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Ingenuity for life

Process optimization for flow measurement

From sewerage services to drinking water supply

The Saalfeld-Rudolfstadt Association is committed to supply around 82,000 inhabitants with clean drinking water. Therefore, the resulting waste water must be cleaned and disposed of to enable a closed water cycle. To allow for smooth processes, the customer focusses on cutting-edge technologies optimizing the flow measurement.

Basically there are two different types of wastewater. On the one hand, the water contaminated by domestic and commercial use, the so-called sewage. On the other hand the rain water draining off from constructed or paved areas and being collected. To enable a sustainable water cycle, these effluents must be treated and disposed of. For the Saale region between Hohenwartestausee and the raftsmen community Uhlstädt-Kirchhasel, this responsibility lies with the association Saalfeld-Rudolfstadt. The association supplies about 82,000 people in this region with drinking water. To this end, 38 wastewater treatment plants are operated in the association's area, which return cleaned wastewater as pure as possible into the natural water cycle.

Additionally, the association operates 59 sewage pumping stations, 24 stormwater tanks and 27 combined sewer overflows. The Saalfeld-Rudolfstadt association's wastewater disposal concept regulates the terms and conditions of public drainage in the operating area of the association.

Thorough wastewater treatment is mandatory

Wastewater treatment by means of a sewage plant is much more thorough today than just a few years ago. After primary clarification, the wastewater treatment process in the treatment plant comprises three stages. The first treatment stage is mechanical. During this stage, coarse and floating solids are removed from the water.

In the second purification stage, which takes place in the so-called aeration tank, substances dissolved in the water are decomposed. The activated sludge resulting from this biological treatment flows into the secondary clarifier. The sludge settles there and separates from the cleaned wastewater. Part of the separated sludge will be fed back to the aeration tank as return activated sludge. The third treatment stage removes phosphate and nitrogen (nitrate) from the water.

After this three-stage cleaning process, the water is returned to the natural water cycle.



Siemens clamp-on sensors mounted on a DN800 steel pipe to measure the return activated sludge..

The challenge - high accuracy flow measurement

High accuracy flow measurement is an absolute requirement in this cleaning process. For the volume flow measurement of the return activated sludge, the association Saalfeld-Rudolstadt previously relied on the installed, approx. 20-year-old electromagnetic flowmeter. However, this was defective and had to be replaced. The association faced several challenges for the replacement of the defective device. The first one was the less than ideal installation situation of the measurement point. In front of the built-in electromagnetic flowmeter, a T-piece with the feed from the first pump is located at a distance of 4 meters. This T-piece causes massive changes in the flow profile.

To complicate matters further, the measuring point is located at a room height of 3 meters directly below the ceiling from the basement to the ground floor. Various pumps are installed below the measurement point, which is a particular challenge for a 1:1 replacement of an electromagnetic flowmeter weighing about 500 kg. That is why the association has opted for a clamp-on flow measurement solution. The 5 - 15 g/l turbidity level of the medium, the very short inlet and the T-piece are generally regarded as challenges for the clamp-on technology, but the Siemens SITRANS FS230 system easily coped with all of them

The solution - implementation without time-consuming installation

To replace the defective electromagnetic flowmeter, a Siemens SITRANS FS230 clamp-on ultrasonic flowmeter was installed during operation in only a few minutes. This flowmeter has an accuracy of 0.5 to 1% of flow rate and repeatability of 0.25% according to ISO 11631. With a 100 Hz data update rate even the smallest, most rapid fluctuations in flow are detected. The SITRANS FS230 has a Digital Sensor Link which digitizes the signal at the earliest stage of measurement for a strong signal-to-noise ratio and high-precision measurement. All changes can be tracked at any time on the display with up to six customizable views. Clamp-on systems in general can be mounted easily on the outside of the pipe, avoiding complex installation.

Using the integrated commissioning wizard, the installation of the SITRANS FS230 goes quickly and easily. The difficult installation situation in the case of the association was also solved by using anomaly compensation in conjunction with the high-precision sensors. A test system was made available to the association for four weeks in order to give the customer the necessary security when using the clamp-on technology under the prevailing conditions, such as turbidity content and installation situation. According to the customer, the measurement was absolutely stable over the entire test period and the measured flow rate data was verifiable.

The benefit – optimum implementation in terms of price and installation

According to Mr. Opitz from the Saalfeld-Rudolstadt association, replacing the defective flowmeter would have exceeded the purchase price of a SITRANS FS230 several times. The realization with the SITRANS FS230 clamp-on hence saved the Saalfeld-Rudolstadt association the costs for the acquisition of a much more expensive electromagnetic flowmeter. Moreover, it was not necessary to remove the existing and defective electromagnetic flowmeter which meant a saving of time and money. Thanks to the installation, commissioning and customer training by the experienced Siemens service technician, the optimal solution for this measurement point was achieved with the Siemens SITRANS FS230 clamp-on flowmeter. The Siemens SITRANS FS230 system has been running for more than three months to the complete satisfaction of the customer



Safety under the most demanding conditions: From now on, the digital clamp-on ultrasonic flowmeter ensures high accuracy flow measurement of the return activated sludge – avoiding any complex installation

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