District heating from crematory in Aalborg, 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

Heat source: Aalborg Crematory, flue gas (800 °C)
Capacity: 2 x 550 kW ovens
Production: 530,000 kWh per year
Temperatures: Supplied flow have a temperature between 75 and 85 °C.
Operation: 8 hours per day for 5 days a week

Investment cost: The extra costs for the district heating company is approximately € 40,000, due to new transmission lines
Annual socio-economic benefit: € 20,000
Period: Finished in 2010

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Source: Danske Krematoriers Landsforening[1]

Description

In connection to installation of a new filtration system at the municipally owned crematory in Aalborg, it was agreed, that a system utilizing energy from combustion should be installed. Hereby, the local district heating company, Aalborg Fjernvarmeforsyning, can receive excess heat from the crematory.

The project has been enabled due to extra regulation on flue gas cleansing from crematory ovens. The regulation demands a filtration system to remove mercury. To do so, the flue gasses must be cooled. Instead of emitting heat to the surrounding ambient air, it is possible to use the excess heat in the district heating network. Hereby excess heat is extracted, benefiting the district heating consumers. The heat from the crematory can annually heat approximately 20 to 25 regular Danish households in the order of 120 and 140m2.

To enhance the lifetime of the filtration system, the flue gasses are cooled from approximately 800 degrees Celsius to approximately 120-140 degrees Celsius. This cooling process contain potential excess energy. In Aalborg, the crematory is expected to produce approximately

585,000 kWh per year based on 2340 cremations annually. The average amount of energy produced for each cremation is approximately 250 kWh. About 55,000 kWh of the energy produced from flue gas cooling is used internally, while the remaining is delivered to the district heating network. To reach high operation temperatures often above 800 degrees Celsius, additional energy is added to the crematory ovens.

Cremation is a well-established funeral excerpt in Denmark and more frequent than casket funerals. The issue of using heat from cremation in district heating has created moral discussions in Denmark and other European countries. The Danish Council of Ethics have processed district heating from crematoriums and concluded, that there are no acts of indecency when utilizing crematory heat, if it is used for district heating. The members of the council have on the contrary found great environmental benefits from utilization of crematory heat opposed to disposing it to the surroundings. As the main purpose of crematoriums is not to produce heat, the excess heat can be seen as a by-product from the cremation. Most of the heat further comes from the energy used to reach operation temperatures in the crematory ovens. Using the excess heat with direct heat exchanger to the district heating network, expensive and energy demanding cooling towers are avoided. Potential gains from sales of heat to district heating companies must however, according to the Danish Council of Ethics, be used internally to lower process operation costs. Hereby exploitation of crematory excess heat is does not have a commercial purpose.

Throughout Denmark, multiple crematoriums have begun to utilize the excess heat to produce district heating. The crematoriums are often located in urban areas and close to existing district heating networks. Among other Danish cities, that use excess heat from crematoriums are Ringsted, Holstebro, Randers, Hillerød, Svendborg, Hjørring and Glostrup. The potential is present in other European countries as well. A single crematorium is not capable of supplying district heating on its own, however they can assist both Danish and European cities in their district heating production[2].

References

1. Danske Krematoriers Landsforening (http://www.dkl.dk/)
2. Handbook - 25 cases of urban waste heat recovery