Increase individual living comfort
and take control of energy costs

EvoFlat decentralized heating systems for apartment buildings

Safe
and comfortable

EvoFlat systems provide heating and domestic hot water rapidly on demand while significantly reducing the risk of bacteria in the water.

30%
lower energy consumption

By increasing awareness about actual heat usage, individual metering in each apartment reduces energy consumption by as much as 30%.

evoflat.danfoss.com
“Paving the way to energy-efficient buildings that provide greater comfort as well as a better return on investment”

“We aim to bring the full benefits of decentralized heating systems to all those involved with apartment block living.

This means better returns on investment, lower overall costs, greater comfort and safety and reduced environmental impacts.”

Ana Perasic
Danfoss District Energy Division
The commercial realities of owning, operating and living in multi-family houses are in a state of flux throughout the world. Rising energy costs and increasing comfort expectations require substantial investments in order to stay competitive and survive in the long term.

Traditional solutions no longer cut it – new thinking is needed to deal with new realities.

**Energy efficiency pays off**
In Europe, buildings now account for more than 40% of energy consumption and are responsible for about 40% of CO₂ emissions. Both in terms of costs and environmental impact, the energy performance of these buildings is thus an essential issue for building owners and tenants. Increasing energy costs make living in a rented apartment more expensive, and owners of apartment buildings risk losing tenants when alternative accommodation becomes more attractive.

Building owners who invest in renovation, insulation and energy efficient systems can reduce the energy consumption of a building by as much as 83%. Such a significant reduction in energy consumption leads to corresponding lower expenses and by including the renovation costs in the tenants’ rent, costs are repaid surprisingly quickly while actually decreasing the total costs for tenant.

Increasing comfort expectations
Fulfilling comfort expectations of tenants is equally important to reducing the energy consumption of a building. Tenants want to have pleasant and comfortable homes with a safe and hygienic supply of domestic hot water on demand. As opposed to traditional central heating systems, modern solutions rely on a decentralized concept in which heating and domestic hot water is produced in each individual flat. This allows for a better fit to tenants’ individual needs and an opportunity to accurately measure energy consumption of each tenant. This transparency furthermore enables tenants to monitor consumption on a continuous basis and adjust consumption behavior accordingly.

**Better business**
Decentralized heating and hot water systems are not a new invention. The benefits of using such set-ups are well documented. The question is how well suppliers can deliver on this promise. This is where the EvoFlat solution from Danfoss comes in, providing a profitable solution for housing associations, building owners, consultants, as well as the tenants living in the apartments.

**FACTS**
- Buildings use more than 40% of Europe’s energy consumption and are responsible for 40% of CO₂ emissions.
- Heating fuel accounts for 57% of EU domestic energy consumption, while water heating accounts for 25%.
- In most of the world, legislation has been introduced to reduce the energy consumption of buildings. One example is the EU Directive on Energy Performance of Buildings 2010/31/EU, which sets out clear requirements for the energy performance of buildings as a whole.
- Decentralized heating systems are an effective way to improve the energy performance of buildings due to their flexibility with regard to renewable energy sources and its great match to low energy buildings.
Radical renovation and new construction: 
New thinking about apartment comfort systems

Flexibility
The array of available energy sources is changing. At the same time, legislation promotes more use of clean sources of energy. This results in a situation in which considerations on the mix of energy sources supplying a building are important when planning renovation and new construction.

Integrating renewable energy sources
Renewable energy sources are usually installed as supplements rather than stand-alone systems. This makes it necessary to provide a centralized buffer tank set-up, which is also ideal for distributing hot water to individual apartments. The central buffer tank supplies hot water to the apartments which is transformed into useful heating and domestic hot water for the tenant.

Decentralized heating systems thus provide a flexible approach to energy source usage due to the fact that the flat station in each apartment will provide heating and domestic hot water - regardless of which energy source is being applied. Also future system upgrades can be done with no hassles.

Benefits for all
Incorporating decentralized heating systems into new buildings and larger renovation projects brings significant benefits for the building owner as well as the owners or tenants of each apartment.

