

Making homes **more energy-efficient**
Renovation of residential HVAC Systems

More
savings.
**Better
comfort.**



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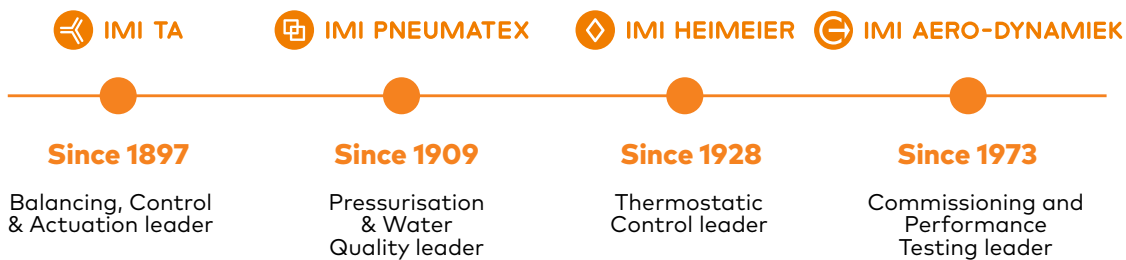


Why renovate?

With the EU goal in mind to achieve **climate neutrality by 2050**, most of the existing housing stock in Europe will have to undergo renovation in order to make them more **sustainable and energy-efficient**.

The **heating, ventilation, and air conditioning ('HVAC') system** accounts for 50% of a building's energy consumption. Therefore, the operation of this system sits at the heart of every major residential renovation project. However, **changes do not have to be drastic for significant improvements** to be seen and felt. In this ebook we aim to answer the most common questions about HVAC systems and guide you through changes you can carry out in order to make your home more **energy-efficient**.

As a hydronic expert with over **300 years** of combined experience **IMI Hydronic** is the perfect partner to help you tackle the challenges that come with the renovation of your residential building. We offer innovative products, reliable technologies, and personal support from the design stage all the way to the system start-up.



Energy Efficiency Roadmap

Buildings consume **40% of the world's energy** and are one of the most significant sources of CO₂ emissions. As climate change concerns increase, and soaring oil and gas prices drive escalating energy costs, finding flexible and effective solutions that **make buildings more energy-efficient** is a key priority. Having a clear vision of the 2050 roadmap is therefore fundamental to achieving long-term climate goals.

Benefits of renovating your residential property



Reduce emissions and associated energy costs



Enhance tenants' living environment



Increase the resale value of your property

75%
of the building stock in Europe is energy-inefficient by today's standards

40%
of the building stock in Europe was constructed before energy performance requirements were introduced

Carbon Neutrality by 2050

The **transition to a carbon-neutral society** is a pressing challenge, but also an opportunity to create a **better world** for all. To achieve this, the **European Commission** has set out a **long-term strategy**. Below we have compiled some of the key directives and targets that are important for you to know.

EU key milestones at a glance

2050

Climate Neutrality

- **Reduce emissions by 80-95%** compared to 1990 levels
(Directive 2010/31/EU)

2030

- At least **55% reduction in greenhouse gas emissions** from 1990 levels
("Fit for 55" package, 2021)
 - **Double the annual renovation rate** compared to 2020
(The Renovation Wave Strategy, 2020)
- 35 million** building units renovated by 2030

