

ABSORPTION HEAT PUMP IN HALLEIN - AUSTRIA

Absorptionswärmepumpe in Hallein



Fig 1: Installation of the absorption heat pump [Salzburg AG]

Summary of the project

The district heating network Salzburg city with a pipe length of 150 km and the district heating network of Hallein with a pipe length of 17 km are connected with a pipe over a distance of 25 km. Both networks supply about 15 000 connected customers. The entire district heating network is supplied with heat by heating plants, cogeneration plants and waste heat recovery systems with an annual heat production in 2016 of about 790 GWh.

The company AustroCel Hallein GmbH (former Schweighofer Fiber GmbH), a producer of pulp in Hallein, feeds industrial heat into the district heating network Salzburg/Hallein. At the company site a biomass cogeneration plant is operated which is partly fired with wood waste from the pulp production. The condensation heat from the steam turbine cycle is used to supply process steam with a temperature of about 165 °C at a pressure of about 6.5-7 bar for the pulp production.

Furthermore, this biomass cogeneration plant is combined with an absorption heat pump which uses the condensation heat of the flue gas as low temperature heat source and a part of the process steam as driving source. Absorber and condenser are arranged in serial. The return and supply pipes of the district heating network are hydraulically separated from the connection pipes to the absorber and condenser. For this a thermal storage

” AN ABSORPTION HEAT PUMP IN COMBINATION WITH A BIOMASS COGENERATION PLANT PARTLY FIRED WITH WOOD WASTE FROM A PULP PRODUCTION PROCESS GUARANTEES AN ECOLOGICAL AND ECONOMIC OPERATION ”

(180 m²) is used and an additional pump is required to provide the volume flow rate through the absorber and condenser.

The flow temperature of the district heating network at the absorption heat pump location is about 105 °C and the volume flow rate is about 200 m³/h. The absorption heat pump is operated to reach a temperature at the condenser outlet of about 90 °C. The typical volume flow rate through absorber and condenser for a difference between the flow temperature and the return temperature of 30 K is about 200 m³/h. This means, the absorption heat pump is designed to heat the total volume flow rate of the district heating network. To reach the required flow temperature of the district heating network additional process steam is used within a heat exchanger. The return temperature at this location is in



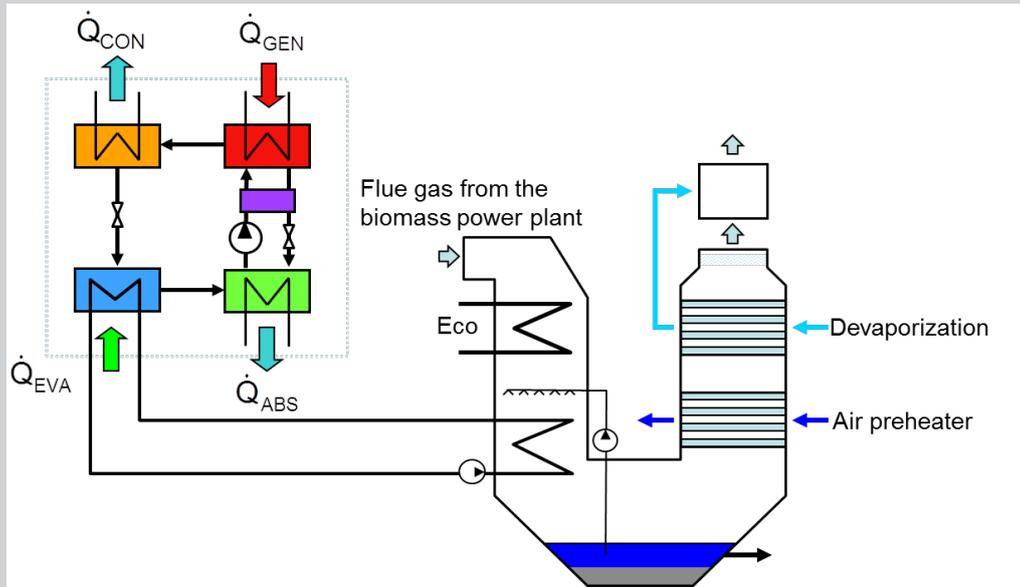


Fig 2: Scheme of the absorption heat pump connected to the biomass power plant (Rechberger, 2009)

Winter about 55 °C (without heat supply to the district heating network Salzburg city) and about 60 °C (with heat supply to the district heating network Salzburg city). In summer heat is always supplied to the district heating network Salzburg city and the return temperature is about 70 °C in this case.

The absorption heat pump uses H₂O as refrigerant and LiBr as solvent and reaches a heating capacity of about 7 MW and a COP_H of about 1.8 at a driving temperature of 165 °C (hot steam), a heat sink temperature of 90/60 °C (flow of district heating network) and a heat source temperature of 60/40 °C (flue gas condensation). The heat pump was manufactured by the company Entropie GmbH (subsidiary company of Veolia Environment S.E.), then Inven GmbH, and now CNIM).

Results

- The absorption heat pump improves the energy efficiency of the biomass cogeneration plant and is in operation about 8 500 hours a year since 2006.
- Due to low driving costs and high operating hours is the absorption heat pump is profitable.
- Due to the use of biomass as driving source and increased heat output through the absorption heat pump CO₂ emissions are reduced.
- The absorption heat pump reacts slowly to changes of the operating conditions nevertheless the controllability is sufficient even at part load conditions.

References

Rechberger, 2009

Rechberger, C., 2009, Wärmerückgewinnung mittels Rauchgaskondensationsanlagen bei biomassebefeuerten Heizkraftwerken, Diplomarbeit, Institut für Wärmetechnik, Technische Universität Graz

FACTS ABOUT THIS PROJECT

Building type: : Residential buildings, commercial buildings and industry

Heated floor area: 15 000 connections

Installed heat capacity: 7 MW heat pump

Heat source: Flue gas condensation of an onsite biomass cogeneration plant

Investment cost: 0.65 Million EUR (for the absorption heat pump without peripheral equipment) and about 1.75 Million EUR (condensation, thermal hydraulics, instrumentation, control, automation and constructional engineering)

Participating countries: Austria

Time frame: In operation since 2006

Project organisation: Austrocel Hallein GmbH, Salzburg AG

Link to web page or report:
<https://nachhaltigwirtschaften.at/de/iea/technologieprogramme/hpp/iea-hpp-annex-35.php#publications>

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