Renovating the building structure and installations reduces heat losses and energy bills and boosts levels of comfort and safety for people living in the building. At the same time, individual metering of consumption in each apartment puts tenants in control of their own bills for heating and hot water. This all makes the building more attractive for everyone.

This brochure gives you a glimpse into what decentralized systems are and the benefits they provide.
Fully
future compatible

EvoFlat systems are compatible with virtually any kind of heat supply infrastructure, and are independent of the type of energy used.
From a traditional vertical mindset …

Energy efficient, with full control
A EvoFlat system consists of hydraulic interface units and horizontal pipe runs in each apartment, supplied with hot water from a high-efficiency central boiler placed in the basement.

A decentralized heating system incorporates a buffer tank and can be supplied by any heat source available to the building. Regardless of any subsequent changes and updates in the heat supply to the building, they remain equally efficient in operation.

The flat stations applied in a EvoFlat system normally incorporate a compact heat exchanger to provide instantaneous domestic hot water and a multi-functional control valve to secure supply and efficient operation.

EvoFlat systems are the modern replacement for traditional centralized heating and hot water solutions, such as:

- Central heating and central domestic hot water supply using central boilers fuelled by oil, gas, pellets, etc.
- Gas-fired combi-boilers installed in each apartment to produce heat and domestic hot water
- Central heating using a gas or oil-fired boiler complemented by an electrical water heater in each apartment for domestic hot water production
… to modern horizontal solutions

The EvoFlat system – with decentralized heating and domestic hot water

**EvoFlat solution**

**Advantages and benefits of EvoFlat systems**

**During planning and installation**
- Cost-effective for new installations as well as refurbishment and renovation projects
- Take up less space in each apartment – can be built into walls, stairwells or shafts
- Quick and easy to install. Only 3 ascending pipes, reduced and uncomplicated piping and no floor slab penetration

**In use**
- Effective operation and low operating temperatures reduce energy loss as well as operating costs
- Accurate, reliable metering and billing for each apartment
- Faults and consumption can be monitored and read-out via the heat meter
- Individual setting of room temperature and independent domestic hot water production
- Minimized risk of bacteria growth in the static water in centralized boiler systems
- Exceptionally low service and maintenance costs
The EvoFlat solution in a decentralized system compared with traditional alternatives

<table>
<thead>
<tr>
<th>Parameter</th>
<th>EvoFlat system with flat stations</th>
<th>Individual gas boiler</th>
<th>Decentralized domestic hot water</th>
<th>Centralized boiler and domestic hot water</th>
<th>Solar-powered domestic hot water</th>
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<tr>
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<td>+</td>
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<tr>
<td>Reduced service requirements</td>
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<tr>
<td>Reduced complexity of piping</td>
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<td>✓</td>
<td>✓</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Shorter piping runs</td>
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<tr>
<td>Central boiler saving</td>
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</table>

The evaluation shown above is based on application complexity, total system costs, building ownership and end-user living comfort.

Danfoss flat stations – a complete range for the EvoFlat system
There are EvoFlat units – flat stations – and configurations available to meet the entire spectrum of needs in all kinds of new apartment blocks, as well as in the refurbishment and renovation of existing buildings. This is just a selection.

**Akva Lux II S-F**

The Akva Lux II S-F is a complete flat station for providing direct heating with mixing loop and instantaneous domestic hot water and is especially useful for systems with under-floor heating. A self-acting control unit with an integrated differential pressure controller makes this system particularly easy to use, by providing a combination of hydraulic and thermostatic adjustment of the domestic hot water supply in the apartment. The controller ensures that district heating water is led to the instantaneous water heater only when hot water is tapped and that the flow of heating water is shut off, when the tapping of domestic hot water ends. Due to this energy saving functionality, standby losses are avoided.

The Akva Lux II S-F is designed for use with heat supplies, especially useful for systems with low supply temperature, supplied from a central energy source. The Akva Lux II S-F is available built into a suitable wall recess box or as a wall-mounted with a cabinet. It is ready for use with Danfoss distribution systems for under-floor heating. Connection pipes for radiator circuits can be mounted prior to the mixing loop, so they can be quickly, easily, and inexpensively connected to radiator and panel heating circuits.

