Heat pumps using waste water in Gothenburg, Sweden

This case study is part of a project catalogue produced by ReUseHeat to provide inspiration on how to utilize excess heat from urban sources for heating and cooling purposes. The catalogue contains 25 existing or planned projects out of which 12 cases are Danish and 13 cases are from other European countries[2].

Facts about this case

Installed heat capacity: 160 MW divided upon four heat pumps (2 x 30 MW and 2 x 50 MW).
Heat source: Waste water (12 °C)
Heat pump COP: 3.0
Temperatures: Waste water is cooled from 12 to 3 °C. District heating water is heated from 45 to 75-85 °C

Operation hours: 11,496 in 2013, divided upon the four heat pumps
Period: Established in 1985
Link to web page:
https://www.goteborgenergi.se

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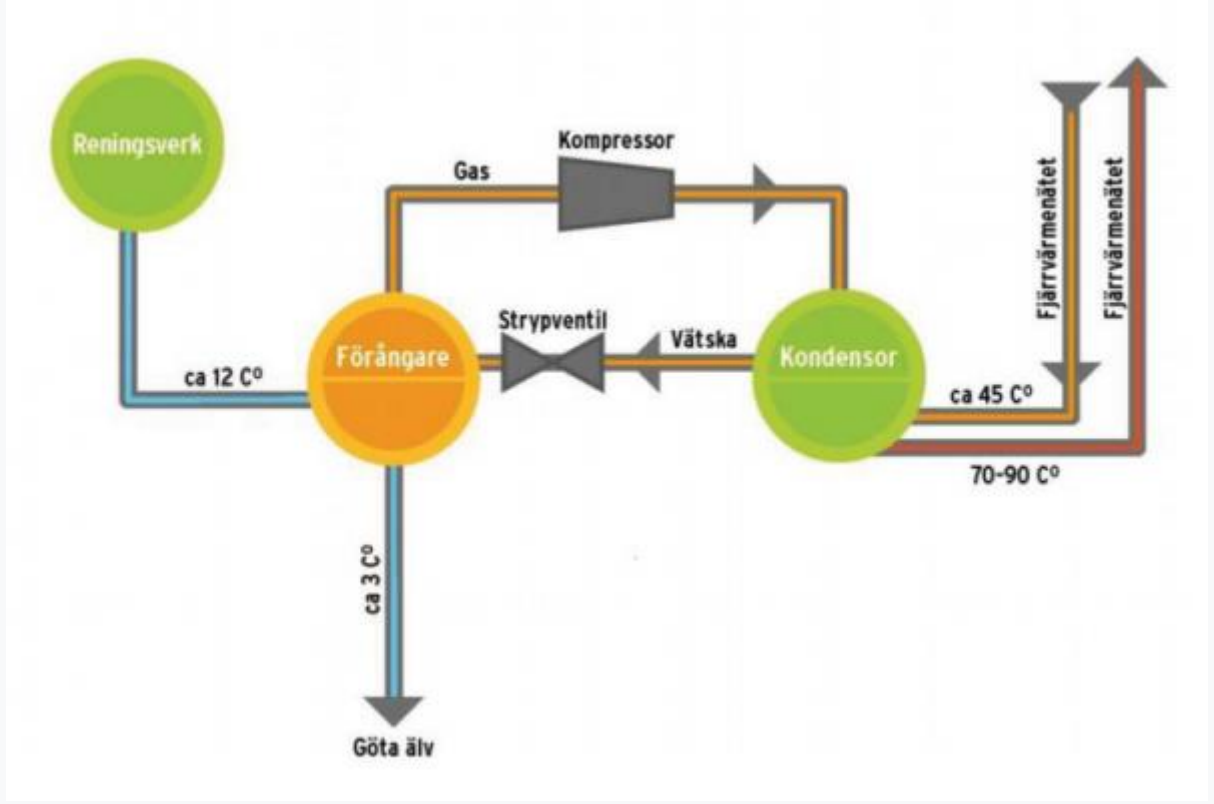

Source: Göteborg Energi [1]

Description

Four heat pumps at Rya Värmepumpverk in Gothenburg, Sweden, extract heat from a waste water treatment plant. The excess heat is delivered to the local district heating network.

A great amount of the heating produced in the district heating system of Gothenburg is from excess heat. However, during winter, it is necessary to operate other production facilities such as

biomass and natural gas boilers and CHP units. To contribute with environmentally friendly heating, the city of Gothenburg established Rya Värmepumpverk, a local heat pump facility with four heat pump units. The heat pump plant was established in 1985 with multiple heat pump units. The units extract heat from the local waste water treatment plant. The total heating capacity for the heat pumps is 160MW, divided upon two 30MW heat pumps and twob50MW heat pumps. All heat pumps are compressor driven and supplied with electricity from the Swedish grid.

As the heat pumps are greatly flexible, they operate as peak-loads. The heat pumps accordingly act as support for the baseload in Gothenburg consisting of waste incineration and waste heat recovery from a local refinery. The waste water has temperatures of approximately 12 degrees Celsius, which is cooled to approximately 3 degrees Celsius through the heat pump. The heating delivered to the district heating network is between 75 and 85 degrees Celsius, depending on season and district heating water is returned at 45 degrees Celsius.

All four heat pumps contain approximately 100 ton of the refrigerant R134a. The greatest environmental effects from the heat pumps are accordingly potential leakages of this, as 1 ton of R134a corresponds to 1430 CO_2 equivalents. However, such leakages are uncommon. In 2013, the four heat pumps had 11,496 operation hours, producing a total of 443.0GWh of heating. All heat pumps operate with a COP just above 3.0.[2]

References

1. Göteborg Energi
2. Handbook - 25 cases of urban waste heat recovery