

## HEAT PUMP IN SIG USING AMBIENT AIR - DENMARK

## Varmepumpe i Sig anvender udeluft

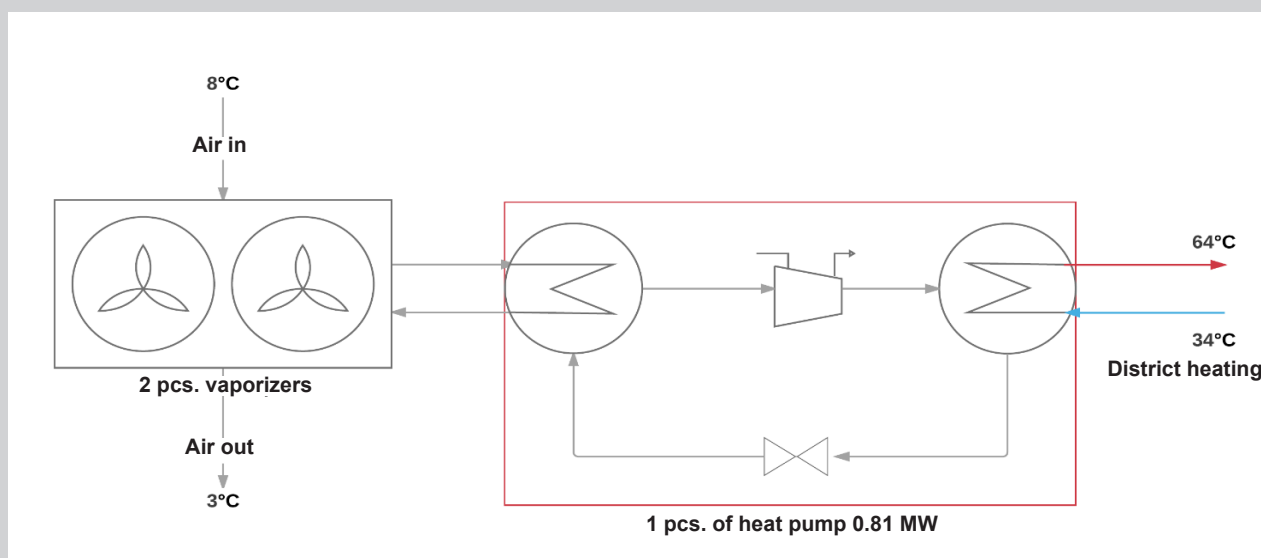


Fig 1: Principal sketch of the electric-powered air/water heat pump solution in Sig.

### Summary of the project

In October 2017, an electric-powered air/water heat pump was established by the local district heating company, Sig Varmeværk. The district heating company was previously based on sole natural gas-powered production units. In 2013, 3 500 m<sup>2</sup> of solar heating was installed, which reduced high heat prices. To reduce prices further, SigVarmeværk invested in a heat pump which utilize energy from ambient air to produce district heating. This was partly enabled due to investment grants by the Danish Energy Agency.

There are approximately 300 consumers in Sig and the annual heat production is approximately 6 500 MWh, which so far have been produced by natural gas units and solar heating. When the heat pump is fully operational, it is expected to deliver 46 % of the total heat production, hereby displacing natural gas. The CO<sub>2</sub> emissions are accordingly reduced with approximately 60 %, corresponding to 700 tons of CO<sub>2</sub>. The heat pump cools ambient air and heats return water from the district heating network.

**” TO REDUCE PRICES FURTHER, SIG VARMEVÆRK INVESTED IN A HEAT PUMP WHICH UTILIZE ENERGY FROM AMBIENT AIR TO PRODUCE DISTRICT HEATING ”**

The annual COP is expected to be 3.48 and through the first three weeks of operation, the COP have been 3.8.

In addition to the project, the district heating company have managed to lower the flow temperature in the distribution network. Hereby the COP of the heat pump can be increased significantly. In periods, the district heating flow temperature have been reduced to 60 °C.

The heat pump is located next to the solar heating panels, which enable sharing of the transmission pipeline to the natural gas based production units. Through



winter, the heat pump temperatures can be lowered further, due to production on the gas units, hereby increasing its efficiency.

## Results

- Total investment costs are 5.6 million DKK.
- The annual COP is approximately 3.5. Through the first three weeks operation, the COP have been 3.8.
- Operations costs are expected to be reduced with 162 DKK/MWh-heat compared with the natural gas boiler.
- The heat pump results in both energy and CO<sub>2</sub> savings as natural gas is displaced.
- Ambient air is cooled from outdoor temperatures to below 3 °C.
- The heat pump is expected to have 3 700 hours of operation annually.

## FACTS ABOUT THIS PROJECT

**Building type:** -

**Heated floor area [m<sup>2</sup>]:** -

**Installed heat capacity [kW]:** 810 kW

**District heating network:** 305 consumers

**Heat source:** Ambient air

**Investment cost:** 5.6 million DKK

**Participating countries:** Denmark

**Time frame:** Finished in October 2017

**Link to web page or report:**

<http://www.sig.dk/content/sig-varmev%C3%A6rk>  
(in Danish)

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**IEA Technology Collaboration Programme on  
Heat Pumping Technologies (HPT TCP)**