



# Smart pumps offer more performance and comfort with less energy use

*Combining energy-efficient pumps, motors, drives and controls into an all-in-one solution that offers more value and efficiency while reducing your energy consumption and carbon footprint.*

## Summary

This whitepaper explores the crucial role of smart pumps in addressing climate change and global sustainability efforts. Pumps consume a significant portion of the world's electricity, and the paper emphasises the substantial energy-saving potential of optimising pumps and their processes. Discover how e-pumps combine energy-efficient pumps, motors, drives, and controls – and together with digital solutions, offer a comprehensive solution to enhance system performance, reduce energy consumption and lower carbon emissions.

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**GRUNDFOS** 

Possibility in every drop



## Introduction

Calls for climate action can be heard all around. And with good reason. United Nations climate reports continue to give dire warnings about global warming<sup>1</sup>

Spurred on by this and inspired by initiatives such as the UN Sustainable Development Goals (SDGs)<sup>2</sup>, companies worldwide are looking for new ways to ramp up their sustainability efforts. They're forming new visions and strategies based on the SDGs, and they're pledging ambitious CO<sub>2</sub> reduction targets and energy-saving goals.

### Low-hanging energy optimisation fruits

While there are many “low-hanging fruits” when it comes to saving energy and cutting carbon, there is a significant, often overlooked opportunity for nearly every factory, building or utility: old, inefficient pumps and their processes. They consume a lot of energy – which means there's potential to save a lot of energy.

And while many component suppliers can deliver energy-efficient pumps, motors or drives, Grundfos is the only one that develops, designs and manufactures all these elements and puts them together in one compact solution: the e-pump.

Grundfos e-pumps are designed for industrial processes, water supply, and cooling and heating hydronic circuits in buildings. The intelligent pump technology pairs superior efficiency with digital cloud connectivity, offering significant energy and carbon savings opportunities. And best of all, it's a solution that benefits the overall system performance.



# A world run by pumps

Pumps are everywhere today: In houses, apartment buildings, hospitals, offices, data centres, water treatment plants, and power plants. They're completely integrated into our society.

Pumps are also an integral part of HVAC systems, circulating chilled and hot water through buildings to enable temperature control and maintain comfortable indoor climates. Pumps transport wastewater and sewage and help keep our homes

and offices clean. And they play a crucial role in fire protection systems, ensuring the necessary water pressure in fire sprinkler systems.

Pumps often perform their work out of sight, meaning many don't even think about them. But without them, there would be no safe and comfortable buildings.



## Pumps consume too much energy today

While they keep our world running, pumps also consume a lot of energy. Electric motors consume about half of the world's electricity<sup>3</sup>, and pumps use around 20% of that<sup>4</sup>. That means pumps consume about 10% of the world's electrical power.

In Europe alone – the world's third-largest electricity consumer behind China and the USA – pumps consume 300 terawatt hours (TWh) per year. That's the equivalent of 30 Coal-fired power plants<sup>5</sup>.

But we still need pumps – in fact, according to Danish consulting and engineering company Rambøll which said that pumps will “play a major role in the sustainable society of the future.”<sup>6</sup>

Our society depends on pumps. But today, most buildings use between 20 and 50% more energy than necessary – even when factoring in new constructions or newly renovated buildings.

Fortunately, we have an opportunity to work with more efficient pumps. And if we turn to modern alternatives like intelligent e-pumps, we can actually reduce energy consumption while improving pumping system performance and overall comfort.



## A foot on the gas – and another on the brakes

By improving the efficiency of pump systems, including pumps, motors, drives, and controls, it's possible to significantly reduce energy consumption and help meet carbon emission targets.

One example is flow requirements changing depending on demand in applications such as cooling or heating.

Typically, older pump solutions use valves to control the flow. If a pump is running at full speed, for example, the operator can open the valves to let out some of the liquid and the pressure inside the pipes, increasing the flow.

However, this does not save energy for pumps that are operating at full speed. In fact, some experts have even likened the idea of using a valve to driving a car with one foot on the accelerator and attempting to control the speed with the brake.

