DISTRICT HEATING NETWORK FLACHAU - AUSTRIA
Fernwärmenetz Flachau

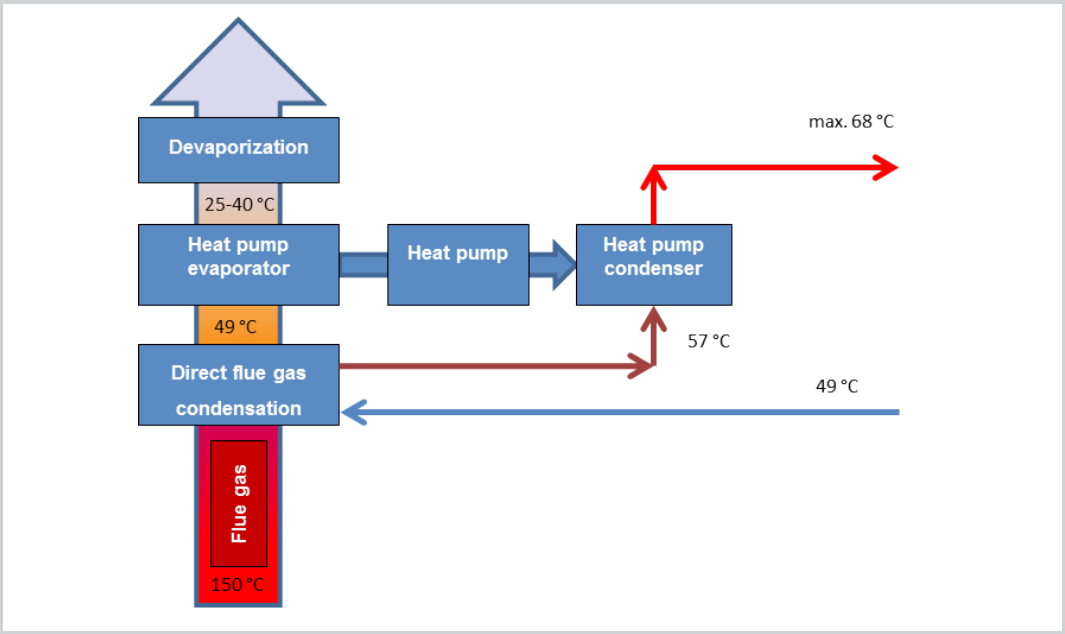

Fig 1: Integration of the evaporator and condenser of the heat pump with typical temperatures [following Kronberger, 2015].

Summary of the project

The district heating network in Flachau with a pipe length of about 25 km and about 381 connections is operated by the Holzwärme Flachau GmbH. During the winter months heat is mainly provided to hotels located at a skiing area. In the year 2016 an amount of 33 677 MWh was supplied. The flow temperature varies in dependence of the ambient temperature between 80 °C and 99 °C. The return temperature varies between 46 °C and 51 °C.

As heat generators, two biomass boilers with a heating capacity of 4 + 3 MW and direct flue gas condensation with a heating capacity of 1.4 MW are installed. For peak load an oil boiler with a heating capacity of 10 MW is used since 2007. In the year 2014 an industrial heat pump with a heating capacity of 1.2 MW was installed to increase the amount of flue gas condensation. Furthermore a thermal storage with a volume of 320 m^3 is used within the district heating network to compensate load fluctuations.

The heat pump was manufactured by the company Frigopol with a nominal heating capacity of about 1.2 MW. At an evaporator inlet/outlet temperature of 27.5/30.5 °C and a condenser inlet/outlet temperature of 57/64 °C a COP_H of about 4.2 is reached. The heat pump uses R134a as refrigerant with five compressors for continuously heating capacity control between 20-100 %. The heat from flue gas condensation is transported in an additional water circuit with a pump (11 kW) to the evaporator of the heat pump. This was done to reduce the refrigerant filling quantity and to prevent the compressor from high evaporating temperatures with an admixing circuit. The flue gas temperature at the outlet of the heat pump evaporator varies with the load of the biomass boiler and is about 25 °C in summer and about 40 °C in winter. The heat of the condenser is used to raise the return flow of the district heating network. The maximum possible condenser outlet temperature is 68 °C.