2021

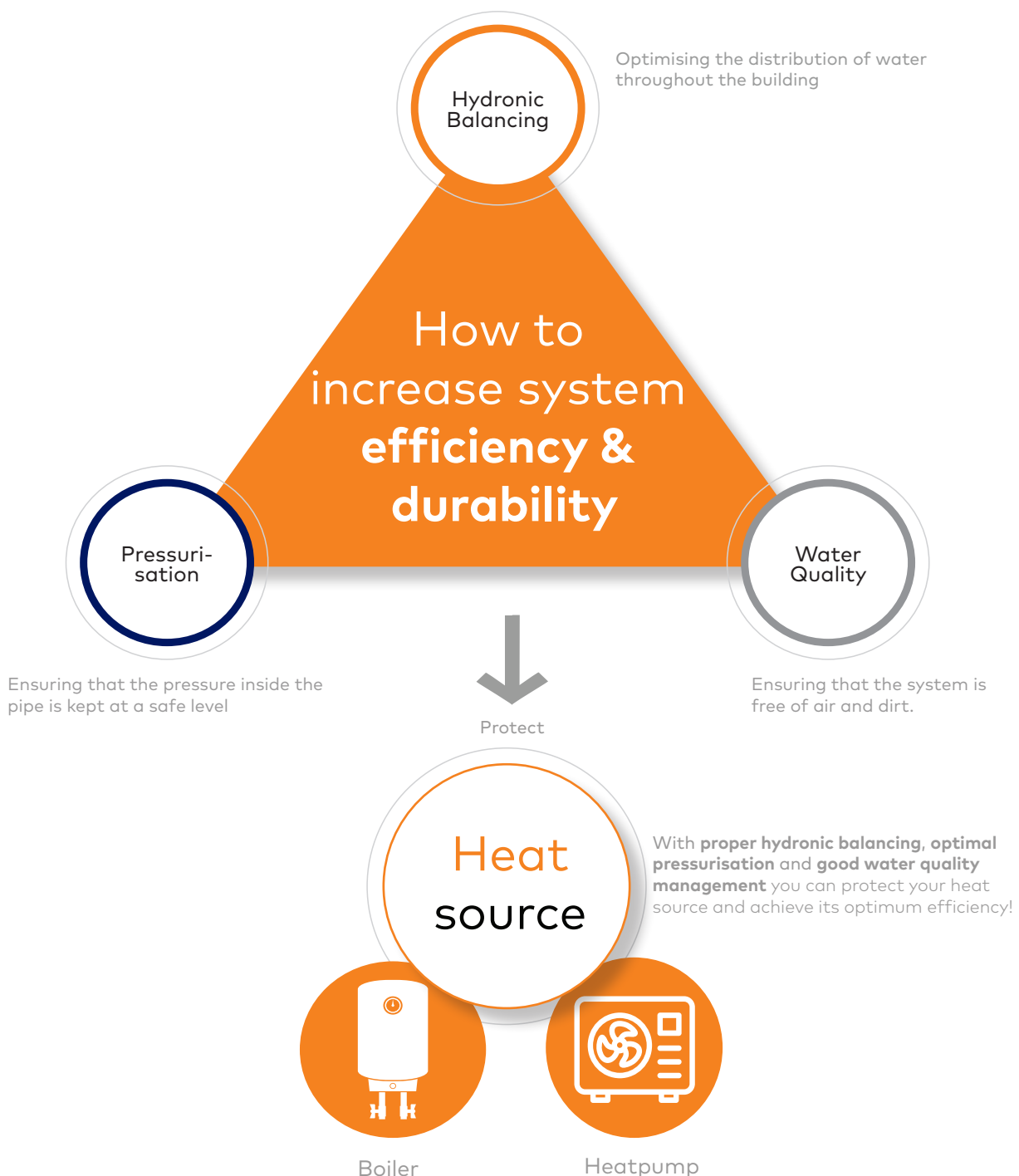
The commission proposed a revision of the Energy Performance of Buildings Directive (EPBD)

Promotes **energy efficiency in buildings** within the European Union. (COM/2021/802 final)

The first version of the EPBD was published in 2002 (Directive 2002/91/EC). A revised version was published in 2018 (Directive 2018/844/EU).

Key aspects to consider before renovating

Outside temperature, building size, number of people, and insulation are variables that can influence the energy consumption of your HVAC system. However, those are not the only ones. The efficiency of your energy source and how it operates will have a significant impact on energy consumption and therefore, potential savings.





Hydronic Balancing

Hydronic balancing is essential for obtaining the required water flows throughout the system guaranteeing that each radiator receives at least its design flow under all operating conditions.

It is the process of optimising the distribution of water throughout the building in order to obtain **maximum comfort at a minimum energy cost.**



Pressurisation

Water expands and contracts as temperatures fluctuate. When temperatures rise, water expands, pressure builds up creating strain on individual components that can lead to rupture and failure. When temperatures decrease, the volume reduces and the drop in pressure can lead to air intake causing corrosion.

