

Biomass Gasification Anchors Dockside Green

Dejan Sparica

Taxiing by floatplane into Victoria's Inner Harbour, newcomers to British Columbia's capital find themselves caught between urban planning past and future. To the right, the stoic stone of the Legislature building and the majestic Empress Hotel. To the left, amidst cranes and jackhammers, rises the glass and steel of one of Canada's most ambitious community developments – Dockside Green.

With the first of three Dockside neighbourhoods scheduled to open in 2009, the 15-acre master-planned waterfront community is the first to target LEED Platinum certification – the highest rating in a suite of internationally recognized standards for environmentally sustainable construction. The initiative is a bold partnership between developer Windmill West and Vancity, Canada's largest credit union. Other industry partners in the Dockside project are Terasen Energy Services, BC Hydro, and Corix. Government sponsors include Natural Resources Canada's Technology Early Action Measures (TEAM) Program, the Province of British Co-



lumbia and the City of Victoria.

Unique Heating System

The Dockside community features the latest in environmentally friendly materials and innovative sustainable design, anchored by a unique renew-

able district heating system. Based on advanced biomass gasification technology, the system for Dockside will enable the community to self-generate clean, low-cost heat using locally-sourced wood fuel.

Joe Van Bellegham, of Windmill Developments, says that choosing biomass gasification for the central heating plant also enables the project to demonstrate concrete action to reduce greenhouse gas emissions.

“Reducing emissions from buildings to the point where we are carbon neu-



Dejan Sparica is Vice President and Chief Engineer of Vancouver-based Nexterra Energy Corp., a developer and supplier of advanced gasification systems using wood waste fuels. Nexterra supplied the gasification system, as well as heat recovery and hot water circulation system for the Dockside Green Project. Dejan can be reached at <dsparica@nexterra.ca>.

tral was one of the key achievements Dockside Green needed to be a world-class sustainable community. We looked around the world for the right technology and found it in our backyard,” he said.

“Biomass gasification is perfect for an urban environment. It is a proven, simple, clean technology that sets a new standard for converting biomass into useful heat energy with meaningful emissions reductions.”

There are essentially two commercially available alternatives for converting biomass into energy: combustion and gasification. Biomass gasification technology promises to deliver performance and operational benefits over conventional combustion, including design simplicity, operational versatility, low emissions, and low cost. Partners in the project hope other jurisdictions will take note and replicate neighbourhood energy systems such as Dockside.

“We see a tremendous convergence of interest from energy providers, customers, and all levels of government to have viable projects like Dockside Green become the new standard for community building and living,” said Lee Davis, President and CEO of Vancity Capital. “There is no reason why this unique energy system cannot be economically replicated in communities up and down the west coast and across North America.”

Micro Energy Utility Delivers Heat and Hot Water

Dockside Green Power Limited was formed as a “micro energy utility” by Terasen, Vancity, Corix and Windmill to own and operate the gasification system and to administer the heat and hot water service for Dockside Green.

The biomass gasification plant will provide heat and hot water to approx-

imately 2,500 Dockside residents and business customers once the harbourfront community is fully complete. The system will take urban wood fuel – including recycled wood construction debris and municipal tree trimmings – and convert it to low emission synthesis gas or syngas. The syngas is directed through an oxidizer and then a boiler which in turn will provide heat and hot water to 1.3 million square feet of mixed residential, office, retail and light industrial space. When operating at peak capacity, the system will require delivery of approximately one truckload of wood fuel every two days.

Gasification is a thermo-chemical process that uses heat to convert any carbon containing fuel into clean-burning syngas. Gasification differs from conventional combustion because it uses just 20 to 30 percent of the oxygen needed for complete fuel combustion. The process consists of heating wood in an oxygen-starved environment until volatile gases (carbon monoxide and hydrogen) are released from the wood. The gas is then mixed with air in a secondary combustion chamber called an oxidizer, where the gases are burned to complete the combustion process.

The gasifier at Dockside is based on a fixed-bed, bottom-fed, updraft design. Fuel, sized to three inches in diameter, is bottom-fed into the centre of a cylindrical, refractory-lined gasifier. Combustion air, steam and/or oxygen are introduced into the base of the fuel pile. Partial oxidation, pyrolysis and gasification occur at 1500-1800 degrees Fahrenheit, and the fuel is converted into syngas and non-combustible ash. The temperature of the fuel bed is tightly controlled to prevent the bed from exceeding the fuel’s ash melting point. This prevents the ash from forming

“clinker,” which represents a challenge for conventional combustion systems. Instead, the ash remains granular, free-flowing and is discharged intermittently through the base of the gasifier into a single ash bin.

After leaving the gasifier, syngas can then be directed through an oxidizer and into energy recovery equipment or fired directly into boilers, dryers and kilns to produce useable heat, hot water, steam and/or electricity. The Dockside system will be able to process fuel with fluctuating moisture content of between 10 to 55 percent.

The neighbourhood energy plant will be situated in the heart of the residential apartment complex, and will avoid approximately 2,500 tonnes of greenhouse gas causing emissions each year – the equivalent of taking 800 cars off the road.

Renewable Energy System with Promise

Certainly the project’s renewable energy system seems tailor-made for British Columbia.

Late last year, at the Union of British Columbia Municipalities Conference, BC Premier Gordon Campbell announced that greenhouse gas emissions reduction strategies and targets will be legally required in all official community plans and regional growth strategies in the province. Municipalities will also be given the power to waive development cost charges as a way to encourage green developments such as Dockside Green. As well, Premier Campbell said all new government buildings or facilities shall be built to a minimum LEED Gold or equivalent certification.

For municipalities looking for a renewable energy solution, biomass gasification seems poised to make good on a promise to provide a new era of energy security. *MW*

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