

ENGINEERING  
TOMORROW

*Danfoss*

**11%**  
Energy saving

Case story | *Dynamic Valve™* field test

## Energy savings and improved comfort for 56 year old apartment building

A field test performed in a residential building from 1958 shows that the installation of Danfoss *Dynamic Valve™* leads to improved hydronic balancing, substantial energy savings and improved comfort for all of its residents.

The field test was carried out during the heating season of 2013-14.



# Automatic balancing satisfies residents

The apartment building is a typical example for many other buildings where noise and energy efficiency complaints about the heating system occur. Automatic hydronic balancing proves to be a simple and effective solution.



**The new valves have improved the comfort for residents. This means that the right amount of heating is always available when the residents need it and it is easy to adjust the temperature in each room.**

Lars Johnsen, Manager,  
Energy Efficiency at  
Bovia Housing Association



For the field test, 36 apartments and six semi-detached homes were equipped with the new dynamic valves. By replacing the old, manual or thermostatic valves with the new dynamic valves, an even flow of heat to all flats in the building was established and the thermal comfort of residents was greatly improved. Previous user complaints about room temperatures being too high or too low due to an improperly balanced heating system have consequently been eliminated, and the building owner is satisfied with the new solution.

“The new valves have improved the comfort for residents. This means that the right amount of heating is always available when the residents need it and it is easy to adjust the temperature in each room. The new valves are convenient for our janitors, too. They do not have to spend time solving problems with the heating system any more”, says Lars Johnsen, Manager, Energy Efficiency at Bovia Housing Association, renting out more than 5,000 flats.

As part of the field test, 87 manual and 88 thermostatic radiator valves were replaced by 175 new, dynamic valves and new sensors. All dynamic

valves were pre-set to match the water flow to the heat requirements of the individual rooms. The installation of Danfoss *Dynamic Valve™* has led to substantial energy savings, and the pay-back time of the installation has been calculated to eight years.

## Easy installation

The new dynamic valves are suited for residential buildings with traditional two-pipe heating systems. According to the installer involved in the field test, the installation of the dynamic valves was quick and easy.

“The new valve is a great achievement. We have been waiting for a valve like this for a long time. The new valve automatically adjusts the flow of water to each radiator according to temperature levels and system loads. During the installation of the 175 dynamic valves it was evident that the new valve is just as easy to install as any other valve, so all in all the dynamic valve is good news”, says Lars Petrowski, director and owner of Petrowski Plumbers who made the field test installation.

With the new Danfoss *Dynamic Valve™* installed on all radiators, no other balancing valves are needed in the



To ensure maximum energy savings the renovated heating system was commissioned with using the dP tool™. This simple tool measures the available differential pressure directly in the *Dynamic Valve™*. The pump pressure of the Grundfos MAGNA was lowered while the required differential pressure in the furthest located valve stayed intact.





system. The field test shows that the new installation increases the  $\Delta T$  by approx. 5°C complying with the requirements of the district heating supplier.

“We are happy that we got the chance to be part of the test installation with the new valves. We are now considering similar energy renovation projects in some of the other buildings in our portfolio to save energy and to improve comfort”, says Lars Johnsen from Bovia.

**Facts about Danfoss Dynamic Valve™**

Danfoss *Dynamic Valve™* is a new, two-in-one radiator valve that combines temperature control with automatic hydronic balancing. Each valve has a built-in differential pressure controller that prevents pressure fluctuations, the main cause of typical heating system complaints such as noise and uneven heating. The new valve has a built-in pre-setting for maximum flow to provide each radiator with the exact, right amount of water. Once all valves in a system have been mounted and pre-set, the system is commissioned and optimized for the rest of its lifetime. No further commissioning is needed.

**Facts about the energy savings**

The energy savings have been monitored through the ECL data logger for remote real time data, enabling precise comparison of the two periods. A separate energy meter

was installed on the secondary side of the district heating system for correct measuring of the heating only, i.e. without the heat used for domestic hot water. Using this method made it possible to compare the exact heating consumption from one year to the next. Since outside temperatures influence the required amount of heating, it was necessary to include the degree days for each year to end up with figures that were comparable and valid.

Measurements in the building document energy savings of 11 percent with the new dynamic valves:

**Energy consumption:**  
(degree days calculated)

Nov-Jan 2012/13	94.9 MWh
Nov-Jan 2013/14	84.3 MWh
<b>% difference</b> <b>= energy savings</b>	<b>11.17%</b>

Using the 226 MWh average energy consumption during the four previous heating seasons and the 11.17% energy saving from the test, result in a calculated saving of 25.3 MWh per season.

With a price of DKK 784 per MWh the total savings amount to DKK 19,835 on an annual basis. Including a first year without financial benefit and an installation cost of DKK 146,912 the payback time of the *Dynamic Valve™* installation is around 8 years.

**Advantages of Dynamic Valve™ proved by the field test**

- Significant energy savings of 11%
- Return temperature on system fulfils specifications
- Improved comfort, no over-/under-heating
- Fast installation and easy commissioning
- Reduction of noise from valves and pipes
- Pay-back time of eight years

## Facts about the installation in the field test

Before	After
The building was supplied by district heating from the local utility company.	No changes.
A Germina Termix Compact Station from Danfoss supplies the building with heating and domestic hot water. The Compact Station contains heat exchangers for heating and domestic hot water, a variable speed pump and weather compensation ECL200. The installation contains two energy meters, one on the main supply pipe from the district energy and one on the primary pipe to the domestic hot water heat exchanger.	The ECL200 was changed to an ECL310 and connected to the ECL portal via internet in order to log the energy consumption.
The heating system is a two-pipe system with 30 risers and 175 radiators.	No changes.
The risers were equipped with manual balancing valves, most of them were not commissioned to the required setting for full-load conditions.	All balancing valves are now fully open as they have no longer a function and removing them would just increase costs.
The radiators were equipped with 87 manual and 88 thermostatic valves.	All radiator valves were replaced by Danfoss <i>Dynamic Valves</i> ™, type RA-DV and new sensors, type RA 2990. All valves have been pre-set to match the water flow to each room.

### Facts about the building and the project

- 3-storey residential building with 36 apartments
- District heating supply; two-pipe system
- Installation of 175 new Danfoss *Dynamic Valve*™
- Building administrator: Bovia Housing Association, Kolding, Denmark



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