Grundfos E-pumps: Superior value for the sustainability agenda

Combining energy efficient pumps, motors, drives and controls into a solution that adds more value, more efficiency, more energy savings and a lower carbon footprint.

While many component suppliers can deliver energy efficient pumps, motors or drives, Grundfos is the only one who develops, designs and manufactures all of these elements and puts them together into one compact solution: the E-pump. Furthermore, Grundfos designs its E-pumps specifically for applications in industrial processes, buildings and water supply.

With their superior efficiency paired with Grundfos iSOLUTIONS digital cloud connectivity, E-pumps offer a major opportunity for energy and carbon savings. They can also benefit overall system performance.

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Possibility in every drop

"If we look at the world today, water plays a critical role in just about everything, and pumps are at the heart of moving and managing water. It is difficult to imagine making a more sustainable operation without considering the pump."

Julián Trascasa Caño,
Vice President, Industry Solutions & Marketing, Grundfos Industry.

Introduction

Customers are calling for climate action – from manufacturers, water utilities and building owners. Shareholders want it. The United Nations' climate reports continue to give dire warnings – *"Every tonne of CO_2 emissions adds to global warming,"* says a headline in the 2021 report, recommending urgent action.[1] The UN Sustainable Development Goals (SDGs) are driving that action.[2]

In response, companies all over the world are pursuing new ways to be more sustainable. They are forming new visions and strategies based around the SDGs. They are pledging bold CO_2-reduction targets and energy-saving goals. While there are many low-hanging fruits in ways to save energy and cut carbon, there is a major, often overlooked opportunity for nearly every factory, building or utility: the pumps, their processes and the potential for savings.

"If we look at the world today, water plays a critical role in just about everything, and pumps are at the heart of moving and managing water.. It is difficult to imagine making a more sustainable operation without considering the pump," says Julián Trascasa Caño.

"Pumps are integrated into our homes, factories, data centers, water treatment plants, in fact pretty much everywhere. They are usually hidden, so we don't think about them. Pumps use a lot of energy, which is directly related to carbon emissions and climate change. When you move from a standard pump to an integrated pumping solution you unlock a lot of value."

Electronically controlled pumps – known as E-pumps – offer a unique and superior potential for energy savings, cut large amounts of carbon emissions and improve pumping systems overall.

Danish consulting engineering company Rambøll declared that pumps will *"play a major role in the sustainable society of the future."*[3] With this paper, we want to show how Grundfos E-pumps with iSOLUTIONS can be part of that future in sustainable manufacturing and smart cities.

Case:
UK Distillery

"The number of improvements that we can create from such a small change is pretty extreme," says Scott Curran, maintenance team leader at William Grant & Sons' Girvan Distillery in Scotland, after installing Grundfos E-pumps for boiler feed.

Whiskey distillery uses E-pumps for boiler feed for massive system improvements

Commercial whisky production relies heavily on steam. William Grant & Sons' Girvan Distillery in Scotland was having a problem with its steam quality. This was because plant operators had to control the levels manually. This wasted energy and affected the whiskey production negatively.[5]

The company replaced its fixed speed pumps on the boiler with Grundfos E-pumps automatically controlled the level in the steam boilers, going up and down in speed depending on demand. At the same time, digital E-pump functions reduced other complex system operations.

"The number of improvements that we can create from such a small change is pretty extreme," says Scott Curran, maintenance team leader at William Grant & Sons. The company saved 40% energy with the pumps, and up to 6% savings on boiler gas usage.

"Grundfos E-pumps automatically controlled the level in the steam boilers, going up and down in speed depending on demand. At the same time, digital E-pump functions reduced other complex system operations."

Case at William Grant & Sons' Girvan Distillery, Scotland

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A row of Grundfos TPE E-pumps for heating at the MVM Dome in Budapest, Hungary.[6]

From old to innovative pumping technology

Electric motors consume about half of the world's electricity,[6] and pumps use around 20% of that.[7] Therefore, pumps consume about 10% of the world's electrical power. In Europe alone – the world's third-largest electricity consumer behind China and USA – pumps consume 300 terawatt hours (TWh) per year – or the equivalent to 30 coal-fired plants.[8]

By improving efficiencies around pump systems – pumps, motors, drives, controls – we can reduce large amounts of energy consumption to help meet carbon emission targets. How is this possible?

