Renewable Fuel

INITIATIVES WEAVE VIBRANT PATCHWORK of Green Energy Solutions

Editor's Note: *In July 2008, Dresser-Rand Company Ltd, completed the acquisition of certain assets of Peter Brotherhood Ltd.*

IN A WORLD FOCUSED ON DEVELOPING clean, renewable energy, one can draw a parallel between Rumpelstiltskin, the fictional character who could spin straw into gold, and today's energy conversion solutions that turn waste and byproducts into biopower.

The U.S. Energy Information Administration reports that renewable sources account for more than 10 percent of domestic energy production, and the new administration in Washington D.C. is emphasizing the increasing importance of the renewable energy market.

Dresser-Rand is committed to this dynamic market with technology that uses waste heat in a combined cycle process for greater efficiency. Other processes burn biomass as a renewable fuel source, producing power. Both types of technology can reduce fuel emissions, and reduce CO_2 (carbon dioxide gas) from entering the atmosphere – to keep the world breathing easier.

The company has considerable experience in steam turbine systems for combined cycle, cogeneration and waste-to-energy, among other applications. When Dresser-Rand Company Ltd acquired certain assets of Peter Brotherhood Ltd last year, it expanded its renewable energy capabilities.

Today, Dresser-Rand's steam turbine installations account for more than 1,000 MW of biomass and sustainable fuel-fired power worldwide. Their success stories weave a vibrant patchwork of "green" energy solutions with high reliability, low maintenance and maximum efficiency.

BIOMASS TO BIOPOWER: TURNING ORGANIC WASTE MATERIALS INTO ENERGY

Dresser-Rand installations can be found in virtually every industry that uses steam for process and/or power production, and biomass installations continue to increase in size and number. These installations normally involve burning a variety of organic waste materials to run turbine generator sets of various sizes and configurations.

Some examples include:

- A U.S. lumber mill burning wood chips to operate a 6 MW, controlled extraction turbine generator (TG) set for on-site power and distributed energy
- A U.S. horse farm burning animal waste to run a 600 kW turbine generator for on-site power
- A toxic waste burning plant in Finland producing 6 MW of power for distributed energy and district heating applications
- An olive oil processing plant in Spain operating two condensing TG sets (the 7 MW and 4 MW turbine generators at this plant produce on-site power and distributed energy during peak harvest season)
- A 25.5 MW extraction condensing steam turbine uses steam raised from burning bagasse (the sugar cane processing waste product) at the Isis Central Sugar Mill in Childers, Queensland, to generate the Australian mill's electrical power. The extraction steam is used in the sugar refining process, and the growing crop absorbs CO_2 released by burning the bagasse.

Dresser-Rand Company Ltd also supplied a steam turbine driven generator set for Energetus, which ordered the 10.75 MW system for the Central Biomassa Terras de Santa Maria wood burning power plant. Located outside the city of Aveiro, Portugal, the biomass plant operates on forest residue, including cork powder. The plant, which began running in February 2009, produces electricity from an abundant source of forest material, and removing the forest waste reduces the risk of fires.

WASTE HEAT RECOVERY: BY LAND AND BY SEA

The process of using waste heat to generate steam that powers plants and containerships offers significant breakthroughs in sustainability and emissions reduction.

In Western Australia, the mineral company Ilucia roasts sand at 2192 °F (1,200 °C) to produce synthetic rutile (which, in its natural form, can be used to produce titanium metal and refractory ceramic). The coal-fired rotary kiln and process uses 1,500 kW of electricity. By installing a waste heat boiler in the exhaust from the kiln, the steam drives an 8 MW condensing turbine generator set. This process allows the plant to run on self-sufficient power and it even exports 6 MW of electricity to the local grid.

Waste heat recovery systems can also be applied to the high seas, particularly for ships with six-cylinder (or more) engines. Large containerships have the potential to reduce fuel consumption by as much as 10 percent, saving on fuel that would have powered auxiliary diesel engines.

Dresser-Rand Company Ltd's series of turbo-compound systems (TCS) incorporates a dual-pressure steam turbine and power turbine (gas expander) driving either a 6 MW or 8.5 MW generator on a combined base frame. Odense Steel Shipyard in Denmark ordered 20 of these machines to provide the power needs on various partially refrigerated containerships.

The current TCS offering evolved from similar turbines supplied between 1987 and 1991, and has proved to be extremely reliable. Known as the M-series, these introductory systems have run for more than 1.5 million hours with availability exceeding 99 percent. They remain in operation today.

The TCS combines the exceptional performance of the M-series with improvements to the system arrangement. If the system produces more power than the auxiliary generators can use, a shaft motor applies the excess power to help the main engine. This saves approximately 10 percent on the engine's fuel consumption (depending on the operating regime of the ship) and an equivalent reduction in NOx, SOx, and CO_2 emissions from the ship's stack.

A 25.5 MW Peter Brotherhood steam turbine being installed at the Isis Central Sugar Mill in Childers, Queensland, Australia..

LANDFILL COGENERATION: TURNING TRASH INTO TREASURE

Landfill methane produces more than 20 times the amount of greenhouse gases as natural gas. Therefore, harnessing this gas as a renewable fuel source presents a golden opportunity with environmental benefits. And using landfill methane literally turns trash into treasure (remember Rumpelstiltskin?).

Gas Recovery Systems, LLC, part of the Fortistar Methane Group, operates three methane-to-energy cogeneration projects at landfill sites in the Chicago area, Michigan and Minnesota. The Chicago area and Michigan sites are duplicates of each other, with capacities of 10 MW, while the Minnesota site has a 6.6 MW capacity. All were designed to collect methane gas produced by the decomposition of municipal solid waste. The landfills are expected to generate methane for the next 20 to 30 years.

The system operates the same at each site: methane is pumped to a gas condition facility, then cleaned and compressed to a higher pressure. The methane is then sent to a cogeneration building where the majority of it fuels up to three gas combustion turbines. The combustion turbines' exhaust gases flow through a heat recovery steam generator (HRSG) that produces 600 psig steam at 750°F (399 °C). Each HRSG contains a duct burner that uses excess methane as a fuel to increase steam production. The steam produced from the HRSG powers a Dresser-Rand steam turbine generator set. The turbine exhaust goes to an air-cooled condenser that produces no vapor plume and makes the plant more environmentally friendly for the local community.

The increasing commitment from companies to produce "green" power has positioned Dresser-Rand as a major player in the renewable fuel market. These projects burn waste and harness exhaust heat to optimize valuable renewable energy resources. It's not exactly turning straw into gold, but close. ■