

PUMPED UP

INNOVATING MATURE PRODUCTS

When you think of smart products, you probably think of phones or other consumer devices – but not industrial machines. Today Denmark-based Grundfos, a world leader in designing industrial pumps, is changing that. Dimensions spoke with Senior R&D Manager Jakob Vernerisen about how the company is differentiating itself in an increasingly competitive market through new digital functionality and increased energy efficiency – all to deliver added value to its customers.

DIMENSIONS: Grundfos has been a world leader in designing industrial pumps since 1945. What business challenges do you face today?

JAKOB VERNERISEN: It is a great challenge to ensure the world's best energy-efficiency and robustness in our products. That is the goal for both our product development team and our entire company, which has a well-known commitment to sustainability. Pumps account for 10 percent of the world's electrical energy

consumption, which means Grundfos can make a huge impact on quality of life and environmental sustainability simply by improving the energy efficiency of the 16 million pumps we manufacture each year. At the same time, we can save money for our customers by reducing their energy costs.

Another strategic goal at Grundfos is to continuously increase the overall performance and reliability of our product designs, so our customers can minimize their

operating and maintenance costs over the life of a pump. The pump market is becoming more crowded every year as up-and-coming businesses learn how to manufacture basic products designed to serve the global market. We need to create next-generation product designs that deliver more customer value than our competitors' products.

DIMENSIONS: How is Grundfos leveraging its engineering talent to respond to these business challenges?

JV: While these requirements place pressure on Grundfos, they also create an opportunity for our company to innovate and move beyond the accepted, mature pump designs that have been in use for decades.

With over 1,000 employees at Grundfos focused on research and development, we are embracing the challenge of making industrial pumps more energy-efficient and reliable by making them more automated, more intelligent and more digital. By leveraging our 70-plus years of industry experience and our advanced engineering technologies — as well as state-of-the-art electronic components — our goal is to add new customer value and differentiate our products. By introducing a new generation of pumps with more digital functionality, we can rewrite the rules of the pump market and maintain our historic market leadership.

DIMENSIONS: How exactly do you make an industrial product like a pump “smarter”?

JV: Unlike a consumer product, where engineers sometimes focus on adding cool new features just to keep the brand trendy or fashionable, our added electronics must add practical value and serve real-world needs.

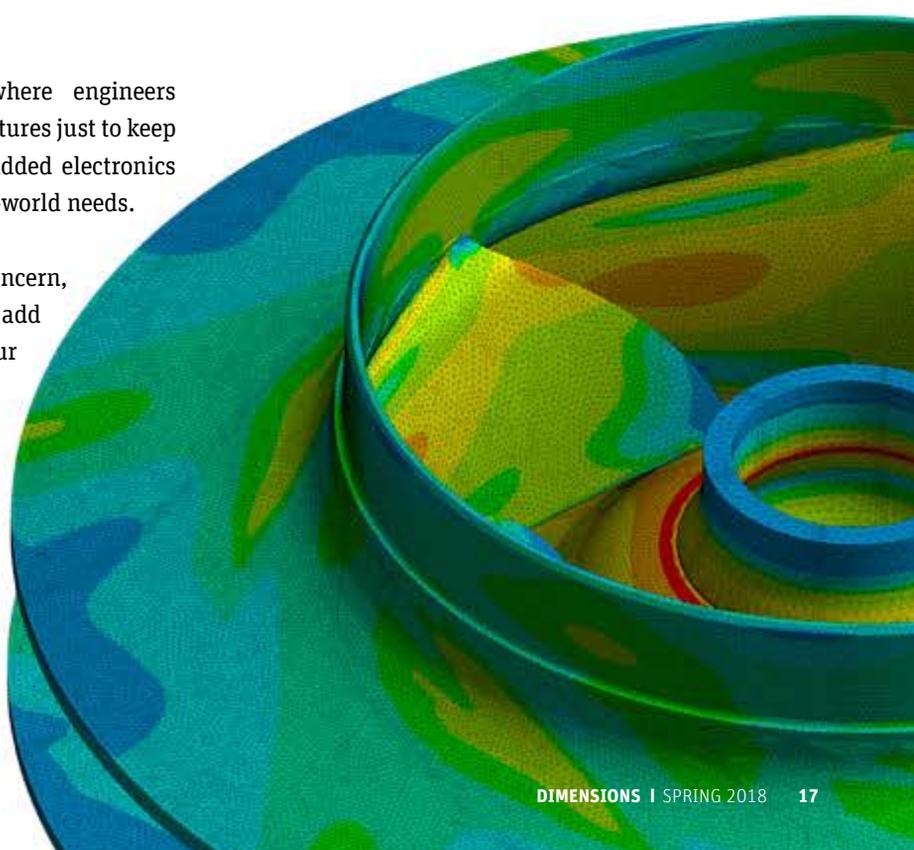
Since energy efficiency is our primary concern, most of the digital functionality we add focuses on energy consumption. Our pumps are designed to be more self-adjusting, so they can intelligently adjust their operation to changes in demand. Since many of our pumps operate in remote locations, we develop digital interfaces that make it easier for humans to monitor and control all aspects of pump performance, including their energy consumption.

Our pumps are becoming more self-aware, so they can monitor and adjust their performance as conditions change. By responding automatically to issues like high pressure, high temperatures, low flow rates and water leakage, our products can maintain high levels of performance and energy efficiency with little to no human intervention. They can also signal when preventive maintenance is needed to address an emerging issue. All this added functionality is aimed at fulfilling our goal of minimizing maintenance and extending the life of our products.

