Pioneering spirit

Biomass power generation is one of the keys to renewable energy. Brian Tinham examines a modular plant that is attracting worldwide interest for its potential to transform adoption, costs and timeframes

One of the first of a new generation of biomass power plants being commissioned this summer is Bagnolo di Po, Rovigo, Italy. The multi-million pound project covers the construction of a renewable electricity generation plant in a rural region, and hitherto it would have been met with strong local opposition. Yet it is going ahead with the blessing of planners.

And that's one of the key points: Staffordshire-based Biomass Power, set up in 2009, has redesigned conventional plant from the ground up – or rather along – not only to make it more acceptable to local communities, but also more practicable. Engineering director Martin Riley explains that, while biomass plants have been around since 2000, a major issue has been their height – typically in excess of 30m.

"The key to our offering has been our ability to create the entire biomass gasification process in a less intrusive, horizontal and modular, turnkey format," states Riley. "We design and manufacture the plant at our premises and then turn up on site to effectively bolt the design together, thereby saving significant amounts of time and expense. This approach allows us to confine the entire biomass power plant process technology within sub 10m high buildings and, as a result, counteract planning objections about scale."

A next-generation modular biomass power plant being commissioned at Bagnolo di Po, Rovigo, Italy, by Biomass Power. Planning permission and timeframes no problem

Local scale and supply

Biomass Power focuses on power stations up to 5MWe, viewing them as the way forward for green energy in locations that cannot tolerate large buildings. But that's not the whole story: the firm's approach is also based on local supply, seeking fuel for its plants from locally sourced waste materials, whatever they may be. Its process technology has been designed, it says, to handle a wide envelope of waste fuel streams, including forestry, agricultural residues, straw and miscantus.

The new Italian plant has a capacity of 15–20MW thermal and is rated at 3.25–4.25MWe gross for export to the grid. It is based on an optimised gasification process, followed by secondary combustion capable of handling fuels at up to 40,000 tonnes per year. In the Bagnolo region, as well as using local farming residue as fuel, electricity generated by the plant will provide power to the local hospital and save an estimated 12,000 tonnes of carbon annually.

In brief detail, a heavy-duty moving floor feeds the fuel into a reciprocating step grate via a metering device. The grate gasifies the fuel to produce a volatile mixture, which is then burnt at above 850°C . Once gasification and secondary combustion are complete, the hot gas is transformed via a water tube boiler into high-pressure steam at 450°C, and hence to electricity, using a vacuum condensing turbine. Finally, once the hot gases are released from the boiler at low temperature, they move into a dust filtering process that monitors flue gas emissions to ensure compliance with local emission standards.

As for monitoring and control, Biomass Power and solution partner Capula specified Siemens' PCS7 process management system. Why? "Capula identified the standardised approach and operational efficiencies we could obtain using Siemens' PCS7 system," answers Riley.

He cites the sophistication of control, but also the system's fault-finding functionality and Siemens' worldwide back-up and technical support. "[Those] made it the ideal choice as the control system for our turnkey power plants. In a rapidly changing marketplace and with power plants expected to be operational for up to 25 years, we now have the assurance that, by using PCS7, we are ... future-proofing our plants with a standardised approach to the automated control system." PE