

# Small investment, big savings

Water companies looking to save on energy costs should take note of a new idea from Festo that is being trialled in Germany. **Martin Hunt** reports.

**THE LAST** two or three AMP periods have underscored the problems facing the UK's water industry, highlighting how utilities are stifled of innovation, face severe difficulties with long-term investment and planning, and are under constant pressure to reduce costs.

Currently, water utilities are constantly being challenged by Ofwat to reduce their energy consumption and carbon emissions through the application of innovative solutions, while at the same time responding to stakeholders' demands to combine profitability with environmental responsibility.

Given that water utilities' power costs look set to continue to rise inexorably, and that they are still only slowly investing in "green" technology such as anaerobic digesters, wind power generators and micro turbines, they urgently need to look for other energy-saving options within their existing plant. There is no magic wand or single solution to this, benefits will come from making many relatively small process improvements, which cumulatively and over time can account for significant savings.

One such idea from Festo, which has proven capable of delivering 2% energy savings year-on-year, concerns changing the type of check valves or non-return valves commonly used in wastewater treatment plants. The investment is modest, the savings are permanent, and payback is typically two years or less. The scheme is being trialled at the Sindelfingen wastewater treatment plant on the outskirts of Stuttgart, Germany, which serves a population of some 250,000. This plant has acted as reference site for Festo for more than ten years, where the check valve replacement scheme has now been in operation for about eight months.

At Sindelfingen, trickling filters are supplied with wastewater pumped from the pre-clarification tanks. These pumps are large and run for long periods daily, pushing wastewater through pipes – until recently, via check valves – to the filters. The plant has six pumps, between three and five of which will be operating at any one time, with one held in reserve.

Each pump is rated at 90kW and produces a flow rate of 500l/s with a delivery

head of 8m to 9m. However, a major disadvantage of check valves – which usually comprise a flap counterbalanced by a heavy weight on a lever arm – is that they require a certain fluid pressure to open, which then has to be maintained to keep them open. This represents "lost" energy, which over time accounts for significant operating costs.

Festo's solution is to replace each check valve with a knife gate valve (KGV) driven by a pneumatic actuator, using an air cylinder reservoir to provide back up in the event of power failure. This means the pumps no longer have to work against the hydraulic resistance of the check valve, making the process more energy efficient. The energy required by the air reservoir pump is negligible – a small 1kW motor provides occasional top-up when needed.

At Sindelfingen, all six check valves have been replaced with KGVs driven by Festo DLP series linear pneumatic actuators. The actuators are controlled by direct mounted NFV3 Namur valves, which are controlled by the site's PLC, enabling the opening and closing of the KGVs to be directly synchronised with pump operation. The system is designed to be failsafe; a pump cannot start if the associated KGV is closed.

The energy savings achieved by this approach are considerable, amounting to 89,469kWh a year. This equates to an annual 2% energy cost reduction, or more than £10,350. The cost savings will be even greater if the pumps are run for longer periods. These direct energy cost savings are not the only advantage of using Festo's solution. In systems fitted with check valves, when the pump is not in operation, gas bubbles produced by micro-organisms build up at the valve, preventing automatic pump start-up. The check valve consequently has to be operated manually to disperse the gas bubbles before the pump can be started, which is a manually intensive and time-consuming procedure.

The KGVs, on the other hand, open in synchronism with the pump starting, and any gas bubbles are displaced by the action of the knife gate being withdrawn. When check valves close, water hammer effect often causes severe vibrations in the pipe systems, eventually leading to permanent damage; this effect is eliminated by the controlled closing function of KGVs.

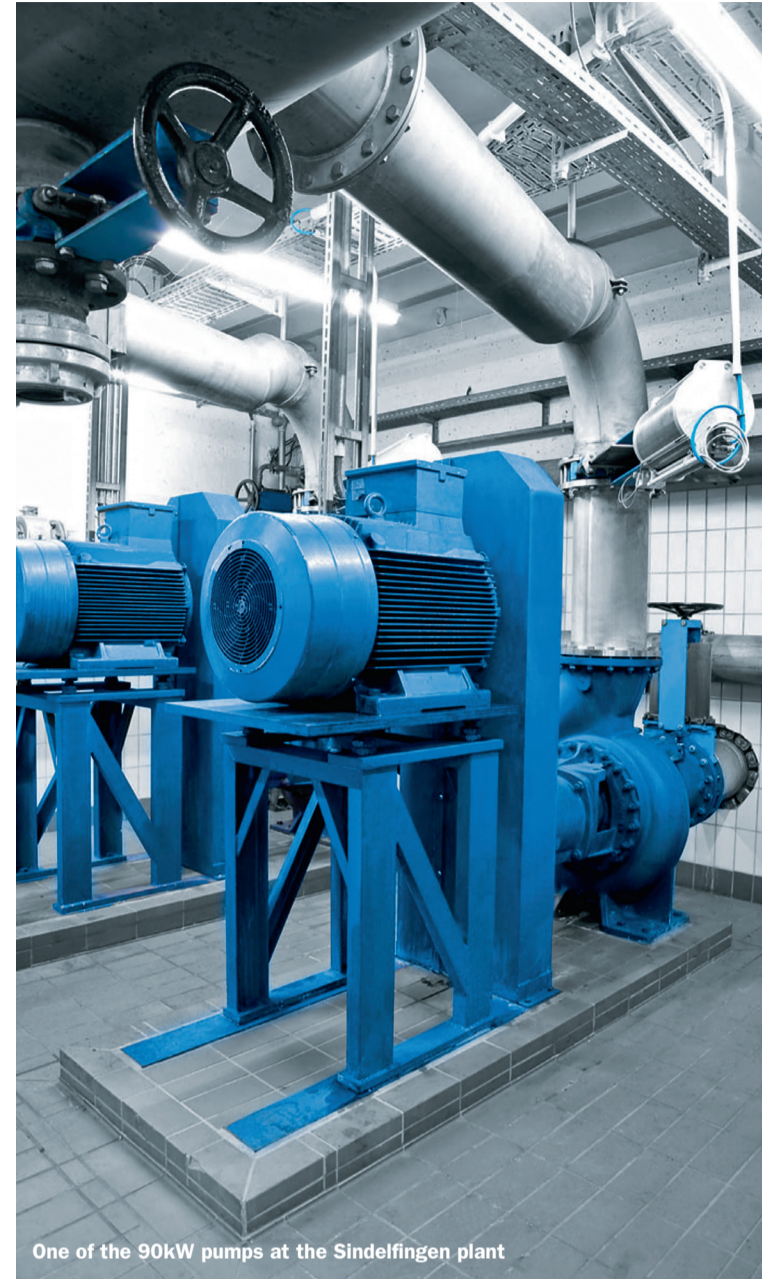
Furthermore, experience shows that even the best check valves have a maximum service life of 12 years and are prone to wear mechanisms to the bearings and sealing

face that can cause leaks and backflow problems, which are often difficult to diagnose and rectify. Long-term, they will require replacement and in the worst-case scenario, so will the pump.

Due to their construction and smooth operation, Festo's automated KGVs are not nearly as susceptible to wear, typically providing at least twice the service life of check valves. Festo's valve solution can be adopted by water utilities, either as a retrofit programme or during new plant build. Even at the Sindelfingen reference plant, which already uses a variety of Festo energy-saving schemes, there has been surprise at the ease with which further savings have been achieved. ■

**Martin Hunt is Festo's industrial specialist for the process industry.**

**E: martin\_hunt@festo.com**



One of the 90kW pumps at the Sindelfingen plant



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