Optimal pressurisation can prevent damage to critical components such as pumps, **avoiding leaks and corrosion, increasing system longevity.**



Water Quality

Managing the water quality of your HVAC system by removing air and dirt is an effective way to **extend the lifetime of critical system elements** while **optimising system performance.**

The benefits of good water quality management are:

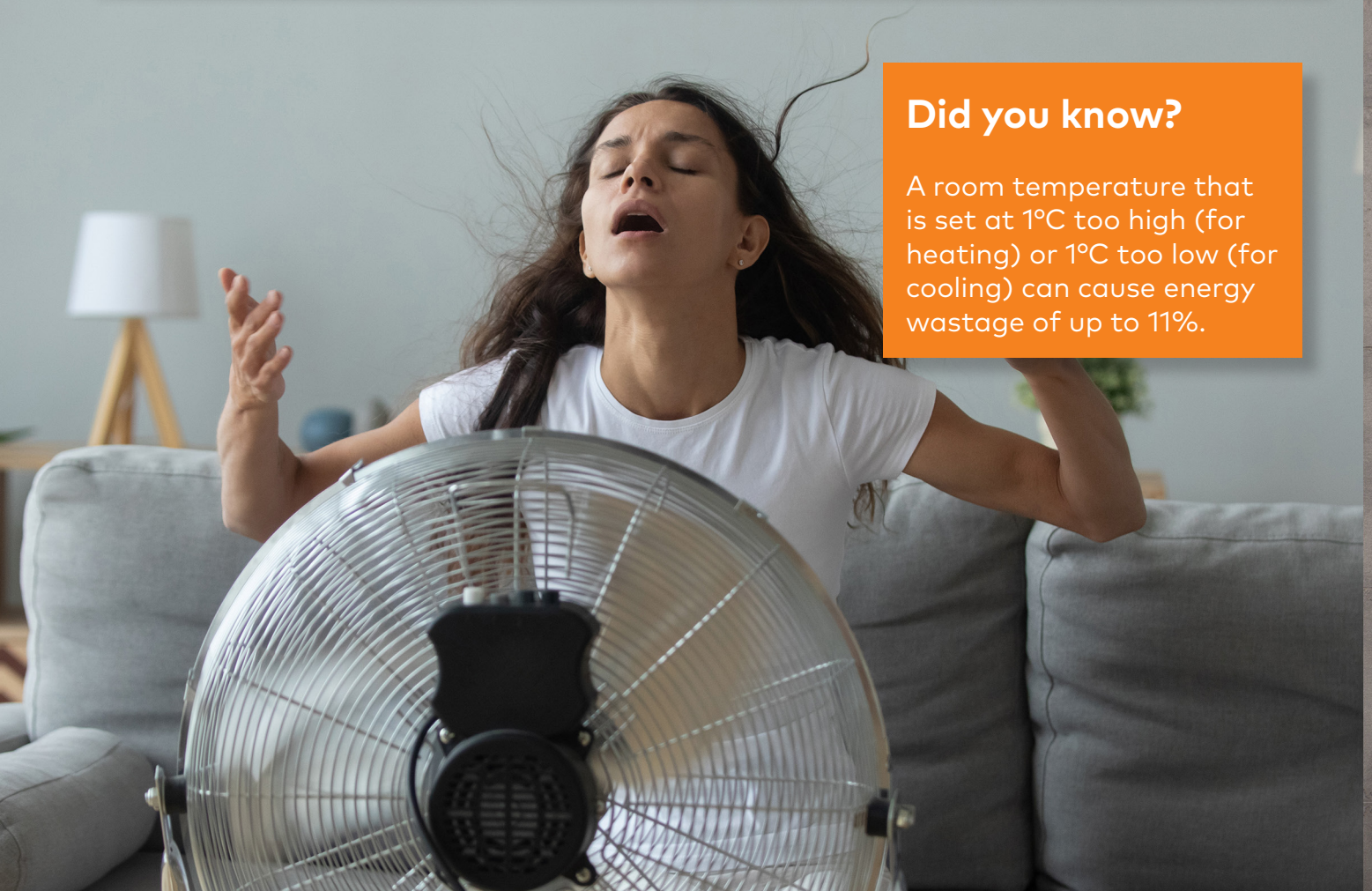
- Reduced energy consumption
- Prolonged system service life
- Quiet operation

Homeowner FAQ

We are aware that the renovation journey comes with a set of challenges not always known by homeowners. That's why we prepared **5 questions and answers** to help you better **understand your HVAC system!**

Did you know?