” THE ANNUAL EFFICIENCY OF THE BIOMASS BOILER INCLUDING DIRECT FLUE GAS CONDENSATION AND FLUE GAS CONDENSATION DUE TO THE HEAT PUMP IS ABOUT 107 % ”

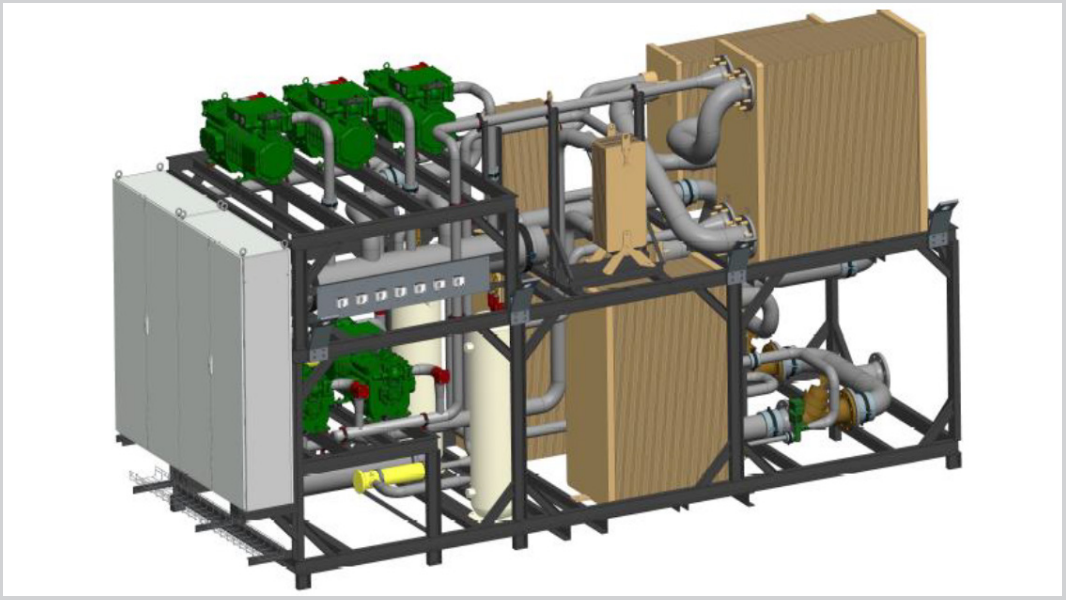

Fig 2: 3D-model of the heat pump integrated in the district heating network Flachau [Frigopol, 2017].

Results

- The annual efficiency of the biomass boiler with direct flue gas condensation and flue gas condensation due to the heat pump is about 107 %
- In the year 2016 the heat recovery due to direct flue gas condensation was about 3.7 GWh and the heat recovery due to flue gas condensation with the heat pump was about 3.9 GWh.
- Due to the heat pump the effort for devaporization of the flue gas is decreased by about 60 % (or about 50 kW).
- The heat pump enables a change of 1.2 MW heating capacity within about 5 minutes.

References

Kronberger, 2015

Kronberger, B., 2015, Wärmepumpeneinbindung und Gesamtanlagenoptimierung am Beispiel des FHKW Tamsweg, Voigt+Wipp Engineers GmbH, Toblach.

Frigopol, 2017

http://www.frigopol.com/wp-content/uploads/MA-026-01-W_W-Waermepumpe.pdf, 18.12.2017

File compiled by Arnitz, A., Rieberer, R., Institute of Thermal Engineering, Graz University of Technology, 18.12.2017

FACTS ABOUT THIS PROJECT

Building type: Residential, commercial and mainly tourism buildings

Installed heat capacity [kW]: 19 600 (1 200 heat pump)

District heating network: 390 connected customers

Heat source: Flue gas condensation

Investment cost: -

Participating countries: Austria

Time frame: In operation since 2014

Project organisation: Holzwärme Flachau

Link to web page or report: https://www.klimaaktiv.at/erneuerbare/effiziente_heizwerke/broschuere.html (in German)

Contact information

Franz Kaml, Holzwärme Flachau
☎ +43 6457 33906
franz.kaml@hwf.co.at