

HEAT PUMPS IN COMBINATION WITH DISTRICT HEATING AT VOLVO CARS



Summary of the project

Volvo Cars in Gothenburg, Sweden, are using heat pumps to recover heat from the cooling water of different processes. The heat pumps are used in combination with district heating for space heating and production of DHW. The heat pumps recycle heat from the buildings cooling water, mainly from the test rigs. The heat pumps work in steps and have a maximal heating capacity of 2.5 MW, the refrigerant used is R134a.

Today the heat pumps are used in combination with district heating and the operation is partly based on the prices on electricity and district heating. During wintertime when the heating system requires high supply temperatures the heat pump capacity is not enough, and a district heating boost is required to reach a sufficiently high supply temperature. Since cooling water of about 25°C can be used as a heat source, the heat pump's COP is relatively high over the year and a Seasonal Performance Factor (SPF) of 5,2 has been calculated.

”HIGH ENERGY EFFICIENCY BY USING BOTH HEAT PUMPS AND DISTRICT HEATING TO RECOVER RESIDUAL HEAT LOCALLY AND REGIONALLY”

The heat pumps are located in a building mainly used for research and development activities and thereby includes offices as well as test rigs. The total area for the building is 117 200 m². The two heat pumps installed has been running since 2011 and delivers around 10 GWh heat per year, the use of district heating is about 13 GWh/year.

Current connection of the heat pumps and district heating substation is made with heating in series. The return flow of the secondary heating system is first heated by the heat pump then by district heating. The heat pumps supply the return flow with



heat between 45-65°, depending on the outside temperature and specific requirements from the process used in the building. The heat pump constitutes a base load during the heating season, and the district heating covers the peak load. During the summer time when the heating demand is lower the heat pumps are shut off and all heating is produced by district heating, this is mainly due to seasonal variations in the district heating price giving low prices on district heating during the summer. In the same time Volvo Cars evaluates the environmental burden from the district heating to be low during summer when the mix mainly consist of industrial excess heat and waste incineration.

The heat pump's heat source consists of the cooling water system, which eliminates excess heat from process and other operations with cooling needs. Process cooling is the dominant cooling demand as there is a need for 7-degree water all year round. The process cooling is obtained by 50 refrigerators and the cooling water is chilled via a cooling tower that holds around 25°. The heat pumps are connected on the inlet to two of the cooling machines to ensure sufficient flow.

Results

- Increased energy efficiency by recovering heat from cooling process.
- Cost-effective energy solution utilizing both heat pumps and district heating.



FACTS ABOUT THIS PROJECT

Building type: R&D

Heated floor area [m²]: 117 200

Installed heat capacity [kW]: 2 500

Heat source: Cooling water, mainly from test rigs

Installation year: 2011

Location: Gothenburg, Sweden

Company: Volvo Cars

Link to web page or report:

<http://effsysexpand.se/p23-varmepumpar-i-fjarrvarmesystem/>

(in Swedish)

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