A room temperature that is set at 1°C too high (for heating) or 1°C too low (for cooling) can cause energy wastage of up to 11%.

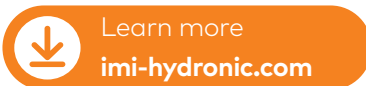


Question #1

Why are some rooms warmer and others colder?

Water is lazy, it will always choose the path with the least amount of resistance. So, if a heating system is not balanced, it will allow too much flow to the radiators in rooms close to the pump, causing them to get overly hot, while not allowing enough flow to rooms further away, resulting in uneven temperatures and uncomfortable indoor climates.

Comfort isn't the only element that suffers when systems are out of balance; **maintenance and energy expenses** are also affected. As a result, making sure that your system is correctly balanced may be the best investment you ever make!



Common failed attempts to remedy the problem:

- Installing larger pumps
- Raising the supply temperature

This just leads to further issues such as loud pipes, greater energy expenses, and deterioration of heat distribution.

Question #2

How can balancing help to save energy consumption and, therefore, reduce my heating bills?

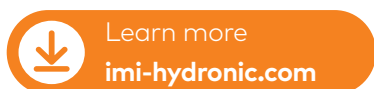
When the heat is correctly distributed in the system, the average temperature can be reduced. For each degree the average temperature can be lowered, the energy consumption of the property is **reduced between 6% and 11%**.



Thermostatic valves can work to their design efficiency in all temperature conditions. Balancing identifies the lowest possible circulation flow, which reduces the work done by the pump and therefore the energy costs.

An easy renovation upgrade is to replace old thermostatic heads. **New thermostatic heads can reduce energy consumption by 28% in comparison to manual ones.** IMI Heimeier Thermostatic Head K comes with effective and incredibly convenient energy-saving clips:

The **blue energy-saving clip** limits the lower temperature setting, e.g. the night setting.



The **red energy-saving clip** restricts the upper temperature range and prevents any high temperatures from being accidentally set.

This is also extremely practical when airing rooms. If you pull back the blue clip, the thermostatic head can be set to 0 without forgetting the otherwise preferred temperature range.

A reduction in energy consumption of 20% to 35% and a payback period between six months to a year is not unusual. Systems that have been correctly balanced will make life more comfortable for the tenants, reduce building life-cycle costs for the owner and minimise the environmental impact. A win-win for all!

Question #3

Why is my HVAC system making noise?

