. It then adjusts the primary and secondary combustion air volumes, exhaust fan speed and fuel feed rates. This ensure that not only do the boilers provide the correct amount of heat to meet the demands of the heating system, but they maintain optimum combustion fuel to air ratios to provide maximum efficiency and low pollution levels at all output capacities.

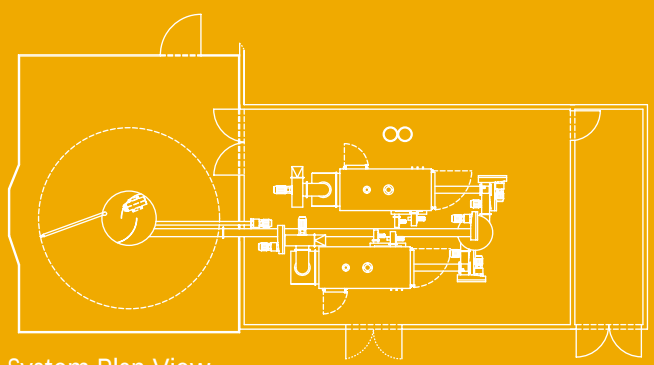
The system has direct access keypad display units mounted on the boiler control panel. This allows the operator to monitor and adjust all of the boiler operating parameters. Additionally, the County Council have plans to provide remote computer graphics access back to their main headquarters. All of this can be achieved using the current hardware and software installed.

Maintenance

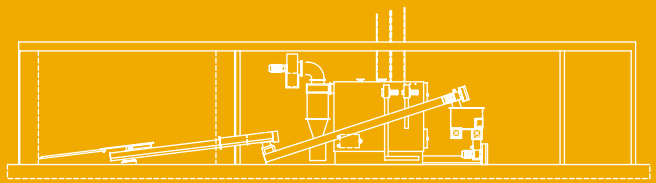
The boilers require de-ashing of the main ash containers (two on each boiler) every 7-10 days depending upon usage and fuel. Every 500 hours operation (approximately twice per year) the machines require de-ashing of the exchanger fire tubes and cyclone vanes, greasing of the bearings and drive chain lubrication. Every 4000 hours the auger motor gearbox oil requires replacement.

Technical Details

Boiler	2 x Binder - RRK/F400-600
Rated Heat output	2 x 400kW
Fuel moisture content	<35%
Fuel particle size	G30 wood chip specification
Approximate fuel use	220-250 tonnes per year
Building size	9m x 6m x 3.2m high
Chip store volume	80m^3
Power Supply	3 phase 50Amp



System Plan View



System Side View