

## OPERATIONAL EXPERIENCE FROM A SUPER INSULATED MULTI-FAMILY HOUSE, KV. SEGLET, KARLSTAD



### Summary of the project

Kv. Seglet (built 2007) is an energy efficient 44-apartment building in Karlstad, Sweden, which was the first Swedish high-rise building to be constructed with a passive heating system. The production of the building had high ambitions regarding quality and resource efficiency. The building does not have a conventional heating system, but is equipped with under floor heating to provide additional heat when needed.

Kv. Seglet uses less than a fourth of the energy per m<sup>2</sup> for heating and DHW than the Swedish energy standards for new buildings from 2006 require (130 kWh/m<sup>2</sup>), which reduces operational costs. An individual electricity billing system is used, which acts as an incentive for tenants to save energy. Karlstads bostad's experience has shown that individual billing reduces the consumption of heating on average by 20%.

Kv. Seglet uses the return flow from district heating for under floor heating and the production of domestic hot water (DHW), the return flow would otherwise be returned directly to the district heat plant. The re-

**"KVARTERET SEGLET USES THE RETURN FLOW FROM DISTRICT HEATING IN COMBINATION WITH A HEAT PUMP FOR UNDER FLOOR HEATING AND PRODUCTION OF DOMESTIC HOT WATER"**

turn flow, at approximately 35°C, provides 75% of the energy needed to produce hot water for the building. The remaining energy for hot water is produced by an electric heat pump.

The production of domestic hot water is done in two steps. First with direct heat exchange with the district heating return flow, second the temperature of the DHW is increased by a heat pump using the return flow from district heating as heat source.



From an environmental point of view it is a benefit to use the return flow of district heating as much as possible for heating and DHW production, but for the house owner the district heating option has to also be economically favorable in order to be of interest. In this case the system solution used at Seglet, is interesting. Since both the distribution losses and the production costs are relatively low the district heating supplier has the possibility to offer the low temperature district heating to a lower price.

The system solution at Seglet shows the possibility to combine district heating and heat pumps. The combination might make it possible from an economic point of view to distribute district heating also to residential areas with low heating density or to increase the power output from the district heating net in existing district heating areas.

In total the solution at Seglet gives the possibility to get 88% of the buildings heating demand from low temperature district heating to a cost of 12% electricity. Compared to a traditional heat pump solution, where approximately 30% of the heating demand is covered by electricity, the system solution at Seglet is of big interest.

## Results

- The combination low temperature district heating and a heat pump to increase the temperature favors the energy efficiency of the heating system.
- In total the solution at Kv. Seglet gives the possibility to get 88% of the buildings heating demand from low temperature district heating to a cost of 12% electricity. This should be compared to a traditional heat pump solution, where approximately 30% of the heating demand is covered by electricity.
- The temperature of the district heating return flow varies much more than expected. The temperature varies during spring, summer and autumn from approximately 20°C to 40°C. During the winter the temperature is more stable and rarely below 35°C.
- If the difference in energy price for normal and low temperature district heating is large enough and the electricity price is not too high the system solution might also be economically advantageous.
- If the district heating price is set to 0.6 SEK/kWh and the electricity price is set to 1.0 SEK/kWh the system solution is economically advantageous if the price for the low temperature district heating is set to 0.45 SEK/kWh or lower.

## FACTS ABOUT THIS PROJECT

**Building type:** Super insulated multi-family house

**Heated floor area [m<sup>2</sup>]:** 3074 m<sup>2</sup>

**Heat source:** District heating return flow in combination with heat pump using the return flow as heat source.

**Built:** 2007

**Location:** Karlstad, Sweden

**Owner:** Karlstad Bostads AB

**Link to web page or reports:**

<http://kau.diva-portal.org/smash/record.jsf?pid=diva2%3A300066&dswid=-7547>

*(in Swedish)*

[http://www.lth.se/fileadmin/byggnadsekonomi/research/report/Energi\\_Resursanvaendning\\_Laagenergihus\\_Thormark.pdf](http://www.lth.se/fileadmin/byggnadsekonomi/research/report/Energi_Resursanvaendning_Laagenergihus_Thormark.pdf)

*(In Swedish)*

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