Take an application like cooling or heating, in which the flow requirement changes depending on the demand. *"Old solutions use valves to decrease the flow,"* says Professor Anibal Traça de Almeida, Department of Electrical Engineering and Computers, University of Coimbra in Portugal.[9]

Thus, the pump is going at full throttle, but the operator can open valves to let out some of the liquid and pressure in the pipes, slowing down the flow. *"But this does not save energy on a pump that is going at full power,"* says Almeida. "To use a valve makes as little sense as driving a car with one foot on the accelerator and controlling the speed with the brake. Nobody does that."

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.

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"If you decrease the flow in a pump to 80%, you only need roughly half the power."

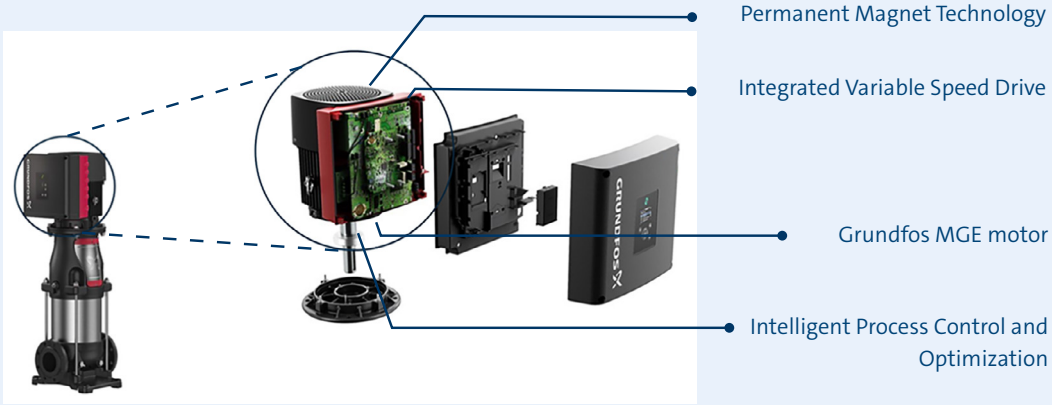
Professor Anibal Traça Almeida,
Dept. of Electrical Engineering and Comupters,
University of Coimbra, Portugal.

Electronic VSDs slow down or speed up automatically according to the application's demand, producing energy and environmental savings in variable flow, pressure or temperature applications such as heating, cooling and water supply when compared with other conventional technologies[10]. Additionally, VSDs bring process improvement.

Grundfos E-pumps integrate the VSDs inside a Grundfos MGE pump motor, bringing built-in intelligence and premium efficiency. But Grundfos does not stop there as it also integrates other components like controller and sensors into Grundfos E-pumps.

"Our approach is not just making great pumps or motors or VSDs or sensors," says Morten Gylling, Multistage Product Director in Grundfos. *"We have competitors who can do good pumps, good motors, good VSDs. But Grundfos is the only solutions provider that puts it all together into one unit.*

"To become world class, you need a world class pump, a world class motor, a world class drive, world class sensoring technology and world class algorithms to adapt to the specific application. That's why we put our efforts into developing and mastering all these technologies and their ideal interactions."



Grundfos CRE pump

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Case:
UK OEM fuel polishing systems

Richard Massara of WASP, an OEM producing fuel polishing systems in the UK, says Grundfos CME E-pumps use 75% less energy than the previous pumps the company used in its systems. *"It's more than just a pump for us. We're running all of our sensors and feedback into this unit. Although we were aware of intelligent and variable speed pumps, we weren't aware of their capabilities."*[11]

EU moving toward pump system efficiency legislation

The European Union is in fact updating its Eco-Design directive from 2009, which considers minimum efficiencies for the pumps alone. A proposed legislation will require minimum efficiencies of the combined system of pump, motor and VSD. This is called the Extended Product Approach.

This approach focuses on optimising the energy consumption of the full pump unit in the actual flow system it is intended to operate, in this way only using the electrical energy necessary to operate at the desired flow.

The potential energy savings by this approach are enormous, according to Europump, the European pump association. A Europump Eco-Design study found that if pumps were looked at in isolation to trim their electrical consumption, they would save 5 TWh in Europe by 2030. But with an Extended Product Approach, they would save between 35-43 TWh/year or more.[12]

The digital layer

Grundfos E-pumps are part of the Grundfos iSOLUTIONS digital universe, combining intelligent pumps, cloud connectivity and digital services to create a full system approach. Together, E-pumps and iSOLUTIONS enable real-time monitoring, remote control, fault prediction and system optimisation.

