ENGINEERING TOMORROW

Case study

Pressure independent control valves work miracles in Swedish housing estate

Installation of AVQMs lower the energy bill by 25 % and pay back substation upgrade in less than a year

Winters are long, dark and freezing in Gothenburg in Sweden. A nice, warm living room and plenty of hot water in the shower are therefore essentials to get through the cold season. Unfortunately, the people living in the apartments of the Göteborgshus housing estate had neither. The supply of heating and hot water was unstable, and complaints piled up in the office of the facility manager. Moreover, the district heating return temperature was much too high, which resulted in substantial penalty fees and high energy bills from the local district heating company.

First step: Installation of Energy Management System

Energy control experts from Dunderon were called in to help solve the problem. After close inspection of the existing heating and hot water installation, they introduced the Dunderon Energy Management System and **mounted electronic controllers on the decentralized substations** for room heating and the central substation for domestic hot water.

After that, things started to improve in the apartments. The room temperatures were comfortable, and the supply of hot water was more stable now. However, the district heating utility was far from satisfied. **The flow on the primary district heating side was even higher now, and they saw no improvement on the return temperature.** The energy bill was rising, and the housing association and residents had to pay dearly to keep warm.

Obviously, something was wrong on the secondary side, and Dunderon asked Danfoss to help provide a solution that would solve the problem once and for all.

Second step: PICVs and new heat exchangers solve the problem

In close collaboration, the partners decided to **replace the existing heat exchangers of the substations** with new micro-channel heat exchangers from Danfoss. Furthermore, the existing two-way control valves were replaced by AVQM pressure independent control valves for district energy systems.

The new system design allowed some fundamental changes to the basic operating parameters in the secondary loop. The pump flow level could be lowered from 40 % to 20 %, and the supply temperature was reduced by ten degrees to only 60°C.

The result fulfilled everybody's expectations. Residents now enjoyed a comfortable indoor environment and hot water at all times, while the housing association could cut the energy costs by as much as 25 %. They even received a bonus from the district energy company in return for low flows and low return temperature.

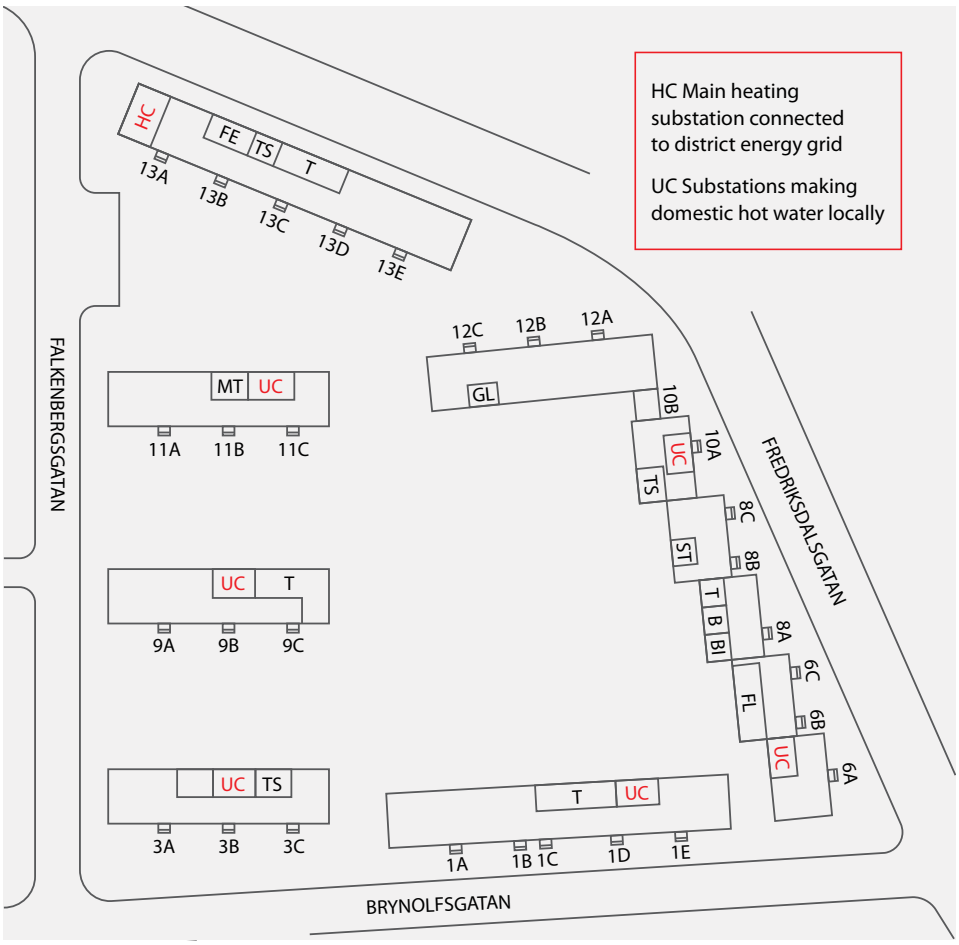


FIGURE 1: Layout of the Göteborgshus housing estate, consisting of several building blocks with a total of 200 apartments. The building blocks are served by on main substation and six decentralized substations.

