

Industrial waste water used for district heating in Rødgersbro, Denmark

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: 1600 kW
Heat source: Low temperature industrial waste water (22-25 °C)
Heat pump COP: 4.6
Production: 6500 MWh per year
Investment cost: € 1.8 M (grants of € 320,000)
Payback period: 7 years

Period: Finished in March 2017
District heating network: 600 consumers
Link to web page: <http://www.xn-rdkrsbro-fjernvarme-nxb98a.dk/>
Contact information:
Vagn Rasmussen, Rødgersbro Fjernvarme, rf@rkfv.dk



Source: PlanEnergi ^[1]

Description

In 2016, the district heating company Rødgersbro Fjernvarmeværk established two sets of transmission pipelines, connecting the nearby Arla dairy with the district heating network. The transmission system enables heat transfer from a newly installed biogas engine at Arla and transmission of hot waste water to a heat pump at the district heating plant. Through the transmission pipelines, Rødgersbro Fjernvarmeværk receive excess heat from industrial processes at the dairy. The main purpose of utilizing excess heating from the local industry was to replace the former natural gas-based production units. By doing so, both economically and environmentally benefits are obtained, due to lowered heating costs and reduced fossil fuel consumption and hereby reduced carbon emissions. The waste water from the dairy processes is

low-temperature and was previously discharged into a nearby stream, but holds a large energy potential with temperatures between 22 and 25 degrees Celsius. A 1.6MW heat pump utilize the hot waste water and cools the water to approximately 5 degrees Celsius, before it is discharged into the stream. This further derive positive environmental benefits.

Rødkærsbro Fjernvarmeværk have approximately 600 consumers and an annual heat production of 15,000MWh. Of this, approximately 6500MWh is delivered as baseload from the biogas engine, due to it being the cheapest heating production unit in the system. Another 6500MWh is delivered from the waste water heat pump, while the remaining 2000MWh primarily is bought from a small biogas plant. The heat pump is constructed as two serially connected heat pump units. District heating water is heated from 38 to 52 degrees Celsius in the first heat pump and further increased to 70 degrees Celsius in the second heat pump. At the dairy, a heat exchanger cools the industrial waste water though an intermediate circuit, before the waste water is transferred 1800m to Rødkærsbro Fjernvarmeværk. The temperatures delivered to the heat pump is approximately 20 degrees Celsius and returns to the heat exchanger at Arla at approximately 3 degrees Celsius. Waste water temperatures are constant throughout the year, enabling an annual COP of 4.6.

Heat pump operation begun in March 2017 and the unit have been running without major challenges since. The waste water utilization displaces great amounts of natural gas based heat production and reduce the CO₂-emissions with approximately 1000 tonCO₂ annually. The heat pump can produce between 40 and 45% of the total heating demand in Rødkærsbro. The total investment was e 1.8M of which the project received a grant from the Danish Energy Agency of e 320,000. The simple payback period is expected to be 7 years.^[2]

References

1. [PlanEnergi](#)
2. Handbook - 25 cases of urban waste heat recovery