

**DIN Forsyning, Esbjerg | Denmark**

DIN Forsyning is a danish multi-supply company in Varde Municipality and Esbjerg Municipality that supplies drinking water to the cities in the region.



## Esbjerg reduces energy consumption by over 15%

At the hub in Holsted, Denmark, the latest generation of Grundfos SPE pumps has replaced SP pumps that were more than 25 years old but still going strong. The SP pumps have pumped up more than 60 million m<sup>3</sup> of water over the years. The advantages offered by the new generation of high-efficiency pumps with permanent magnet motors made the decision to replace the old submersible groundwater pumps easy.

The strategy for DIN Forsyning in Esbjerg, Denmark, is green – and the goal is 30% higher energy efficiency by 2030. Operations Coordinator Palle Kragh Rühle is therefore looking for any energy savings he can find for the Esbjerg water supply. Even small savings add up to a lot of money when you pump 9 million m<sup>3</sup> of water each year. But the savings from the latest investment are anything but small. Energy consumption of almost 600,000 kWh per year at the hub in Holsted will be reduced by 15-17%.

“The bores were drilled in the mid-90s, and fitted with contemporary

50 Hz motors without the option of regulating output,” Palle explains. “It’s 32 km from Holsted to Esbjerg, so two 400 mm PE pipelines were installed to transport the water to Esbjerg, with a booster station along the way. When the hub had been in operation for a few years, we experimented with bypassing the booster pumps, and I found that we could save over 100,000 kWh a year.”

But this meant that the SP 46-4 pumps in Holsted were not able to deliver the nominal output of 46 m<sup>3</sup> per hour due to back pressure in the pipeline. The output was only around 35 m<sup>3</sup>, but if more water was needed, the booster

pumps were standing by. DIN Forsyning decided to separate the two pipelines, so that one is dedicated to water from a new hub at Brørup, and only one pipeline transports water from Holsted. This raises energy consumption in Holsted by 0.03 kWh/m<sup>3</sup>. However, Palle is happy to pay this in exchange for the protection against contamination that the separation offers.

### **Reality exceeds expectations**

Around 6-7 years ago, Palle began hearing about the first Grundfos trials using permanent magnet motors for submersible groundwater pumps. Highly experienced Grundfos Sales



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Engineer Poul Bøgelund Johansen, reported that several years of positive experience with dry CR pumps with IE5 permanent magnet motors could be transferred to mass production of submersible pumps – making the price competitive.

Palle and Poul monitored developments closely over the following years. If the SPE pumps met expectations, they would be the perfect choice for Holsted. Almost 2.5 million m<sup>3</sup> of water is pumped up around the clock from 10 bores every year, so the combination of a very energy-efficient motor and flexible output regulation led to hopes of substantial energy savings.

“Poul and I each made our own calculations. He arrived at 10.7% and my results predicted 11%, and that was enough for me to see that the investment would quickly pay for

itself,” says Palle, who has since found that the actual results are much better. The latest report says 15%, and both Palle and Poul expect that the fine-tuning to be done over the coming months will increase the savings to around 17% annually.

#### **Adjustable from 15-20 m<sup>3</sup> to 60 m<sup>3</sup> per hour**

Palle was a little nervous that the 18.5 kWh 4-pole 100 Hz motors in the ten SPE 46 pumps, with 6 pressure levels, may have been overkill. “But they aren’t,” he reports. “The motor speed and output can be greatly reduced without compromising efficiency, so we have an extremely flexible solution.”

Poul notes that flexibility will be an important parameter in the future for many waterworks, which need to pump water in varying quantities from different hubs. “The SPE solution covers

a range from 15-20 m<sup>3</sup> to 60 m<sup>3</sup> per hour,” says the sales engineer.

Palle has set up a hub in Holsted, with an advanced control system that ensures smooth water extraction with very few starts and stops and variable adjustment between 30 and 46 m<sup>3</sup> per hour. “We have set limits for how much we can lower the water level in the bores, as it makes a big difference to energy consumption whether you pump water up from a depth of 5 or 20 metres. The control system measures pressure, power consumption and flow for all bores, so we know exactly how many kWh are used per m<sup>3</sup>. I can monitor this via the SCADA system, and I do a lot of fine tuning. If we raise consumption from just 0.15 to 0.18 kWh per m<sup>3</sup>, it makes a big difference to costs.”

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#### **Payback period: 2½-5 years?**

“We have performed many calculations on the potential for savings since the SPE pump was launched. These have often shown a payback period of 5-10 years, but with today’s skyrocketing electricity prices, it’s not unrealistic that we might see an investment in SPE pumps recouped through energy savings in just 2½-5 years,” says Poul, who bases his calculations on figures from a number of utility companies.

The payback period is even more positive in light of the fact that Poul expects the new SPE generation to have a long lifetime – even longer than the robust SP predecessors.

“SPE pumps are simply made from the best components Grundfos has available,” says the experienced sales engineer. He notes that permanent magnet motors have a rotor loss close to zero, which increases efficiency and extends service life because the operating temperature is lower. “The pumps are also fitted with a very robust bottom bearing and reinforced shaft seals, so we have great confidence in the motors’ longevity,” says Poul. “As a result, Grundfos decided to extend the warranty to five years from 1 June 2022.”

In Esbjerg, Palle and his team look forward to many years of working with the Grundfos SPE 46 family on a daily basis, because drilling, electrical systems, setup, installation, service and repair are all handled internally. “We don’t just do routine tasks. You have to feel that you’re part of the whole project. This builds professional pride and gives a sense of perspective. We are a high-tech company – which needs to save energy,” says the operations coordinator and water supply specialist, who ensures that all staff have in-depth pump knowledge through training courses and close contact with Grundfos.



*Palle Kragh Røhe, who is Operations Coordinator at DIN Forsyning, inspects the facility in Esbjerg*



## Facts about Grundfos SPE pumps at DIN Forsyning in Esbjerg

- **Ten Grundfos SP pumps** have been replaced with Grundfos SPE 46-6 submersible pumps
- **Approx. 2.5 million m<sup>3</sup>** of water is extracted annually
- **Annual energy consumption** of 600,000 kWh at the bore
- **Expected energy savings** of approx. 15-17%
- **Flexible, high-efficiency pump operation** with output of 15-60 m<sup>3</sup>/hour for each pump

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