

ENGINEERING
TOMORROW

Danfoss

Case story | Wachsbleiche

Refurbishment of an apartment building from 1930

Until 2014, the apartments in this multi-family building located in the Hamburg suburb of Bergedorf were heated using electrical water heaters and supplied with domestic hot water using electrical instantaneous water heaters. Now, after the renovation, a block heating station in the basement of the building provides heating distributed via flat stations installed in the stairwell and used for decentralized domestic hot water. Tenants were able to stay in their apartments throughout the renovation process.

CHP in the basement, flat stations in stairwell, domestic hot water heating in each apartment

Decentralized supply pays off:

When renovating existing building stock, the focus is often on upfront investment costs, even though these only make up for a small part of the total life-cycle costs. It is true that the upfront investment in a conventional centrally located boiler system is around 15% lower than a system installed in combination with flat stations, yet lower heat losses and lower heating costs make for a rapid return on investment. In addition, a heating system using flat stations only requires three supply lines (heating supply, return and cold water) instead of the usual five. Because the drinking water is heated decentrally in each apartment, separate pipes for hot water supply and circulation can be eliminated.



The renovated apartment building in Hamburg-Bergedorf has four storeys and 16 apartments.

Renovation highly needed:

Three quarters of all apartment buildings in Germany were built before 1979, i.e. before the first Heat Insulation Ordinance came into force. This unrenovated stock of older housing is responsible for 95 percent of energy consumption in buildings, Fraunhofer researchers estimate. It is possible to renovate this old building stock and bring it up to the state-of-the-art, as this example shows.

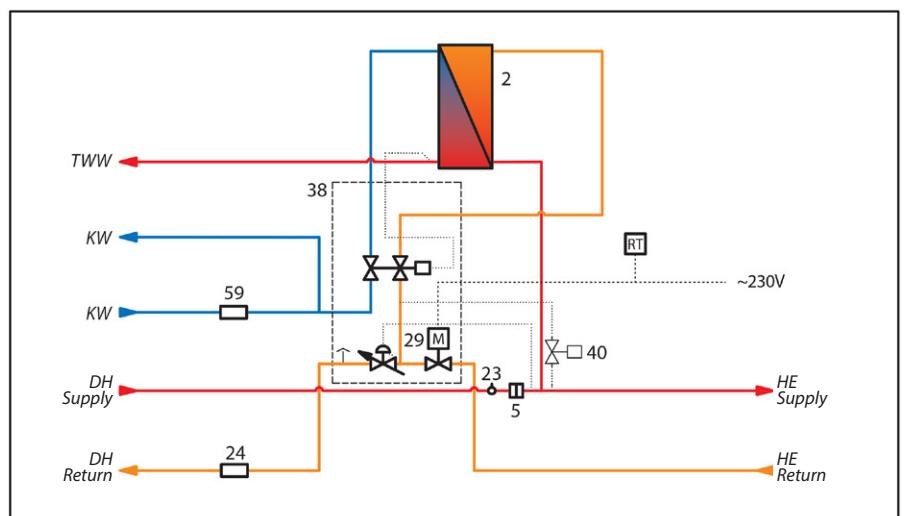
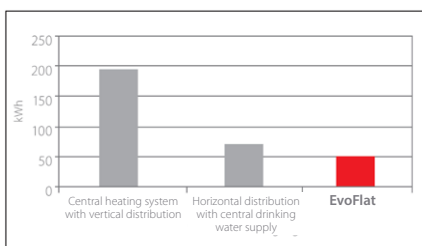
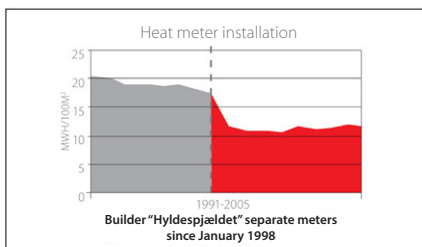
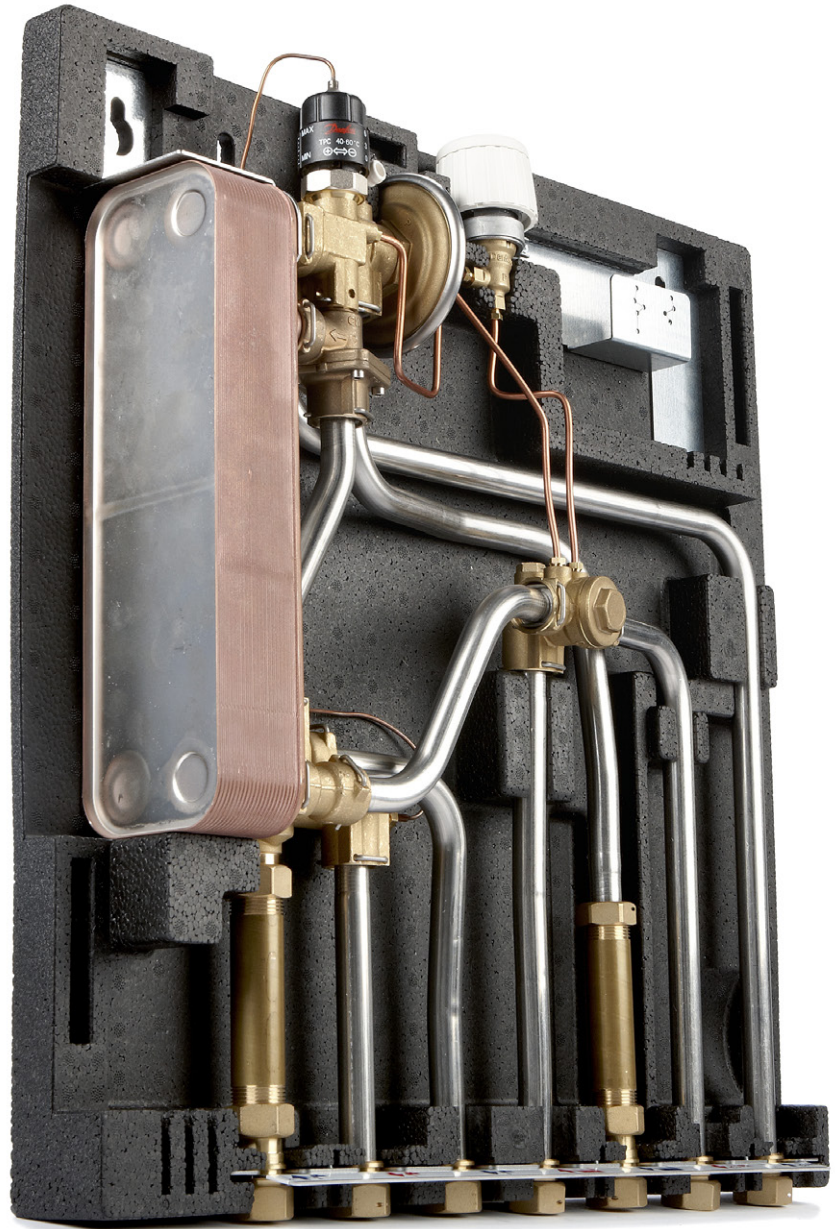
inconvenience for the tenants. Only when laying the horizontal connections from the stairwell to the radiators and taps in the kitchens and bathrooms the tenants' presence was required. If the tenant could not be reached at home during the final phase of the project, the installation team was able to move on to another apartment instead.

