

*Bioenergy Insight* delves into a biomass cogeneration facility which is approaching commissioning phase in the US

# Achieving renewable compliance

**N**ippon Paper Industries USA (NPI) is only a few months away from commissioning its new 20MW biomass fuel cogeneration facility. Construction of the new facility began in November 2011 and is located in Port Angeles, Washington, adjacent to an existing paper mill also owned and operated by NPI.

The \$85 million (€66 million) facility required completely new systems, equipment and facilities. The major assets included a fuel management area, steam generating combustion and environmental systems and a steam turbine electrical generator.

Before obtaining construction permits, significant time and money was expended to secure electrical generating agreements and ensure compliance with environmental requirements. In doing so, NPI was able to obtain pre-certification with the California Energy Commission for qualification into the Renewables Portfolio Standard programme.

The biomass feedstock used will be refuse forest waste material that would not otherwise be used for conventional purposes. That includes slash, thinning, tree tops and limbs, along with mill generated bark and sawdust. The inherent moisture of the fuel is expected to range from 45-55% H<sub>2</sub>O.

As the Pacific Northwest is known for high rain fall, a silo is also being installed by Atlas to provide storage equivalent of three days, or nearly 1,100 tonnes, of



Going green: the building on the right is the NPI boiler house

biomass. Storing feedstock from weather elements provides a more consistent and uniform fuel for, not only handling purposes, but also combustion characteristics. Annually, the system is expected to consume 170,000 tonnes of biomass, relating to an annual electrical generation of 168,000MW/h.

#### Internal breakdown

The combustion system is being designed, supplied and installed by FSE Energy. The boiler capacity is 225,000lbs of steam/hr at superheated conditions of 945 psig and 482°C. The boiler's furnace design allows for additional residence time for staged combustion to enhance reduction of the products of combustion, particularly carbon monoxide and particulate matter.

It is also equipped with a condensing economiser, tubular air heater and mechanical dust collector. The tubular air heater allows for supplying a minimum 265°C pre-heated combustion air to the both the primary and secondary air system.

The lower combustion system incorporates an air-cooled, vibrating grate system

manufactured by Detroit Stoker. The vibrating grate system is a modular design for which this project required two modules for a total active combustion area of 462.2ft.

In addition to the grate system, a staged secondary air system, specifically designed for this furnace, was provided. Biomass is distributed into the furnace with air swept distributors to maintain a consistent fuel and ash bed to mitigate fluctuations in boiler performance related to changes in fuel quality.

Following the combustion controls, the fuel is metered to the distributors via four metering bins with a two screw live bottom in each bin, which each contains about 15-20 minutes worth of fuel.

#### Hitting all targets

NPI is a subsidiary of Japan-based Nippon Paper Group which resides in a country that has an established environmental stewardship programme which has not only been fully integrated into the existing paper mill, but also this project.

As a result, compliance of

state and federal rules for air emissions was key in pursuing this project. Subsequently, the major pollutants of concern were reviewed and evaluated based on published compliance values. Of greatest concern were carbon monoxide, acid gases (HCl), sulfur dioxide (SO<sub>2</sub>), NOx and particulate matter.

Monoxide, HCl and SO<sub>2</sub> all relate to either inherent constituents of the fuel or combustion technology and it was determined that no additional flue gas conditioning was required. However, reduction in NOx was required and a post-combustion ammonia-based injection system, commonly referred to as selective non-catalytic reduction, has been installed. Evaluation of particulate matter emissions revealed that a four cell electrostatic precipitator would ensure compliance.

To generate electricity a General Electric extraction/condensing turbine was installed coupled with a General Electric 25 KVA generator.

Final construction is expected to be completed during this summer, with final commissioning of the unit hoped to be achieved by October. 'The cogeneration of steam and electricity from this project will take our business to a new and more sustainable level while allowing us to continue to improve our paper making business,' says Port Angeles paper mill manager Harold Norlund. ●

#### For more information:

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