

Improve wastewater plant reliability with full-system integration

By Justyn Barnes

Modern wastewater management demands an intelligent, proactive approach. Grundfos iSOLUTIONS goes beyond the pumps alone to deliver intelligent controls and communication capabilities that help the system adapt automatically to dynamic conditions.

Traditional wastewater pumping stations had fixed-speed pumps with simple on-off controls, but times have changed. Pumping stations are still designed for peak-demand situations, but speed-regulated pumps have become increasingly important as energy prices have risen. In addition, operators have more to oversee.



Image: Grundfos packaged lift station installation

“In the old days, wastewater treatment focused on a centralised – and urbanised – approach, which meant that wastewater from cities was treated in local plants,” recalls Torben Silberg Poulsen, Global Product Manager, Drives. “More remote areas had separate wastewater collection systems, such as septic tanks disconnected from the municipal treatment network. Now a new paradigm has evolved. Every building, farm or industry must be connected to the municipal wastewater treatment network in order to treat wastewater. This means more pumping stations, a larger and more-extended pipe network and, most important, a need for continuous surveillance of the network in order to control the flow of wastewater.”

Integrated system solutions

The Grundfos iSOLUTIONS [system approach to wastewater management](#) can meet these new demands. Torben Silberg Poulsen says, “We have much more to offer than just pumps – such as controllers, communication units, Grundfos Blueflux® high-efficiency motors, sensors, etc. We provide customers with integrated system solutions.”

Grundfos iSOLUTIONS combines Grundfos’s application expertise and pump intelligence to offer the following features:

- A reliable, integrated system solution, where the operator is in full control at all times
- High performance and energy efficiency
- The ability to monitor and control the system so that operators can plan maintenance and avoid costly, unplanned breakdowns, thereby reducing the total service cost.

Total control at all times

In wastewater systems, total control is crucial to ensure demands are met precisely all of the time. To achieve this, the Grundfos offers a Dedicated Control (DC) unit with many standard and application-specific wastewater functions, including flush and reverse operation.

“With our Grundfos dedicated control units, reliability and energy efficiency are our key objectives,” says Danny Staerk, Global Product Manager, Controls. “We aim to reduce unplanned maintenance to a minimum and optimise energy efficiency.”

The DC is expandable with I/O modules to ensure full application flexibility and may be integrated into any SCADA system via international standard communication protocols such as MODBUS RTU, Profibus DP and Ethernet.

It allows control of up to six pumps of any size and can regulate how many pumps are used at any time depending on the inflow to the pumping station and the capacity of the network.

“The DC control units also have 27 language options visualised in a large, graphical colour display,” adds Danny Staerk. “This is important, as we are often dealing with municipal authorities worldwide who need to ensure that local personnel can easily operate them.”

Grundfos Remote Management

The Grundfos Remote Management (GRM) client/server-based solution allows an infinite number of applications to be monitored by a single server.

“GRM delivers a complete overview of your whole system – its pumps, controls, sensors, etc., at all times in an efficient way,” explains Mikael Nedergaard, Grundfos Global Product Manager, Wastewater. “Site installation is simple too. GRM is all pre-configured – zero programming is required – so it takes just a matter of minutes to configure the communication set-up and product configuration.”

Proactive maintenance

“In talking to customers, we have learnt that operational reliability lies above energy efficiency in importance,” notes Mikael Nedergaard. “So to address this issue, the DC Grundfos wastewater controller has advanced functions to prevent problems before they build up.” (see Figure 1)



Figure 1) The Grundfos wastewater controller, DC, incorporates anti-blocking protection to optimize

For instance, the DC can help prevent a layer of grease building up on the walls of a pumping station with its start-level variation function.

Combined with the full drainage function, grease, sand, rags and fibres will be pumped out to keep the pumping station clean, ensuring steady and reliable operation. The DC’s possible daily flushing sequences at full pump speed prevent sedimentation in pipework as well.

“This comprehensive range of intelligent features will prevent many potential failures from occurring in the wastewater transport networks,” says Danny Staerk. “The controller measures in real time and will ensure the pumps stop before a breakdown can occur.”

Energy optimisation

Many Grundfos wastewater pumps are designed to have a flat efficiency curve. ‘This is ideal for wastewater applications and speed-controlled operation, since the duty point always varies,’ explains Mikael Nedergaard. “When we design and develop pumps and controllers, we aim for the most energy-efficient solutions to the benefit of our customers. And we look to develop supplementary services in the system to help achieve that.”

For instance, the Grundfos DC wastewater controller features a “minimum control” setting (see Figure 2). This energy-saving algorithm keeps pumps running at the lowest allowable frequency to maintain wastewater flow. This is particularly useful for applications where building pressure in the pipe causes excessive energy consumption when the pump starts.

Life Cycle Cost

Grundfos encourages potential customers to consider life cycle cost when choosing their wastewater management solution. Research published in the book *Pump Life Cycle Costs: A Guide to LCC Analysis for Pumping Systems* by Europump, the Hydraulic Institute and the US Department of Energy, shows the initial purchase price rarely accounts for more than five percent of a pump’s total cost over its lifetime (see Figure 3).