"We are really pleased with the solution and so is our customer Göteborgshus. The AVQM valves cope seamlessly with the variable flow in the secondary loop, and the result is appreciated by everybody, who benefit from comfortable temperatures and low energy bills"

says Robert Kviberg from Dunderon.

Fortunately, we were able to find a solution where the customers did not have to compromise between comfort and cost. Coupling our pressure independent valves with energy management from Dunderon paves the way for innovative energy solutions, and we sincerely hope that this is only the first step in a close partnership with Dunderon

says Anders Gustavsson from Danfoss in Sweden.

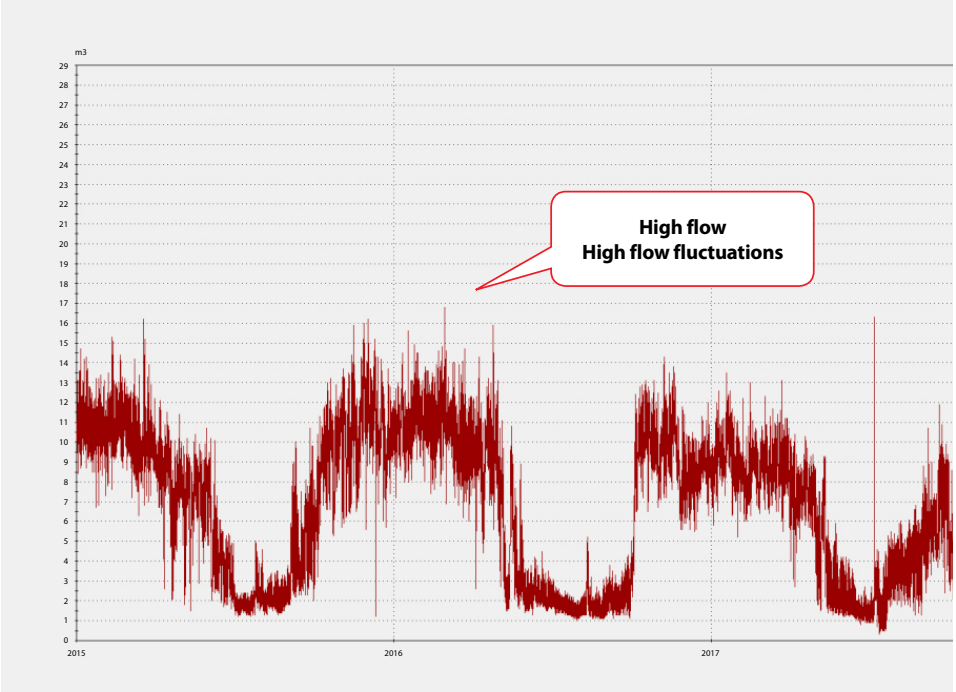


FIGURE 2: Flow through main substation before any changes were made.

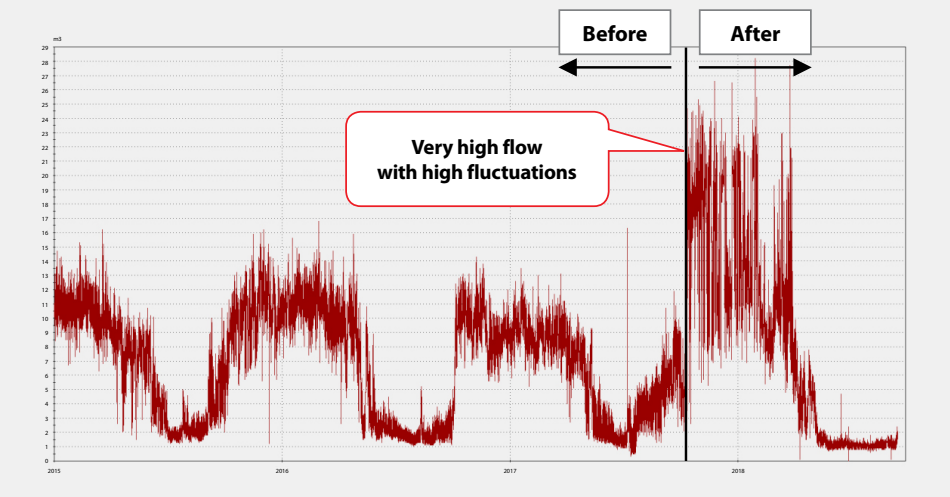


FIGURE 3: Flow through main substation after installation of Dunderon Energy Management System and electronic controllers.

