

## HMP Guys Marsh Dorset



### Dorset Prison demonstrates the benefits of biomass heating

**HMP Guys Marsh is located near Shaftesbury in Dorset and can accommodate up to 578 people. The majority of the prison campus was heated from a single energy centre using heavy oil boilers dating from 1977. The heat was distributed to the building via underground heat main.**

An appraisal was undertaken to evaluate the technical and economic viability of constructing a new energy centre comprising of a single wood chip boiler system to act as the lead boiler with natural gas boilers providing standby and peaking capacity. New pre-insulated heat main was installed to connect into the existing heat main system.

The design settled on a single 1.2MW Binder wood chip boiler with 2 gas boilers each rated at 2400kW of capacity. The Binder boiler has an excellent turn-down ratio, being able to operate at 20% of the boiler maximum rated capacity while still offering high efficiency. The load profile of the site indicated that there was sufficient base load demand that an accumulator tank would not be required.



A key challenge for the project was the fuel storage and logistic arrangements for fuel delivery. A below ground fuel store was discounted due to a high water table (in keeping with the sites name "Guys Marsh") which would have presented technical difficulties and high civil costs.

The wood fuel solution, therefore, was an above ground walking floor (5m by 8m) and a fast wood chip distribution system. This design enables a tipped delivery of wood chip into a hopper which is then elevated by a fast vertical auger and distributed evenly onto the walking floor. The wood chip distribution system is capable of moving 120m<sup>3</sup> of wood chip per hour, which means a 60m<sup>3</sup> wood chip delivery can be emptied in half an hour.



Name of project	HMP Guys Marsh
Location	Dorset
Boiler type	Binder GmbH SRF-s 1200 wood chip boiler
Maximum rated output	1.2MW
Maximum Moisture content	50% (W50)
Ignition system	Gas burner ignition
Maximum particle size	G100
Fuel storage volume	approximately 150m <sup>3</sup>
Commissioned	September 2010

It was important that the wood chip boiler system was sufficiently versatile to be able to operate on a wide range of wood chip quality – from dry wood chip of small particle size to wet wood chip of large particle size and everything in between.

Therefore a Binder SRF-s step-grate boiler with gas burner ignition was chosen with a robust 330mm diameter auger transport system to move chip from the walking floor to the boiler. This allows wood chip up to 50% moisture content to be burnt efficiently within the boiler and allows a maximum particle size of G100 (on the Austrian O Norm Standard) and P63 on the new European standard for wood chip particle size. This gives flexibility on wood chip procurement into the future allowing lower operating costs.

Another important consideration was to have the most automated system as possible, reducing maintenance and cleaning time of the boiler and hence reducing running costs. The Binder GmbH system has fully automatic de-ashing whereby all ash from the combustion system and the cyclone (which removes fly ash) is automatically transported to a sealed steel wheeled container for removal.



The boiler heat exchanger tubes have a fully automatic cleaning system using high velocity air from the exhaust gas fan. This keeps the heat transfer to the water at maximum efficiency and means the heat exchanger tubes are only required to be cleaned manually during the annual major service.

The overall system is expected to significantly reduce the prisons heating oil demand (approximately 1,000,000 litres) and use approximately 2,000 tonnes of locally sourced wood chip and result in an estimated annual CO<sub>2</sub> saving of over 1,000 tonnes per year.