### Adjusting performance according to demand

Instead, the operator can use a variable speed drive (VSD) with the pump. This is also known as Variable Frequency Drive (VFD) or a frequency converter. These allow you to adjust the speed and flow of the pump to the requirements of the application, avoiding waste.

Electronic VSDs slow down or speed up automatically according to demand in variable flow, pressure or temperature applications such as heating, cooling and water supply. Compared with other conventional technologies, VSDs offer energy savings, improved processes and reduced emissions<sup>7</sup>.

In fact, reducing the flow in a pump to 80% means you only need around half the power.



## E-pumps elevate efficiency

Grundfos e-pumps combine VSDs with a Grundfos IE5 MGE motor. The IE5 rating is the highest efficiency level of 5 and is considered “Ultra-Premium Efficiency”, according to the International Efficiency (IE) standard motor rating system.

The IE codes are a point of reference for governments when determining the efficiency levels required for the minimum energy performance standards of motors in their respective countries<sup>8</sup>. And while market standards are at the IE3 level, Grundfos goes further with the IE5 motors<sup>9</sup>.

IE5 motor losses are at least 30% lower than the IE3, which alone reduces the energy consumption by 10% with a typical pump load profile. Choosing the right control mode in MGE for the application can provide even more energy savings for the entire system – almost up to 75% compared to uncontrolled pumps.

This potential means that high-efficiency e-pumps with IE5 motors contribute substantially to energy savings and reduced CO<sub>2</sub> footprint. In 2020 alone, our e-pumps helped avoid 270,000 tonnes of CO<sub>2</sub> emissions.



## Convenient and connected with Grundfos GO

And the benefits of e-pumps don't stop there. Building owners and operators have traditionally maintained their pump systems on-site via control panels and monitoring equipment – and in the event of faults or failures, physical equipment inspections were necessary. But that's no longer convenient or efficient enough.

That's why Grundfos has developed Grundfos GO, a digital tool for monitoring, controlling, maintaining and commissioning pump systems through seamless Bluetooth connection.

Operators can access real-time e-pump data, troubleshooting, analysis, control functions, and detailed information on operating times, speed, energy consumption and more to ensure the e-pumps remain functioning and energy-efficient – anywhere, at any time. For example, the connectivity enables seamless interaction between the control unit and the pump, which makes it easy to adjust flow precisely or find the optimal Delta T for the most efficient operation.

### Easy integration into building management systems

Grundfos e-pumps also fit with all components of integrated building management systems. A key benefit of this is that you get unlimited possibilities when it comes to control – and more access to data that can be used to optimise the building's overall performance.

This data is also useful because it essentially offers increased system intelligence. All connected pumps can deliver key data points such as estimated flow, power and liquid temperature.

By combining all components like controllers, sensors, motors, drives, and application-specific algorithms, Grundfos has created an industry-leading, all-in-one solution, bringing built-in intelligence and premium e-pump efficiency to the market. In short, it's the ideal solution for better efficiency and reducing energy consumption.

[→ Explore Grundfos GO in detail](#)



# A collaborative commitment to sustainability

It's clear that there is an urgent need to change the way buildings are constructed, developed and operated. And as the world's first water solutions provider to receive full SBTi validation for science-based 2050 net-zero greenhouse gas reduction targets, we're proud to contribute. But we cannot do it alone.

We need to collaborate closely, bringing together building industry professionals and stakeholders to drive carbon reductions upstream and downstream to reach climate targets.

As part of our initiatives to encourage collaborative, sustainable actions, optimise pump efficiency and reduce CO<sub>2</sub> emissions, we offer tailored service contracts to our customers and partners.

Our maintenance engineers inspect pump installations, perform an energy consumption analysis, conduct a pump condition assessment, and recommend replacements for inefficient pumps.

One example is the Grundfos energy audit, a comprehensive, measurement-based pump system analysis that calculates how a building can save energy and reduce CO<sub>2</sub> emissions.

Owners can take this data and replace low-efficiency pumps with intelligent, higher-efficiency Grundfos e-pumps. In fact, Grundfos estimates that the yearly avoided CO<sub>2</sub> emissions from e-pumps in 2020 alone totalled 270,000 tonnes<sup>10</sup>.