Grundfos iSOLUTION systems like Smart Filtration Suite, iRO (Intelligent Reverse Osmosis) or Condition Monitoring are fundamentally software-based to help operate plants in a better, smarter way. But they need E-pumps to get the full benefits of these software solutions and advanced algorithms.

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Case:
University Hospital Brussels, Belgium

In 2012, the University Hospital Brussels, Belgium, planned to grow 40% over the next decade without letting energy consumption grow. It replaced 217 pumps with Grundfos E-pumps in its heating system, among other initiatives. Savings: more than 643,000 kWh per year, corresponding to about 65,000 euro and 140 tonnes of CO_2/year. *"We will earn back all the money spent on pumps in four years,"* says Energy Engineering Manager Jimmy Van Moer. *"Some of the pumps consume up to 80% less than their predecessors."*[13]

When running a manufacturing facility or a business, processes must be operating in the most optimal manner with the uptime and efficiency required, not only reducing consumption and emissions but also impacting positively in the operation of multiple products. This is also about using resources such as water, energy, and chemicals as wisely as possible. Grundfos Electronic pumps (E-pumps) paired with system integrated iSOLUTIONS enable that to happen, resulting in significant savings and waste reduction.

"Also, the more intelligence that goes into managing a process, the more your people can actually focus on adding value in other places, as opposed to spending time monitoring what is happening in the pump," explains Julián Trascasa Caño.

"With efficient and optimised operations, you're unlocking creative and operational potential to do other things, so you add more value to your business."

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"Grundfos estimates that the yearly avoided CO_2 emissions from E-pumps in 2020 alone was 270,000 tonnes."

"E-pumps and motors are known to improve the efficiency of the entire system, but also help in reducing energy consumption, and helping us mitigate climate change," says Jimm Feldborg Head of Product Develepment IND. *"This is what we push further to the benefit of our customers and end-users in reducing cost and CO_2 emissions. We at Grundfos are proud to pioneer in creating the digital products and solutions of the future."*

Grundfos estimates that the yearly avoided CO_2 emissions from E-pumps in 2020 alone was 270,000 tonnes.[14]

IE5 efficiency and the system approach

Grundfos E-pumps are rated IE5, or Ultra-Premium Efficiency, the highest efficiency under the International Efficiency (IE) standard rating system for motors. These IE codes serve as a reference for governments who specify the efficiency levels for their minimum energy performance standards for motors in their respective countries.[15]

While the market standards or requirements are at IE3 level, Grundfos offers superior efficiency with its IE5 motors, which in reality exceed the IE5 efficiency requirements by as much as 2%.[16]

"Our aim is not just to obey legislation," says Morten Gylling. *"Our technology allows us to go above that. And that's why we do it."*

Case:
Danish Brewery

Carlsberg's Total Water Management plant treats and purifies the factory's process water, sending 90% of it back to be reused as process water.

Carlsberg taps into process water reuse with onsite treatment.

Carlsberg brewery wants to cut its water use by 50% by 2030. In its production facility in Fredericia, Denmark, Carlsberg has developed a Total Water Management treatment plant. The onsite facility treats used process water, purifies it to drinking water quality and sends it back to the brewery to be reused as process water. The plant recovers and reuses 90% of its process water. Grundfos E-pumps play an important role.

This has been a dream for us says the company's brewing director.[17]

Carlsberg's Total Water Management plant at its Danish brewery

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This system, powered by Grundfos E-pumps, treats wastewater from a Grundfos CED surface-treatment application with a series of filters and reverse osmosis. It then sends the cleaned water back to the CED unit for reuse.

Conclusion

As Grundfos customer and end users attest, E-pumps offer superior value for their sustainability agenda. Grundfos E-pumps and iSOLUTIONS combine energy-efficient pumps, motors, drives and controls into a system solution that adds more value, more efficiency, more energy savings and a lower carbon footprint.

“In addition to having good and capable people in your organisation, it’s also natural to want to draw upon and benefit from best practices from around the world," says Julián Trascasa Caño and concludes:

"At Grundfos, we apply best practices and our application knowledge to create Grundfos iSOLUTIONS and pair these digital solutions with our E-pumps. Not only is your system optimised, but we are also bringing industry best practices into new solutions that will further benefit your business and processes.”

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