

LOWER SPECIFIC ENERGY AND RELIABLE FLOW ESTIMATES IN WASTEWATER NETWORK



"It pays off to work closely with suppliers. We gain much more than just setting up and running a pumping station," says Casper Højlund Koch, wastewater network manager at Provas.

THE SITUATION

Provas, the municipal utility company in the city of Haderslev in southern Jutland, Denmark, is in charge of handling drinking water, wastewater, and waste management. Like many other utility companies, Provas needs to reduce its operating costs to make room for future investments. Saving energy at its 150+ network pumping stations will help Provas reach this goal. Provas, however, also has another challenge that must be addressed.

Following a network restructuring project, wastewater from all four corners of the municipality is transported up to 60 kilometres to Haderslev for centralised treatment. Large amounts of infiltrating water swell the water volume in the pipes to around 10 million m³ a year. As Provas only gets paid for handling 2 million m³, this is bad for business. Solving the problem requires a detailed overview of flow patterns at every single pumping station. This could

be achieved by installing external flow meters, but as this would be a major investment, Provas started looking for other options.

Provas was interested to know if modern pump control technology could provide a solution. "Knowing how our pumping

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- Casper Højlund Koch, wastewater network manager, Provas



Read more about Dedicated Controls [here](#). "It's really important that we draw on each other's strengths and find good cooperation partners like Grundfos. In the long run, we will really benefit from this!" - Casper Højlund Koch Wastewater Network Manager, Provas

stations perform, and at what price, is essential if we don't want to be swamped in operation costs", says operations manager Erik Jørgensen of Provas. "We want to spend as little time as possible inspecting them. And when they do run, they should do so at the optimal duty point so they spend as little energy as possible". The company therefore launched a test project in close cooperation with Grundfos in order to save energy and get detailed flow data at pumping station level.

THE SOLUTION

Provas and Grundfos decided to test if the Dedicated Controls pump controller from Grundfos could solve both issues. The controller, which can be used for network pumping stations and main pumping stations, has a number of standard features for normal pump control (such as pump start/stop, pump alternation, overflow measurement, and alarms and warnings), but it also has several advanced features for wastewater transport.

The energy optimisation feature optimises the duty point for pumps with frequency converters, reducing specific energy. The feature is continuously recalibrated so that pump wear and other installation conditions do not adversely affect pump efficiency.

The flow estimation feature calculates pumping station flow inde-

Topic: Flow estimates and energy optimization in network pumping stations

Location: Haderslev, Denmark

Company: Provas (refuse, water and wastewater utility)



Advanced features include energy optimisation (for pumping stations with built-in VFDs) and a flow estimation feature

pendently of pump speed. Like the energy optimisation feature, the flow estimation feature is continuously recalibrated to ensure the greatest possible accuracy.

These two Dedicated Controls features were tested for three months. The flow estimation feature calculated the flow at three pumping stations around Haderslev, and the results were verified using existing, external flow meters. In addition, the energy optimisation feature was tested on the wastewater pumps at one of the pumping stations.

HOW IT WORKS

The energy optimisation feature in Dedicated Controls can assist the operational staff when setting up the pumps, and it can automatically adjust pump frequency depending on operating conditions. This means optimised specific energy, and the lowest possible energy costs for the utility company.

“If there’s enough water in the well, the controller can analyse all pump motor operating frequencies using a sweep function and display the correlation between frequency and specific energy,” explains sales engineer Finn Dalsgaard Nielsen of Grundfos. “You can then quickly and easily find the frequency that provides the lowest possible specific energy; this feature is meant to guide the user during initial set-up of pump motor frequency. Once the pump is running, Dedicated Controls constantly monitors specific energy consumption and adjusts the frequency to match actual operating conditions. You could also use this feature for the initial setting if the water level in the well is low”.

The flow estimation feature estimates wastewater flow based on well water level, output pressure, and operational data from the pump. “The feature is not dependent on wastewater input flow in the well, and it is able to calculate the flow even at varying pump speeds,” says Finn Dalsgaard Nielsen. Like the energy optimisation feature, the flow estimation feature is automatically recalibrated to compensate for pump wear and therefore always provides accurate estimates.

THE OUTCOME

After three months of testing, the results were clear: Specific energy was reduced by 36% at one of the three pumping stations, and the flow estimates at all three stations were correct within a 5% error margin; good enough for Provas to use in daily operations and long-term planning. “Given the amounts of water we deal with, tiny differences don’t matter very much. Estimates are fully adequate”, comments Erik Jørgensen. The estimates also

enable much better operations planning. Dedicated Controls allows the operator to monitor specific energy consumption over time, making it possible to plan cleaning and maintenance in order to optimise system energy consumption. “Maybe we only need to use the cleaning pig once every six months instead of every month,” says Casper Højlund Koch. “That means that we can use our man hours elsewhere where they are needed more”.

The results achieved indicate that Provas can reap a number of benefits by using Grundfos pump controller technology:

- The company stands to gain operational savings (lower specific energy, no need to install expensive external flow meters, reduced demand for onsite inspection through fact-based maintenance planning, and opportunities for reducing infiltrating water in network).
- The company gets a better system overview (detailed flow estimates for every pumping station, opportunities for identifying local issues quickly, and pinpointing sources of infiltrating water).
- Project plans can be based on actual operating data and flow estimates rather than generic computational models.

Both Erik Jørgensen and Casper Højlund Koch are satisfied with the way the project was handled. “Our cooperation with Grundfos was good, as always,” says Erik Jørgensen. “Both parties were focused on reaching a good result”. Casper Højlund Koch also views the successful cooperation as a central aspect of the project that has improved system efficiency.

“Of course, the technical aspects are important, but I tend to think that it’s the process itself that is the most interesting”, he says. “It’s really important that we draw on each other’s strengths and find good cooperation partners like Grundfos. In the long run, we will really benefit from this!”

GRUNDFOS SUPPLIED:

Energy optimisation and flow estimates for Provas’ pumping stations using [Grundfos Dedicated Controls](#).