## Conclusion

Grundfos' intelligent e-pump technology offers energy-efficient pumps, motors, drives and controls. That means you get a system solution that adds more value, efficiency, and energy savings and has a lower carbon footprint than conventional technologies.

That is possible because Grundfos takes the best practices around pumps and combines them with decades of application knowledge to create its intelligent e-pumps. In essence, that means bringing more than regular optimisation; it means bringing best practices from the industry to new solutions. Because we believe every business and factory should be able to benefit from what has been optimised from within the industry.



# Explore some of our smart pumps

We offer a wide range of intelligent and energy-efficient pump solutions for different building types, including hospitals, schools, and offices. From water supply and treatment to heating and cooling, you can find a solution that matches your application.



## MAGNA3: An intelligent, high-efficiency circulator pump

The MAGNA3 is the premium choice for system control and monitoring. The MAGNA3 circulator is a highly-advanced canned rotor pump intended for large commercial buildings such as hospitals and schools. Intelligent features such as AUTOADAPT and FLOWADAPT select the optimal system setting, ensuring that your system always provides the best possible comfort and the most efficient operation. Connect the pump to a building management system and get complete control and monitoring of the system while improve reliability at the same time.

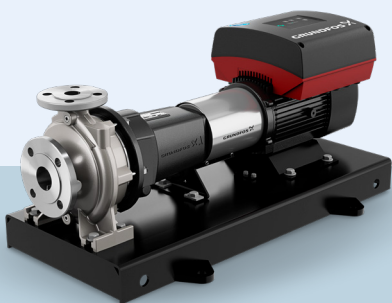
[→ Explore Grundfos MAGNA3](#)



## TPE: Robust, reliable and low on energy

Grundfos TPE pumps are single-stage, close-coupled, in-line centrifugal pumps with mechanical shaft seals for applications such as heating/cooling/district energy/hot water recirculation. One of the most characteristic features is the close-coupled design, which means the pump and motor are separate units – securing a high tolerance of impurities in pumped liquid. The motors are either mains-operated or electronically speed-controlled. With ultra-premium IE5 efficiency as the standard now across the entire range up to 55 kW, TPE pumps are an efficient choice for heating, air-conditioning, cooling and water supply systems or industrial processes.

[→ Explore Grundfos TPE](#)



## NKGE/NBGE: High-efficiency end-suction power for demanding applications

Grundfos NKGE end-suction long-coupled pumps are non-self-priming, single-stage, centrifugal volute pumps with axial-suction port, radial-discharge port and horizontal shaft. If you require a pump for demanding applications where flow requirements vary, the NKGE/NBGE is available with a permanent magnet MGE motor up to 22 kW with built-in variable frequency drive and IE5 efficiency to keep efficiency high at all times. The long-coupled pump design makes the pump easy to service because of the spacer coupling.

[→ Explore Grundfos NKGE](#)

[→ Explore Grundfos NBGE](#)



## MIXIT: Increase building energy efficiency

The innovative all-in-one Grundfos MIXIT solution simplifies commissioning and balancing, while making it faster, easier and more efficient as all components are automatically adjusted and balanced to the system demands, saving you up to 25% energy. Reduce installation and commissioning time by up to 50% with Grundfos MIXIT by combining 8-12 traditional mixing loop components into an all-in-one solution. With MIXIT and high-efficiency Grundfos pumps, you'll gain optimal energy performance, full control over your operations and real-time monitoring for full transparency over of your HVAC system's energy use.

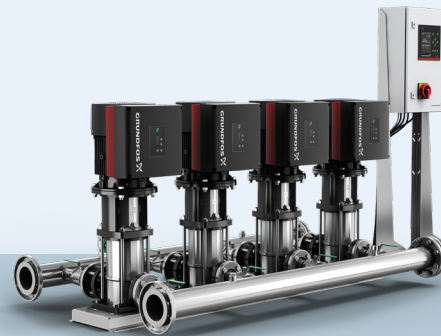
[→ Explore Grundfos MIXIT](#)



## CMBE: Constant water pressure for increased comfort

The CMBE is a booster set that provides constant water pressure for domestic and lighter commercial applications. With a CMBE booster set in the building, end-users will no longer be bothered by fluctuating water pressure, and they can even adjust the pressure manually. The pump is compact, easy to install and has very low noise levels. You can use it for single-family homes, two-family homes, apartment buildings, schools, smaller hotels and office buildings.