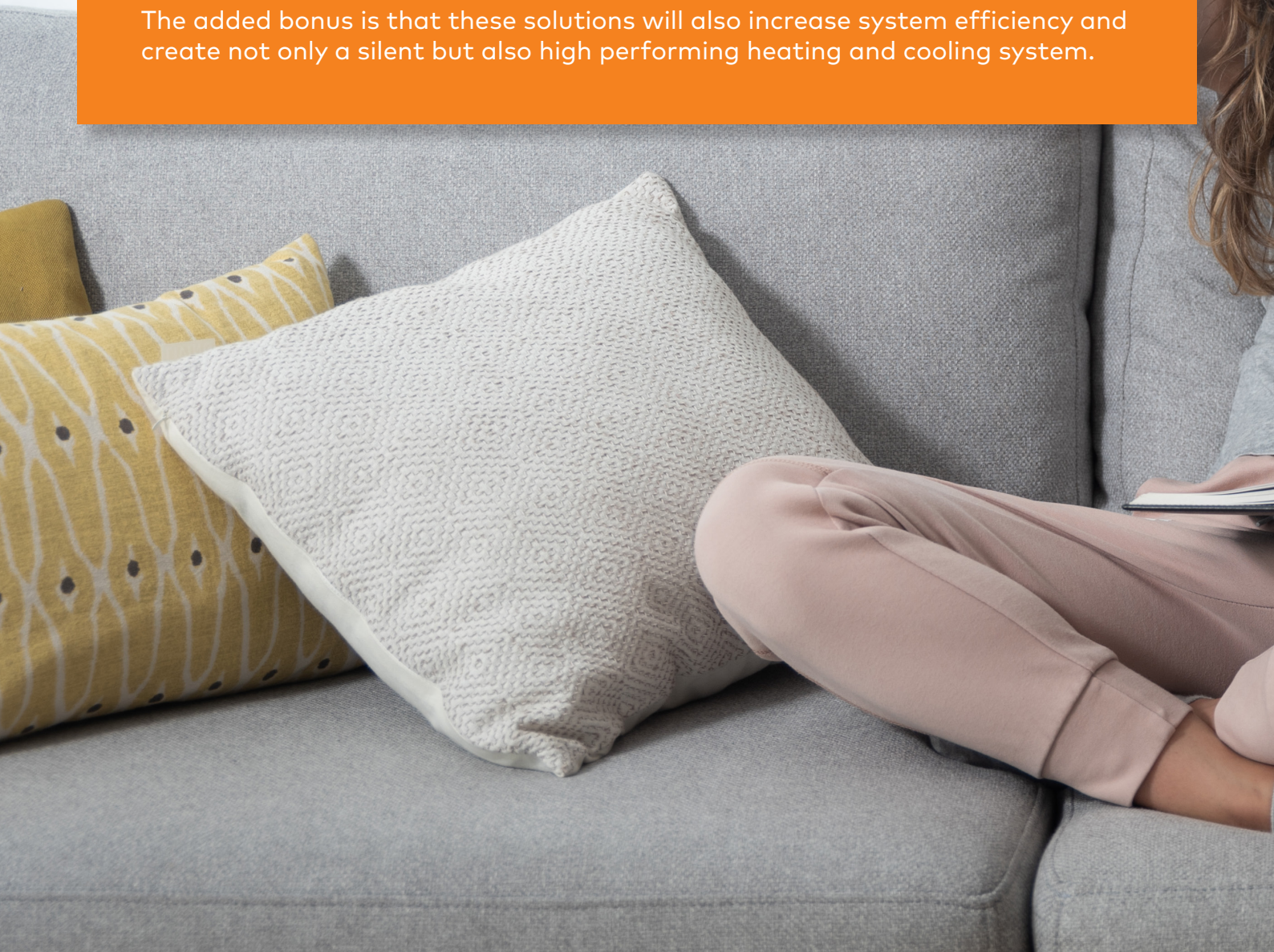
Disrupting system noise can be the result of vibrations across valves and the pipework due to:

- Air and dirt circulating in radiators and pipes
- High flow speed
- Too high pressure drop in valves

Air vents, dirt separation, and degassing solutions help to maintain a clean system and to avoid air bubbles that, when passing through valves and radiators, lead to system noise.

In addition, **balancing** will reduce and optimise the pressure drops in the system, avoiding high-pressure drops across the valves.

The added bonus is that these solutions will also increase system efficiency and create not only a silent but also high performing heating and cooling system.



Question #4

Why should I invest in a high quality dirt separator?

Installing a **dirt separator** is one of the best things you can do to safeguard the lifetime of your HVAC system. A system without dirt is more reliable, energy-efficient, and durable!

Dirt is the cause of a number of undesirable consequences, making it a major problem for HVAC systems leading to:

► **Higher energy costs**

Dirt in the system sticks to surfaces where heat is transferred, for instance in heat exchangers and radiators, and creates an unwanted insulating layer that impairs the transfer of heat. Valves are likely to be blocked by the dirt, causing failures and expensive repairs.

► **Less indoor comfort**

Dirt affects the circulation and output of components such as radiators and air diffusers, impairing the indoor climate.

► **Shorter system service life**

Valves and other system components that are exposed to dirt are more likely to develop faults and the system has a shorter service life. Simply installing a filter will not solve the problem because it only stops the largest particles.

Did you know?

