

Novel hybrid formula for L'Oréal

The sun delivers the gross energy to the photovoltaic system. With an average consumption of 40-60 tonnes per day, the plant is expected to use about 12 000 tonnes per annum of G40 woodchip.

The star of technical visits organised by the 2014 Expobiomasa was undoubtedly the hybrid biomass-solar trigeneration plant built by Biocen to supply steam, hot water, cold water and electricity to the L'Oréal factory in Villalonqu ejar, Burgos, Spain.

L'OR EL GROUP IS IMPLEMENTING AN energy strategy to be carbon-neutral in all its factories around the world. It has therefore decided to increase the use of renewable energy and has begun with the Burgos factory, where all of the brand's hair products are produced, substituting natural gas and electricity with biomass and solar energy.

The most important trigeneration hybrid plant for Spain, it supplies all the energy the industry needs and has provided a reduction in emissions of 4 230 tonnes per annum, making it CO₂ neutral.

So far, Cogeneracion Biocen S.L. (Biocen) only supplies power to the L'Or el factory, but the facility has been designed to house another boiler, if a new energy supply contract with another nearby industry is signed.

Recovering all combustion gas energy

Guillermo Morillo, Biocen project manager explains, "we make use of 90 percent of the energy contained in the woodchips we use as biofuel".

The main energy generation equipment is a 4.8 MW thermal oil boiler with moving grate, from the Austrian manufacturer Polytechnik, using woodchips as the biofuel. The plant also uses a saturated steam generator operating at 12 bar with an output of 2.6 tonnes per hour of steam provided by an oil/steam exchanger; an ORC Turboden 6 CHP with 400 volt output and capable of producing more than 600 kW_e and 2 600 kW_{th}; a single-effect absorption machine, a

Broad 1200 kW, with 50 000 litres of cold water accumulation for working machines and another 70 000 litres for air-conditioning; and a 500 kW photovoltaic installation.

The energy production begins in the thermal oil boiler where the flue gases from biomass combustion, at about 850 °C, circulate first through the main heat exchanger – three concentric coils – transmitting thermal energy to the oil and thereby heating it up to a maximum 320 °C.

These gases are then directed to two heat recovery units, termed "economisers", which pre-heat the return thermal oil before it re-enters the main heat exchanger.

After passing through a cyclone that reduces the amount of particulate matter, the flue gases pass through another heat recovery unit, preheating the air entering the boiler to improve the biomass combustion.

Finally, before flowing outside through the chimney, the gases pass through an electrostatic filter for final cleaning. Particulate and other compound emissions are lower than 50 mg/Nm³, says Guillermo. The ashes are placed in a container to be delivered to a waste management system.

In the ORC CHP, the 320 °C thermal oil transfers its heat to the organic silicone until it evaporates. The vaporised, high-pressure silicone moves the turbo generator, after which it is cooled and condensed through contact with a water circuit.

Water heated to 90 °C is accumulated in two deposits of 50 000 litres each; from here it is destined for different uses. There is an additional 50 000 litre tank for cold water.

Water and steam

L'Or el factory needs hot water to heat buildings and for various processes. The hot water is sent to the plant through a DN200 (diameter), 300 metre pipe. Steam is used in the production line cleaning processes. The average consumption of vapour at

the cosmetics factory is 1.7 tonnes per hour at 5 bar, although the generator produces steam at 12 bar to meet peak demand. The cold water produced in the absorption unit is stored at 7-8 °C in a 50 000 litre tank and will be used in the factory to meet the HVAC and process cooling needs.

Sun and chips

The sun delivers the gross energy to the photovoltaic system, and the public enterprise Somacyl manages the woodchip supply to the biomass plant. With an average consumption of 40-60 tonnes per day, the plant is expected to use about 12 000 tonnes per annum of G40 woodchip.

To ensure smooth operation there are 3 woodchip silos with a storage capacity of 80 tonne each and a fourth with moving floor to feed the boiler. To keep them well stocked deliveries are received from four trucks per day.

One of the biggest operational challenges for the plant is complying with client requirements at all times. The plant can supply all the energy required by L'Or el, but consumption peaks cause significant fluctuations in both thermal and electrical generation, which require precise regulation of all systems. To achieve this, the plant is staffed 24 hours per day by 3 personnel – a technical manager and 2 operators.

Cent Solar previously installed a 500 kW biomass boiler in the L'Or el factory in 2009. They have worked together since then to bring this flagship project to completion. The old boiler will be kept only as a backup system.

Biocen is a company created to manage the plant that supplies energy to Productos Capilares L'Or el SA and is composed of CIDAUT Technology Center, the engineering company Cent Solar and the public company SOMACYL.

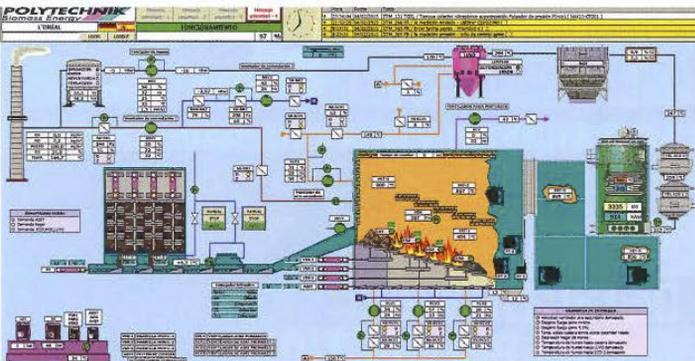
Text: Dorota Natucka & Ana Sancho

Photos: Jeanette Fogelmark

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From left to right, Alfonso Calderon from Cenit Solar, Guillermo Morillo, Biocen Project Manager, Dorota Natucka and Ana Sancho from Bioenergy International with the L'Oreal factory in the background. The main energy generation equipment is a 4,8 MW moving-grate thermal oil boiler from the Austrian manufacturer Polytechnik. The boiler uses woodchips fuel.



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