[→ Explore Grundfos CMBE](#)



## HYDRO MPC-E: Always find the best efficiency point

The Grundfos Hydro MPC-E is a smart pressure booster set that adapts automatically to varying demands. Grundfos boosters are designed to maximise efficiency, and the system automatically matches your demand profile through the intelligent use of pump curves and cascade functions. When demand goes up or down, you will still experience the same pressure in the tap. Ideal for water supply systems, commercial buildings, industrial plants and irrigation systems, the Hydro MPC-E pressure booster provides full-speed control for all CR pumps.

[→ Explore Grundfos HYDRO MPC-E](#)



## NBE: Ideal for medium-flow requirements in distribution networks

If water pressure is too high for too long, the risk of water loss, lower revenue and increased maintenance of pipes increases. Grundfos supplies a complete system designed for flow and pressure management that meets medium-flow requirements from local pumping stations. The compact end-suction close-coupled NB/NBG/NBE/NBGE pumps are ideal for this purpose in a water distribution system.

[→ Explore Grundfos NBE](#)



## CRE: Take control with variable speed

The CRE is a multi-purpose in-line multi-stage pump with a built-in variable-speed drive available in a wide variety of flow and pressure sizes and is built from AISI 304 grade stainless steel/cast iron. The variable-speed drive continually adapts pump performance to match current conditions and desired pressure, temperature or flow. This makes the CRE perfect for a variety of applications, including water supply, washing and cleaning, water treatment, boiler feed, chemical industries, temperature control and mining. The CRE is also available with the IE5 motor.

[→ Explore Grundfos CRE](#)



## MTRE: The ideal immersible pump

The MTRE is an immersible pump suitable for machining and wash and clean. The vertical multistage centrifugal pump with an integrated frequency converter is designed for tank top mounting and for pumping of cooling lubricants and cutting oils for machine tools, cooling applications, industrial liquid transfer and similar applications.

[→ Explore Grundfos MTRE](#)



## Want to see our solutions in action?

Our solutions are used in many commercial buildings around the world to save energy and reduce carbon emissions. Here are some examples of what we've helped customers achieve:

In Dubai, one customer unlocked energy savings with simple pump swaps. They went from pumps that used to consume 36 kW/h to intelligent pumps that used between 7-10 kW/h. After two years in operation, they use 81% less electricity than before<sup>11</sup> – and the payback time on the investment was just eight months.

When one of Europe's largest indoor arenas opened in 2014 in Krakow, Poland, Grundfos pumps were part of the setup. These included the Multi Hydro-E booster system, MAGNA3 circulators and TPE3 pumps. The pumps have helped save energy, especially during large-scale events<sup>12</sup>, where the arena needs to use water efficiently and sustainably.

In Denmark, our all-in-one MIXIT mixing loop solution helped a customer optimise heat control. Usually, this is done with a mixing loop that consists of a pump, valves and sensors, but the customer replaced their old setup with the MIXIT solution to achieve intelligent control and connect to their automated Building Management System. The MIXIT units have made it possible for the company to reduce annual CO<sub>2</sub> emissions by 3,000 tonnes a year<sup>13</sup>.

And in Ireland, we've helped several customers save money and improve Delta-T challenges. In one case, we replaced fixed-speed pumps with intelligent MAGNA3 and TPE3 pumps, which has helped reduce electrical usage by 70-80%<sup>14</sup>. We've also helped a five-star hotel with a new cooling system. With variable-speed pumps, the hotel's cooling system is now more efficient and easier to control.

If you're interested in reading more about these cases or want to explore some of the other customers we've helped with our solutions, please visit [grundfos.com](https://www.grundfos.com).



## Sources

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