**Akva Lux II TDP-F**

The Akva Lux II TDP-F is a flat station for providing direct heating and instantaneous domestic hot water. The unit is in a fully insulated cabinet which reduces heat losses. A self-acting control unit with an integrated differential pressure controller makes this system particularly easy to use, by providing a combination of hydraulic and thermostatic adjustment of the domestic hot water supply in the apartment. The controller ensures that district heating water is led to the instantaneous water heater only when hot water is tapped and that the flow of heating water is shut off, when the tapping of domestic hot water ends. Due to this energy saving functionality, standby losses are avoided.

The Akva Lux II TDP-F is designed for use with heat supplies, especially useful for systems with low supply temperature, supplied from a central energy source. The Akva Lux II TDP-F is available built into a suitable wall recess box or as a wall-mounted with a cabinet. It is ready for use with Danfoss distribution systems for under-floor heating or wall-mounted radiators and panel heating units.

**Akva Lux II**

Akva Lux II is an instantaneous water heater. This fully insulated, high-performance flat stations meets future demands for low energy consumption and very low heat losses while on standby. Akva Lux II is designed for installations in which the flat station only supplies domestic hot water, while room heating is supplied and controlled separately.
Documented benefits of EvoFlat systems

The idea behind the decentralized system for heating and domestic hot water is not new, and the advantages and benefits of opting for such systems are well documented. The main benefits with decentralized systems include lower energy consumption as a result of individual metering, more revenue-generating space in apartment blocks and multi-family houses, and reductions in the amount of heat wasted in long pipe runs. Here are some factual numbers.

Low overall costs with EvoFlat

Encourage people to save on energy
When residents and tenants only pay for what they use, they tend to keep a critical eye on their energy consumption. A study carried out in Denmark in 1991-2005 examined the actual energy consumption before and after individual meters were installed.

The results clearly showed that individual metering significantly reduces energy consumption per square metre – normally by as much as 15-30%.

Reduce energy loss
A 2008 study compared the different distribution systems available for apartment blocks and multi-family houses. The calculations were based on a 4-storey building with eight 133-square-metre apartments per storey. The figures compared a EvoFlat solution with a single vertical riser pipe system and a horizontal riser pipe system with centralized production of domestic hot water. The study showed that compared to modern centralized domestic hot water solutions, a EvoFlat solution reduces heat loss from the pipes by more than 40% and by as much as 80% compared to traditional one-pipe solutions.

Take up less space
As the name suggests, EvoFlat systems take up very little space. Compared to individual gas-fuelled boilers, which are often combined with a storage tank, a flat station takes up about 80% less space and can normally be mounted in a wall recess or small cupboard. Admittedly, flat stations do take up a little more space than centralized systems for domestic hot water production, although they are still very unobtrusive. In return, however, they free up considerable amounts of space in basement areas.

* Storage tank in basement will take up significantly more space than in a EvoFlat solution
EvoFlat in action
30% energy savings for Danish housing association

"EvoFlat units turned out to be the best solution."

Henning Christensen
project manager
SAB - Sønderborg Housing Association
A EvoFlat solution for 324 apartments in a housing association block in the Danish town of Sønderborg provides average annual energy savings amounting to about 30% per apartment.

This was mainly achieved by installing a two-pipe heating system integrated with a flat station installed in each apartment, with the municipal district heating system as the energy source.

In the apartment block’s old-fashioned original single-pipe heating system, dating from 1964, water was heated in central substations located in a boiler room in the basement. Today, domestic hot water is heated by small, energy-efficient flat stations in each apartment. Residents can now see exactly how much energy they use – and what they get for their money.

**Awareness helps people save**
Prior to the modernization project, none of the residents in the housing association had any way of knowing how much heat and domestic hot water they used in their particular apartment. With the new EvoFlat installation, each apartment has a meter that registers consumption of both heat and domestic hot water. This has resulted in residents becoming much more aware of how much they use. Djafar Gazrani, who lives in a 90-square-metre apartment with his wife and two children, explains: “We now focus much more on how much heat and hot water we use than before the renovation.

