TURBO CHARGED TURBODEN

Turboden SpA's biomass and wood-based industry consultant Alessandro Guercio, highlights the company's drive towards energy efficiency and decarbonisation

Above: *Turboden's installation at Starwood in Turkey*

To date, Turboden has more than 300 biomass-fired Organic Rankine Cycle (ORC) units in operation, mainly dedicated to generating combined heat and power for district heating and industrial processes. Of the total, 78 of these units are in the wood-based panel production industry.

Not only are ORCs available among Turboden technologies nowadays, new solutions have been developed, such as large heat pumps and new concept high temperature ORCs able to co-generate steam up to 25 bar and power.

Let's see how the Turboden technologies can contribute to energy efficiency and decarbonisation in the wood-based panel production processes, starting with biomass-fired ORC for combined heat and power (CHP) in particleboard and OSB production.

A circular economy model has been implemented in wood-based panel production thanks to the rising use of recycled wood as a raw material, mainly in particleboard production but also for OSB and MDF. The use of residual waste wood as source of renewable energy for combined heat and power production can offer additional environmental and economic advantages to the production process.

Particleboard, OSB and MDF production are energy demanding processes, due to the high demand for heat for drying and pressing and electric power.

Particleboard and OSB have a similar configuration when it comes to energy demands. Wood particles for particleboard or wood strands for OSB are first dried, then pressed in a thermal oil heated press. Electric power is needed in all the phases of the process.

Biomass-fired CHP ORC systems can make a strong contribution in reducing both the primary energy demand and CO_2 emissions, thanks to a local generation of renewable electric power, using residual waste wood.

In particleboard and OSB production, conventional biomass-fired ORC systems can generate combined heat and power in a proportion of 1:5, producing useful heat up to 125°C for belt dryers, and electric power for the process.

Replacing high temperature rotary drum dryers with low temperature belt dryers increases the potential of combined heat and power solutions.

Now looking at biomass-fired high temperature ORC (steam and power ORC) for CHP in MDF production: MDF production needs heat in the form of saturated steam for refining the raw wood to be reduced in wood fibres.

The wood fibres are then dried in a dedicated flash dryer and pressed in a thermal oil heated press. Electric power is needed in all the phases of the process.

The new Turboden concept of biomass-fired high temperature ORC systems (steam and power ORC) can generate combined heat and power in a proportion of 1:6, producing useful heat in the form of steam up to 20 bar to feed both refiner and indirect flash dryer, and electric power for all the phases of the process.

The production of electric power in biomass-fired CHP configurations can satisfy a considerable part of the overall electric power demand of the process, offering many technical, economic and environmental advantages, such as:

- Production of renewable electric power for own consumption and reduction of CO_2 emissions
- Securing the power supply for essential systems in case of interruption of electricity supply from the electric grid
- Controlled cost of electric power generation protecting from unpredictable fluctuation of energy market price
- Competitive to market price electric power generation cost

Looking from a different point of view, large heat pumps can reduce heat demand for

Turboden installations

Customer	Country	Application
Kastamonu Entegree	Turkey	PB and MDF
IPAN SpA (Bonzano group)	Italy	OSB
Starwood	Turkey	PB and MDF
AGT	Turkey	MDF

TURBODEN TODAY AND ITS FUTURE VISION

Turboden, a Mitsubishi Heavy Industries (MHI) group company, is an Italian firm and a global leader in the design, manufacture and maintenance of Organic Rankine Cycle (ORC) systems, highly suitable for distributed generation.

ORC systems can generate heat and power exploiting multiple sources, such as waste wood and any residual process waste, contributing to optimise the circular economy in the industrial production process.

The company was founded in 1980 in Milan by Mario Gaia, professor of energy at the Politecnico di Milano and today honorary chairman of Turboden. In 2013 Turboden became part of Mitsubishi Heavy Industries, a group that strongly supports Turboden in the development of innovative solutions.

Thanks to its long experience in the energy efficiency sector, today Turboden has broadened its portfolio with new solutions such as: high temperature ORCs, large heat pumps and gas expanders, to contribute to the worldwide efforts to mitigate global warming by creating reliable and clean energy systems.

MHI, which is headquartered in Tokyo, is one of the world's leading industrial firms, with 80,000 group employees and annual consolidated revenues of around US$38bn (in 2018).

For more than 130 years, the company has channelled big thinking into innovative and integrated solutions that move the world forward. MHI owns a unique business portfolio covering land, sea, sky and even space. MHI delivers innovative and integrated solutions across a wide range of industries from commercial aviation and transportation to power plants and gas turbines, and from machinery and infrastructure to integrated defence and space systems.

drying, either coupled with ORC or as an alternative. Low temperature heat sources, such as condensing flue gas, can be exploited as a heat sink by a large heat pump to produce useful heat for drying and heating.

Large heat pumps associated with low temperature dryers can be integrated into conventional drying systems to replace fossil fuels with electric power. A heat pump can replace four to five units of heat with one unit of electric power.

Considering power production is always more carbon free, heat pump drying systems cut global and local emissions.

Industrial heat pumps associated with low temperature dryers can be the solution to reduce emissions and cut fuel consumption while increasing drying capacity. ●