Poor water quality in the system can lead to scale deposits (calcium and magnesium salts) building up on the internal parts of the boiler, which means that more gas needs to be burnt to heat up the water. In fact, **even one single millimetre of scale deposit can increase a boiler's energy consumption by up to 9%.**



Question #5

What if I don't want to replace my radiators, how can I achieve some energy savings?

When it comes to renovation, HVAC systems can have their challenges. In older HVAC systems, radiators can be widely branched making it difficult to understand the flow requirements inside the different sections or radiators. When in addition reliable drawings of the HVAC system are missing, calculations of network resistance and output requirements in the different sections can be almost impossible.

With intelligent flow control technologies, such as AFC (Automatic Flow Control), complex calculations for hydronic balancing are no longer necessary as this technology automatically adjusts the design flow independently to the differential pressure variation, making them time savers and cost-efficient solutions.

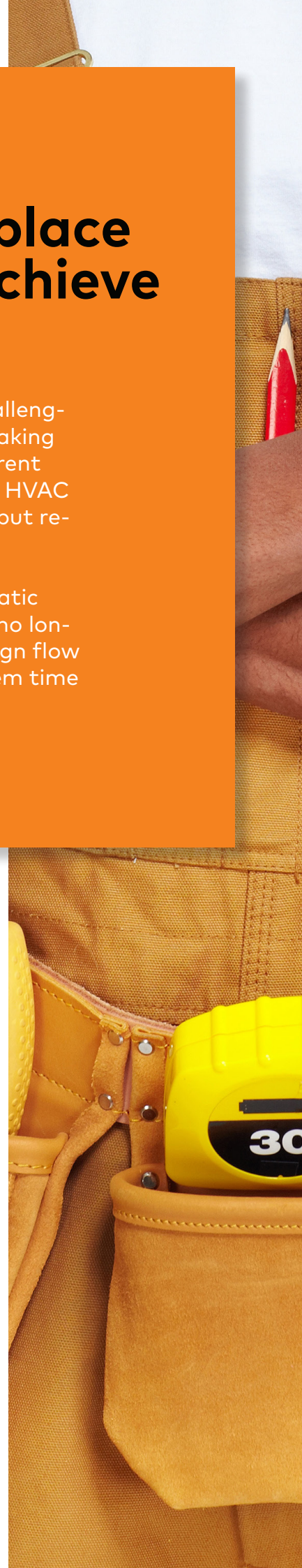
Common home renovation challenges

No available plan of the building	Partly unknown pipe layout
The pipe length can't be measured	Unknown pipe friction factor

The solution



Learn more
imi-hydronic.com





Did you know?

On modern condensing boilers the lower the return temperature is back to the boiler, the higher its efficiency is.

Our expertise applied

Residential renovation projects have included:



The Jever project in Northern Germany involved modernising a building housing 1,300 apartments.

IMI Hydronic's bespoke solution focused on combating heat loss by ensuring that the heating system was accurately balanced and no apartment was overheated or undercooled. Incorporating the business' IMI TA products, including balancing valves, differential pressure controllers, and thermostatic radiator valves, the new system delivered **energy savings of around 20% per annum.**



The refurbishment of two large residential complexes in the Netherlands owned by the Wageningen Housing Association.

IMI Hydronic developed an energy-saving solution that involved the installation of IMI Heimeier Eclipse thermostatic valves in combination with thermostatic K-Heads, in **490 apartments**. With built-in sensors and automatic frequency control technology, the easy-to-install and commission Eclipse thermostatic valves automatically regulate the flow of water through the heating system and enable precise control of individual room temperatures without the need for constant adjustment.



The renovation of a large 1970s housing complex in Sundsvall, Sweden containing more than 230 apartments spread across 30 buildings.

The project's key objective was to increase comfort within each apartment and, at the same time, reduce heating costs. Together with the complex owner, IMI Hydronic designed a new energy-efficient system incorporating balancing valves, including the STAD valve, which accurately regulates water flow, and thermostatic radiator valves that deliver optimal room temperature control. **Annual energy consumption across the complex was reduced by 15%** and comfort levels within each apartment were significantly improved.



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