Fact box: How AVQMs solve the problem

The pressure independent control valves:

- Prevent oscillation over control valves
- Increase precision of temperature control
- Enable reduction of supply temperature – no overflow
- Lower return temperature to district heating system

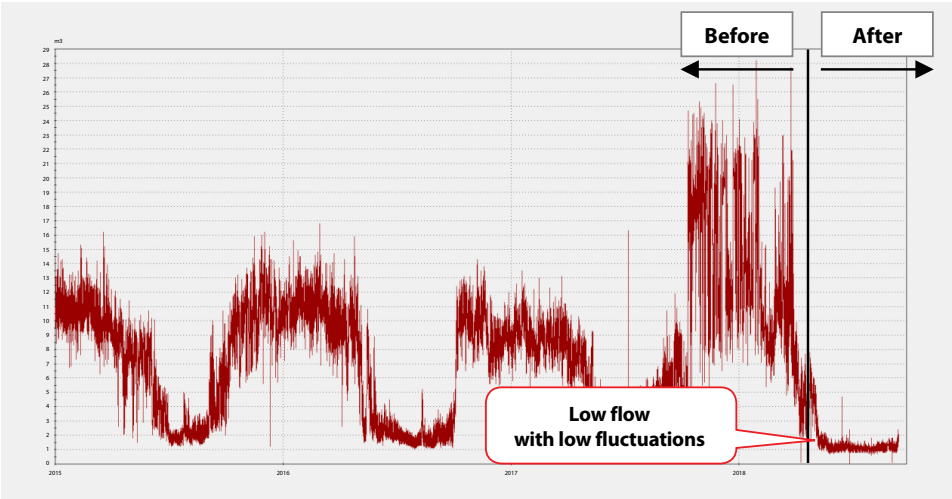


FIGURE 4: Flow through main substation after installation of Danfoss AVQM pressure independent control valves with AME actuators.

FIGURE 5: Before AVQM: Sudden drops in the temperature of the domestic hot water.

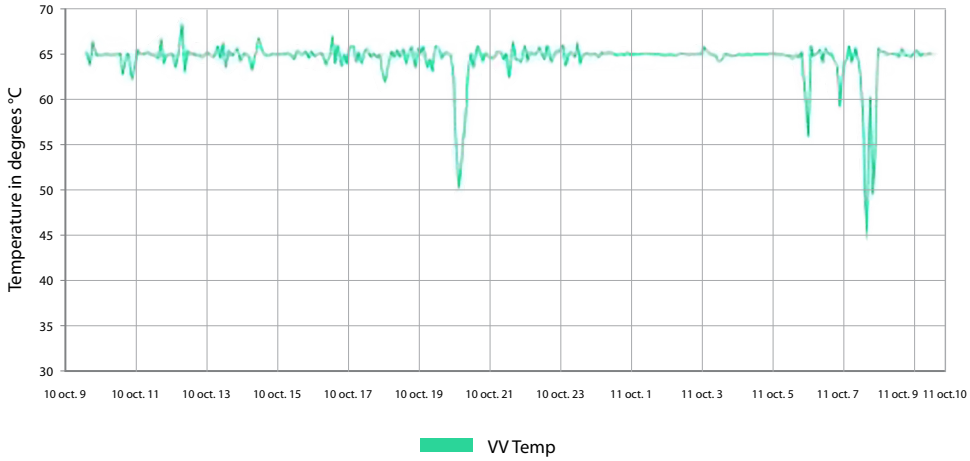
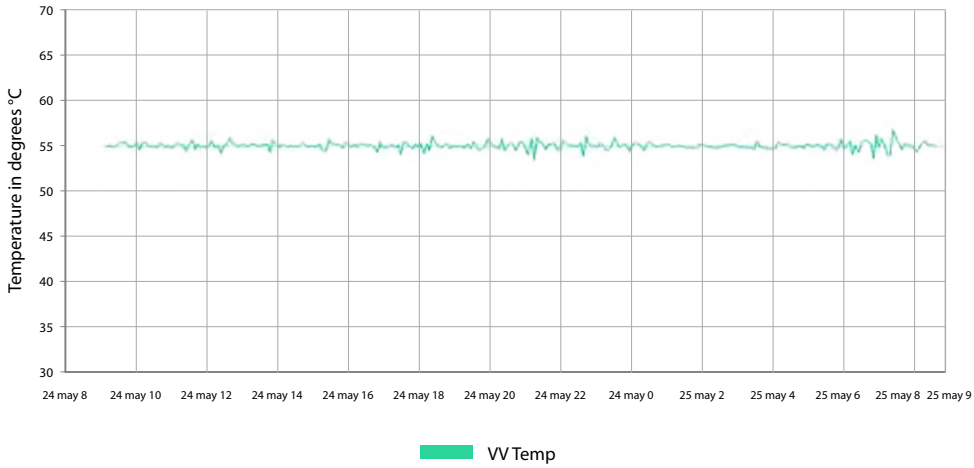


Figure 6: After AVQM: Constant temperature of domestic hot water.



	Before	After
Indoor temperature	Ueven/Low – difficulties to reach right temperature in apartments	Excellent / exactly on set point
Domestic hot water temperature	Ueven/Low	Excellent / exactly on set point
Flow on primary DH side	High (penality fees)	Low (bonus for low flow)
DH returen temperature	High (penality fees)	Low (bonus for low return temperature)
Energy consumption	High	20-30% lower than before
Apartment owners satisfaction	**Unsatisfied / low comfort**	**Very satisfied with good comfort**

Benefits of substation upgrade with pressure independent control valves and new heat exchangers

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