Thanks to the new meter in our flat, we can see exactly how much energy we use, and we can see how much we save by being careful. We keep an eye on the thermostats fitted on each radiator, and we take care not to let the water taps run more than necessary.”

**Benefiting from individual metering**
The SAB housing association was responsible for installing the new heating and hot water system in this apartment block. According to project manager Henning Christensen, alternative system solutions were considered. However, the housing association’s requirement for individual metering and billing of the energy used meant that flat stations turned out to be the best solution.

“EvoFlat systems now deliver heat and hot water directly to each apartment. The hot water we use as the energy source comes from the local district heating plant, piped directly to the housing association buildings. This means we eliminate the expenditure and maintenance costs associated with a central substation, hot water boilers, water treatment fixtures, and central circulation pump systems. It also means big savings in heat losses compared with a traditional hot water distribution system and also from the heating circulation system – in addition to electricity savings because we’ve been able to do away with circulation pumps,” says Henning Christensen.

“We now focus much more on how much heat and hot water we use than before the renovation.”

Djafar Gazrani, tenant
From 1913 to 2006, Highbury Stadium in London was the world-renowned home of Arsenal Football Club – a venue steeped in drama and history.

When the club moved to the ultra-modern Emirates Stadium nearby, this high-profile site underwent a remarkable rebirth and a radical redevelopment process. It emerged as a complex of 719 high-end apartments, each featuring some of the most modern approaches to energy efficiency currently available.

The stadium’s art deco East and West stands were completely renovated as the centrepiece of a unique urban development. Two new “stands” were added, so that what was once the Gunners’ field of glory is now surrounded by four 7-storey glass-fronted blocks. The primary heat source for each block is a gas-fired central boiler. In the summer, this is supplemented by roof-mounted thermal solar heating panels that help reduce operating costs still further.

**Accurate, useful metering data**

Each of the apartments in the Highbury Square development is equipped with a prefabricated flat station to provide both under-floor heating and domestic hot water. Discretely mounted on the wall, these flat stations do away with hot water cylinders that take up valuable space, yet provide instantaneous hot water on demand as well as full control over heating in each room.

These units are also equipped with built-in energy meters that monitor consumption and provide accurate data for billing as well as fault-finding.

Service staff can link up to each meter via a hand-held Bluetooth receiver, so they don’t ever need to enter the apartment to read off consumption or find out what’s wrong.
Adding value, reducing costs
Specifying EvoFlat systems for the Highbury Square project enabled developers and investors to make the apartments commercially more attractive, with the advantage of lower heating costs as well as the most effective exploitation of the space available in each unit.

**Basic info**
The project was managed by SAV Systems. There are flat stations from Danfoss in each of the 719 flats in the high-profile Highbury Square development.

**Installed Danfoss flat stations:**
- Pressure level: PN10
- Differential pressure: 0.7 bar
- Design temperatures for heating: 70/26°C–35/25°C
- Design temperatures for domestic hot water: 70/28°C–60/10°C
We mind your business

Danfoss is more than a household name in heating. For more than 75 years, we have been supplying customers all over the world with everything from components to complete district heating system solutions. For generations, we have made it our business to help you mind yours, and that remains our goal both now and in the future. Driven by our customers’ needs, we build on years of experience to be at the forefront of innovation, continually supplying components, expertise and complete systems for climate and energy applications. We aim to supply solutions and products that give you and your customers advanced, user-friendly technology, minimum maintenance, and environmental and financial benefits along with extensive service and support.

EvoFlat in action

With EvoFlat, Danfoss has already delivered proven successes that enhance energy efficiency, individual comfort and reduce costs in multi-family houses and apartment buildings in many countries. This is a selection of European reference projects.

<table>
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<tr>
<th>Project, city</th>
<th>Country</th>
<th>Year</th>
<th>EvoFlat products installed</th>
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