DIMENSIONS: How is Grundfos applying advanced technologies, including engineering simulation, to support product differentiation?

JV: Grundfos has relied on engineering simulation since the 1980s to design and troubleshoot our products in a virtual environment. We achieve significant results from simulation by reducing the number of prototypes we need to produce. In fact, for just one new pump design Grundfos was able to cut 30 percent in overall development time and achieve significant savings in physical prototyping costs.

However, some of the greatest benefits of simulation are hard to measure. By applying simulation at a very early stage — which is often referred to as digital exploration — we can arrive at some extremely innovative ideas without incurring a lot of risks or expense.



Product concepts that prove too expensive to manufacture or have other drawbacks can be discarded easily. The earlier we can assess a product design, the more strategic choices we can make in terms of performance features and final product cost.

Simulation brings our entire engineering organization together in a collaborative design environment. By leveraging a common, easy-to-use technology platform like the one from ANSYS, everyone can play a role in product development, no matter their physics discipline or their specific training. From experienced simulation specialists to design engineers, various groups at Grundfos can participate in simulation-driven product development. Electrical engineers working on digital functionality are using the same technology platform, and accessing the same data, as hydraulic engineers. This accelerates the pace of our innovation and ensures that our product solutions are creative because so many perspectives are considered.

Simulation

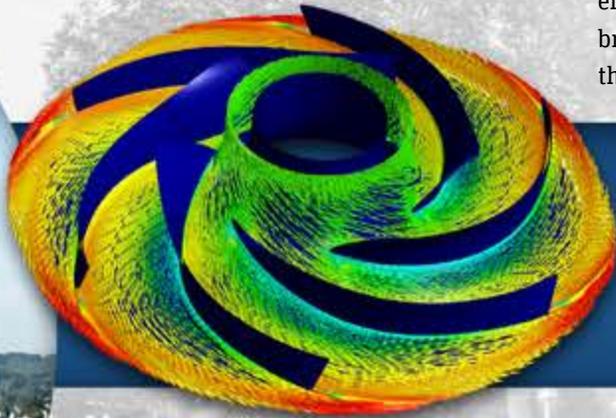
brings our entire engineering organization together in one collaborative design environment.

DIMENSIONS: As a longtime user of simulation technology, what do you see as the future of simulation-driven product development?

JV: Our business challenges become more complex every year, as we try to eke out every bit of performance improvement in terms of our products' energy efficiency. Simulation technology has responded to those challenges with system-level simulation capabilities, faster solution times and other enhancements that enable us to predict and optimize the energy efficiency of our pumps over time and under a wide range of operating conditions. Simulation software has also improved in its ability to consider production requirements simultaneously with product performance — and this kind of integration is a necessity as Grundfos seeks to combine lower costs with higher product functionality. Overall, we've been pleased with the way simulation technology has evolved to help us launch more complex, value-added product designs while still launching new offerings rapidly and cost-effectively — which is critically important as our global competition continues to grow.



Today, Grundfos is also increasingly relying on simulation to minimize maintenance requirements, reduce warranty costs and extend the working life of our products. Grundfos is currently exploring the concept of creating digital twins of our pumps as they operate in the field via engineering simulation. By placing sensors on installed machines and collecting performance data in near real time, we can simulate a working pump under actual field conditions. This will help us study and improve such key metrics as energy efficiency.



JV: Grundfos is a leader in a mature market, with well-established pump designs that have been in place for decades. We cannot maintain our global leadership with incremental improvements; dramatic innovations like highly digitalized products that change the industry are required. We are not going to get there with legacy engineering tools and processes. In the same way that we apply the latest thinking and the most sophisticated technologies to our pump designs, we must equip our global R&D group with the newest, best-in-class engineering tools. We will never arrive at groundbreaking product improvements unless we engineer them in a groundbreaking way. 

*Grundfos is currently exploring the concept of creating **digital twins** of our pumps as they operate in the field via engineering simulation.*

It also allows us to predict any issues such as vibration, leakage and wear — and schedule preventive maintenance to extend the product's life. Our product development team can use this operating data from the field to inform future pump designs.

We are in the very early stages of exploring the concept of the digital twin with ANSYS and its partner in Denmark, EDRMedeso, but we believe this could have a significant impact on our ability to serve our worldwide customers and further differentiate Grundfos. Many of our product installations are difficult to access and service, and downtime can be very costly. So it makes a lot of sense to monitor performance remotely and identify any issues. Right now, we are in the process of mounting sensors and collecting operating data, and we are in the very early stages of creating product simulations that are informed by this data. The biggest challenge is figuring out how to gather, manage and apply the large volume of information we have.

DIMENSIONS: Why is it so important for Grundfos to invest in the most advanced engineering technologies?

About Jakob Verner sen

Jakob Verner sen is senior R&D manager in the technology and innovation organization of Grundfos. He holds university degrees in mechanical engineering and technology management, and has 12 years of R&D experience, particularly within the fields of mechanics and computer-aided engineering. He has a lead strategic role in the digitalization of product development at Grundfos.



Grundfos at a Glance

2016 revenues: 24,677 DKKm

Number of employees: 18,000

Headquarters: Bjerringbro, Denmark