

CIRCOR Optimization Consulting Streamlines German Sewage Plant Operations

Challenge:

The Flerzheim cooperative sewage plant in Germany's Rhine-Ruhr region was looking for a better way to handle raw sludge – and at the same time optimize its operations to cut the facility's energy expenses and maintenance costs.

Solution:

CIRCOR provided focused consultation services for this plant and identified an array of opportunities for optimization. An ALLWEILER® pump technician performed a detailed analysis that led to a three-pronged approach for improving pumping performance, a solution that included replacing belt drives and old belt-driven units as well as modernizing pumps for redundant operation.

Results:

CIRCOR was able to quickly analyze the facility's entire installation, check pumps and motor assemblies, and offer insight on new and better ways to improve fluid-handling procedures. Already, the analysis services have led to lower energy requirements, increased reliability and reduced maintenance costs.



Pinpointing Problems – and Spotlighting Solutions

The Flerzheim cooperative sewage plant has been in operation since 1969, expanding and modernizing numerous times over the years. Since 1993, the facility has been part of a larger association known as the Erftverband, serving an extended area that includes the city of Mecenheim, its districts and several other surrounding communities. The sewage plant is designed to handle a population of approximately 50,000, cleaning wastewater in a single mechanical and two biological clarification stages.

In 2008, the company asked CIRCOR consultants to carefully analyze its operations. A pump and system expert from CIRCOR subsidiary Allweiler AG performed the audit and offered a detailed proposal for improving pumping performance. Even though Flerzheim officials had recognized problems existed, it was not until the CIRCOR proposal was completed that the company could take the necessary steps ahead.

CIRCOR offers individualized consulting services for treatment plants, helping them analyze their entire operation. As part of the analysis, CIRCOR checks out the performance of pumps and motor assemblies, and offers pinpointed solutions for optimizing the facility's fluid-handling procedures. The goal of these audits is to lower energy requirements, improve productivity and cut maintenance costs. In addition, CIRCOR consultation services are objective and provided at no obligation.

A Three-Step Solution for Today – and Tomorrow

As part of its effort to help Flerzheim more efficiently handle its raw-sludge demands, CIRCOR outlined a three-step solution for both current and future improvements.

Step 1 – Optimizing Efficiency

The first step at the Flerzheim plant was to replace the belt drives of two SEP Series progressing cavity pumps with direct drives. CIRCOR also selected the best possible speed, so the pumps will constantly operate with optimized efficiency. Capacity is no longer controlled by altering speed, but instead by altering operating times. In addition, by using motors of Energy Efficiency Class 1 (EFF1), it has been possible to reduce motor output from 5.5 to four kilowatts.

“The additional cost of 140€ to get the EFF1 motor paid for itself immediately,” said Wolfgang Schwarz, wastewater engineer. “Maintenance costs are now also noticeably lower. Replacing parts on our old belt drive used to cost us as much as an entirely new motor.”

As part of the initial phase, the plant will also retire two centrifugal pumps that have been used for initial pumping of primary sludge. The new installation has shorter piping, eliminating the need for these pumps. The plant will also save the power and maintenance costs associated with these units.

Overall, these initial optimization steps have already significantly reduced energy and maintenance expenses at the facility.



Time control and highly efficient direct-drive motors (EFF1) have replaced these belt-driven SEP Series primary sludge pumps.

Step 2 – Frequency-Converter Control

In the second round of optimization, belt-driven units for pumping excess sludge will be replaced by frequency-converter control. The associated pump will operate 24 hours per day; the material will be directed to biological clarification stages, depending on its sludge content.

Replacing the high-maintenance belt drive with an EFF1 motor (the speed of which is controlled by a frequency converter) is expected to reduce energy consumption by 10 to 15 percent, since the motor itself is more efficient. This change will also improve reliability, because it uses fewer mechanical parts that are subject to wear.

“When we do have to replace something, it will happen much more quickly,” Schwarz added. “As an additional benefit, the new drive will be much quieter.”

Step 3 – Pump Modernization

The third phase of optimization involves the charge pumps for the chamber filter press. Before the consultation, a single Allweiler progressing cavity pump performed all the work. In the future, two pumps will perform the same task and provide the security of redundancy. Fortunately, this does not mean that Flerzheim must purchase a new pump. Instead, the company will refurbish an existing Allweiler pump that is no longer utilized and upgrade it to meet the new requirements. Frequency-converter control and the replacement of pumping elements are important aspects of this change.

Since both pumps are modularly constructed and many parts are exchangeable, Flerzheim will need to keep only a small number of spare parts in stock. Both Allweiler pumps have a discharge pressure of 12 to 15 bar and a capacity range of 31 to 77 cubic meters per hour.



Allweiler’s optimization recommendations made it possible to eliminate these two centrifugal pumps, saving the plant energy and maintenance costs.



The preliminary filling pump for charging the chamber filter press (right) will be refurbished to make it identical to the existing pump (left).



Propeller pumps for recirculation remain unchanged.

Original Spare Parts – for Additional Savings

Moving forward, the Flerzheim plant will use only original parts directly from Allweiler. According to Schwarz, “Other parts vendors claim that their parts can stay in service for twice as long at only half the cost. In reality, the parts commonly last only one-quarter of an original part’s service life. So clearly, the lower procurement cost actually masks higher expenses.”

Keeping the Benefits Flowing

Already the Flerzheim facility has seen a number of built-in benefits emerging from the CIRCOR consultation and the implementation of the proposal’s recommendations. In addition, the sewage plant continues to perform the necessary conversions and installations with its own personnel.

About CIRCOR International

CIRCOR International is a global leader in critical fluid-handling products and technologies. Through its global operating subsidiaries, CIRCOR manufactures positive displacement industrial pumps and valves used in oil & gas, power generation, commercial marine, global naval and general industrial markets. CIRCOR’s operating subsidiaries supply products under the well-known brands Allweiler, Fairmount Automation, Houttuin, Imo, LSC, Portland Valve, Tushaco, Warren and Zenith. Additional information about CIRCOR is available at www.circorpt.com.

About Allweiler

Allweiler AG is the oldest German pump manufacturer and the European market and technology leader for macerators and centrifugal, propeller, screw, progressing cavity, cogwheel, rotary lobe and peristaltic pumps. Headquartered in Radolfzell and with locations in Bottrop and Gottmadingen, Allweiler owns a foundry, produces its own stators, and manufactures ready-to-use fuel and lube oil skids and rinsing-water facilities for commercial marine, oil & gas, chemical processing, specialty chemical, and waste and wastewater applications.



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