

Organic Rankine Cycle (ORC) technology for WBP industry: reference cases and developments of new high-temperature ORC solutions

Simone Passera¹⁾; Riccardo Vescovo¹⁾

¹⁾ *Turboden SpA, Brescia, Italy*

Abstract

This paper features the application of Turboden ORC technology for Combined Heat and Power (CHP) generation fuelled by wood biomass or other biomass residues in the WBP industry.

In such installations, the ORC module is coupled to an automatically biomass combustion system with thermal oil heater and pollution control technology.

Turboden has developed more than 300 ORC plants in the biomass sector over the last 20 years. The main fields of application have been CHP plants for district heating networks, pellet, sawmills and furniture factories. The success of ORC technology in these fields is mainly due to the high overall efficiency (>80%) of the CHP configuration, generating electricity and hot water at temperature suitable for those application (i.e. in a range between 80 and 110 °C).

On the contrary, in WBP industry the application of ORC technology has been limited so far by the higher heat temperature required by the process (i.e. mid-pressure saturated steam and/or thermal oil).

Turboden has recently developed a new high temperature (HT) ORC CHP solution able to produce electricity and discharge to the condenser heat in the form of saturated steam (between 5 and 25 bar) or thermal oil (between 160 and 280 °C).

Profitable economic and energetic applications of this new HT-ORC technology are promising in particular for plywood and MDF industries, considering the heat requirements in terms of temperature, heat media and size of these production processes.

Compared to traditional steam cycle technology, ORC technology has proven to be more competitive in distributed energy installations with sizes up to 5 MWe. This is mainly due to the following reasons:

- higher electrical efficiency and overall energy efficiency at the mentioned plant scales
- reliable equipment with low maintenance requirements
- ease of operation (fully automated controls)
- avoidance of high pressures and related regulatory operator requirements

The aim of the paper will be to underline the experience and reference cases of Turboden technology in WBP industry so far and to describe the new developments of high temperature ORC technology and its possible application to the WBP industry, with particular focus to plywood and MDF production processes.

COMPANY DESCRIPTION

Turboden SpA, a group company of Mitsubishi Heavy Industries, is committed to providing clean, efficient, and reliable power within the renewable energy market. Turboden is global leader in ORC plants for biomass applications. About 350 Turboden ORC units with sizes from 300 kW to 10 MWe have been installed worldwide.