Renovation while residents remain in their apartments:

Whereas all the tenants whose apartments are located in the same vertical segment of the building need to be present at the same time when renovating systems relying on centralized heat distribution via vertical pipes for heating and domestic hot water, the process involved in the decentralized flat station solution is considerably simpler. In this project, there was enough space in the stairwell to install risers and flat stations without

Flat stations:

EvoFlat flat stations are available for surface or recess mounting as a standard feature, with fittings for optional energy meters and water meters. This makes it possible to verify, record and bill for consumption at any time. An integrated fresh water system with a MicroPlate heat exchanger ensures hygienically safe decentralized domestic hot water heating. The TPC-M controller is a key component. In a single component, it combines the functions of a differential pressure and flow controller, zone valve, thermostat and de-aerator. This way, it provides instantaneous DHW heating with a high degree of temperature stability, low return temperatures and reliable, energy-efficient operation, even with primary-side pressure and temperature fluctuations. Thanks to the internal ClickFit pipe connections, the EvoFlat flat stations do not require the usual time consuming tightening of threaded joints.



The hydraulic diagram of an EvoFlat FSS Type 3: RT room thermostat;

- 2 Plate heat exchanger
- 5 Strainer (mesh size 0.6 mm)
- 23 Sensor pocket
- 24 Fitting piece for heat meter
- 29 Actuator; optional
- 38 Multi-functional controller TPC-M
- 40 Summer bypass
- 59 Fitting piece for cold water meter.

The new heating concept:



The flat stations are easy to install outside the apartments while residents remain in their homes, as the apartments' kitchens and bathrooms are conveniently located relative to the stairwell.

In stead of the outdated electric radiators and water heaters the apartments are now furnished with a modern and efficient system for heating and domestic hot water. The heating system (Dachs CHP) is located in the basement of the building. The hot water supply and return of the 16 apartments are distributed through the stairwell and the installed flat stations. Because the bathrooms and kitchens are conveniently situated relative to the stairwell, it was possible to continue using the existing drinking water pipes. The cold water supply to the existing instantaneous water heaters was redirected a short distance to the flat station in the stairwell, and the domestic

hot water from the flat station is led into the apartment the same way. Circuits were installed above the baseboard to supply the new radiators in the living spaces.

Decentralized and hygienic: Danfoss EvoFlat FSS Type 3 flat stations were chosen for the project. Basically, the concept is based on not storing hot water, but only heating water and distributing it. This reduces consumption costs and is the optimal solution from a drinking water hygiene perspective. The energy for the heating water may be drawn from any available source. Solar thermal energy, geothermal energy and heat recovery are suitable,

as are district heating, oil-fired, gas-fired or solid fuel boilers (in this case a small CHP). The heating system collects hot water from all available sources in a buffer tank and distributes it from there to all apartments. Every flat station has its own decentralized instantaneous water heater that only heats the water as needed. Because of the low pipe volume (less than three liters) regular Legionella testing is not necessary, as has otherwise been prescribed for rented residential space under the German Drinking Water Ordinance since 2011.

Conclusion:

The renovation of the apartment building in Hamburg-Bergedorf is a showcase project in many ways: It shows that decentralized supply of heating and domestic hot water is possible in older buildings as well, and that it provides increased convenience and hygiene for tenants. In particular, the project demonstrates that decentralized supply engineering is flexible and adaptable to varying conditions of a building.