DISTRICT HEATING NETWORK KRUMPENDORF - AUSTRIA
Fernwärmenetz Krumpendorf

Fig 1: Solar thermal system at the biomass heating plant Krumpendorf [Regionalwärme, 2017].

Summary of the project

The operator of the district heating network in Krumpendorf is member of the Regionalwärme Gruppe which operates 18 biomass heating plants and provides heat for about 8 600 private households. The district heating network in Krumpendorf has a pipe length of about 9.8 km with about 243 connections (mainly private households). The district heating network is designed for a flow temperature of about 90 °C and a return temperature of about 48 °C.

As heat generator a biomass heating plant, consisting of two boilers with a heating capacity of 1.5 MW and 0.5 MW, is used. Furthermore a solar thermal system with an overall collector area of 191 m^2 is installed. A compression heat pump with a heating capacity of 245 kW is installed which uses heat from the solar thermal system and from flue gas condensation as heat source. For peak load an oil boiler with 2 MW is used. Within one year about 12 000 MWh heat are produced.

Within this system thermal storages at two different temperature levels are used. A low-temperature thermal storage (t~20 °C) with a volume of 10 m^3 is loaded with the flue gas condensation heat and/or the heat from the solar thermal system. The low-temperature thermal storage is used as heat source for the heat pump. Furthermore, a stratified storage with a volume of 60 m^3 is used for the heat from the solar thermal system.

” THE COMBINATION OF BIOMASS HEATING PLANTS AND SOLAR THERMAL SYSTEMS WITH HEAT PUMPS INCREASES THE OVERALL EFFICIENCY OF THE HEAT PRODUCTION ”

There are three operating modes possible. In summer the heat supplied by the solar thermal system with a higher temperature than the flow temperature of the district heating network can be directly used to heat the flow of the district heating network. In this case the biomass boiler is off and no flue gas condensation is used. Furthermore, the heat pump can be used for further cooling of the return flow to the solar thermal system which is

taken from the bottom of the stratified thermal storage and transported to the smaller low temperature storage. This increases the solar yield of the solar thermal system. In this operating mode the heat pump supplies heat directly into the return flow of the district heating network.

In the second operating mode the biomass heating plant is operating to supplies heat at the required flow temperature, as the temperature of the heat provided by the solar thermal system is lower than the flow temperature of the district heating network. In this case the heat pump and the solar thermal system are used to heat the return flow of the district heating network.

The third operating mode of the system is used in times with high heating demand. In this case the biomass heating plant is operating and thus heat utilized by flue gas condensation is supplied to the low-temperature storage. Furthermore, some heat is supplied to the low-temperature storage from the solar thermal system at a higher temperature than from flue gas condensation. Then the heat pump uses the low-temperature storage as heat source (i.e. heat from solar & flue gas condensation) to heat up the return flow.

The heat pump (Type IWWS 270 R2) was manufactured by the company Ochsner with a heating capacity of about 245 kW and a COP_H of about 4.8 at a heat source temperature of 23 °C and a heat sink temperature of 65 °C. The heat is used to raise the return flow of the district heating network. The heat pump uses R134a as refrigerant and a screw compressor.

Results

- The design of the thermal storage has to consider the collector area of the solar thermal system and additional storage volume for the biomass heating plant.
- The heat production costs of the solar thermal system vary with the return temperature.
- The size of the solar thermal system should be able to cover the heating demand in the summer months.

References

Aste, 2015

Aste, C., 2015, Solaranlage BC Regionalwärme Krumpendorf, Publizierbarer Endbericht, aste energy.

Regionalwärme, 2017

http://www.regionalwaerme.com/fernheizwerke/krumpendorf, 18.12.2017

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FACTS ABOUT THIS PROJECT

Building type: Residential and commercial buildings

Installed heat capacity [kW]: 4 245 (245 heat pump)

District heating network: 243 connected customers

Heat source: Flue gas condensation and solar thermal energy

Investment cost: 108 599 EUR (biomass boiler, flue gas condensation, heat pump, thermal storage, oil boiler)

Participating countries: Austria

Time frame: In operation since 2015

Project organisation: BC Regionalwärme Krumpendorf GmbH

Link to web page or report: https://www.klimafonds.gv.at/assets/Uploads/Projektberichte/2014/Solare-Groanlagen/20150827Solare-Groanlagen2014EBSolarthermiehwKrumpendorfB463952.pdf (in German)

Contact information

Johann Hafner, Regionalwärme Gruppe
☎ +43 4220 26271
office@regionalwaerme.at