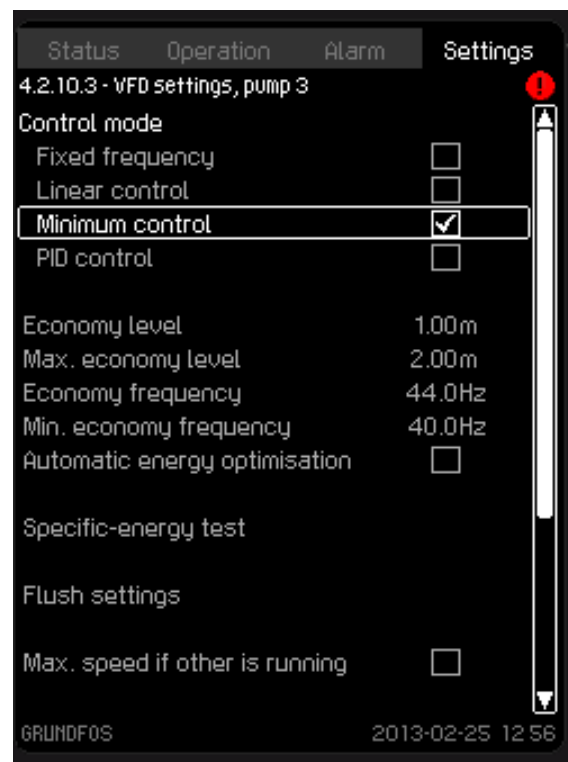


Figure 2) Selection of the “minimum control” on the HMI of the Grundfos DC wastewater controller.

Life Cycle Costs

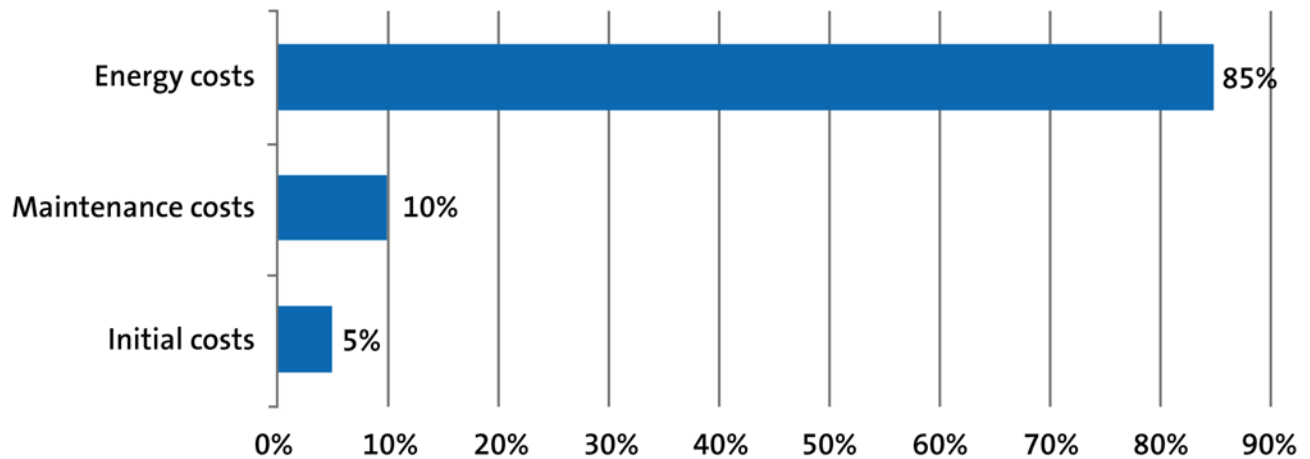


Figure 3) Energy costs account for 85% of total life cycle costs of a pump.
 Source: Europump, the Hydraulic Institute and the US Department of Energy.

Power consumption is by far the most significant factor at 85 percent of total expenses, while service costs are likely to be approximately ten percent.

“Clearly, energy-efficient operation should be a very high priority,” says Mikael Nedergaard. “Especially for larger pumping stations where the initial investment costs are relatively low compared to energy costs over the lifetime of the installation. This is where the Grundfos iSOLUTIONS approach offers great advantages.”

Take the example of a wastewater-pumping network in Lolland, Denmark. By replacing the existing on-off operation with Grundfos iSOLUTIONS, the plant saved 45% in its energy consumption.

Case study: Lolland, Denmark

Daily pumped volume	300 m ³ per day [55GPM]
Yearly pumped volume	109,500 m ³ [20,088 GPM]
On/off operation	With energy optimization
Energy used: 6,570 kWh	Energy used: 3,614 kWh
Pumped volume: 109,500 m ³ [20,088 GPM]	Pumped volume: 109,500 m ³ [20,088 GPM]
Specific energy on: 0.060 kWh m ³ / [0.33 GPM]	Specific energy on: 0.033 kWh m ³ / [0.18 GPM]

Energy save per year: 6,570 – 3,614 = 2,914 kWh (45%)

Figure 4) A wastewater plant in Lolland, Denmark achieved a 45% reduction in energy use by implementing the Grundfos iSOLUTIONS system approach.
 Source: Grundfos

Single supplier for maximum functionality

Grundfos can deliver reliable, energy-efficient performance because the company designs every component to work smoothly together.

“At Grundfos, we have used GeniBUS communication for several years,” explains Torben Silberg Poulsen. “More or less all of our products support this standard way of communication. That makes it easier to interconnect them when we are creating a combined system.”

As Grundfos can provide everything from pre-fabricated pumping stations to built-in sensors and motor protection, it is a one-stop shop, says Danny Staerk. By sourcing the entire solution from a single supplier, customers can get the most out of their system.

“You might buy our pumps, but if you buy a standard controller from a third party, then there is a risk that it won’t interface well with the system and your range of functions will be limited,” he says. “With our controller, we can do much more.”

About Grundfos

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