

# Water treatment plant on the mobile network

## TeleControl system creates transparency for process from the control center to the remote stations

How do you keep an eye on 53 wastewater pumps distributed across an area of 83.78 square miles (217 sq. km) and partially in locations without a phone line? The water and sewage board in Haldensleben thought about the ubiquitous GSM/GPRS network in this case and implemented a solution that is setting new standards.

Haldensleben is a small city located between the Mittellandkanal and the small Ohre river. While the city located about 25 miles northwest of Magdeburg may not have the hustle and bustle of a big city, its inhabitants are still keeping up with the times and are always open to new ideas. An attitude that is clearly visible in something as obvious as the sewage system.

At its center is the board-owned wastewater treatment plant just outside of Hillersleben. It collects the sewage of Haldensleben and the surrounding communities, resulting in the disposal of an area totaling an impressive 83.78 square miles (217 sq. km). The backbone of the system is a network of pipes that covers each village and settlement and guarantees safe drainage.



The wastewater treatment plant covers an area of approximately 83.38 square miles (217 sq. km).

## Sewage is turned into water and fertilizer

The wastewater treatment plant treats the collected sewage so that it does not pose a threat to the environment and can be drained into the river Ohre which runs close by.

The first step in the process is to remove all coarse suspended solids from the sewage with a step screen. An aerated sand trap with attached grit washer then removes the sand that was flushed into the sewage through the road drains.

Then it's on to preliminary sedimentation. The flaky and grainy components of the sewage filter out and form the primary sludge. The pre-cleaned water drains into the anaerobic tank to eliminate the phosphorus.

The actual biological cleaning of the sewage takes place in the downstream aeration tank. The subsequent clarification removes any remaining sludge components.

The treated wastewater can now be drained into the Ohre without any concerns. The activated sludge settled during subsequent clarification is partly forwarded to the sludge thickeners; the remaining sludge, referred to as return sludge, is mixed with the raw sewage once again.

There is a static separation of the water from the sludge in the thickener. The sludge is now drained into the digestion towers via a decanter where it will stay for about 20 days. The generated digester gas consists of up to 70 % methane which is turned into thermal and electrical energy by means of a combined heat and power unit. The digested sludge is finally drained once more through a second decanter. The sludge can now be used as fertilizer and for other agricultural purposes.

## Step toward homogenous control

The different processes of the wastewater treatment plant are fully automated and run completely automatic. Manual interventions are only required for maintenance work and in case of technical problems. The entire system is visualized on a screen and the ongoing process data are saved according to legal requirements.

In the past, this was done by an assembly of heterogeneous components and systems from different manufacturers. The keywords today are SIMATIC S7 control system, SCALANCE S 612 and WinCC. "A sensible standardization", says Frank Teggatz, technical manager of the wastewater treatment plant, and adds: "We only have to stock very few components now to remedy any kind of problem in no time".

The old system did not meet today's requirements on a control system with advanced remote data transmission and evaluation options. The new system was to be standardized regarding hardware and software, make it possible to intervene in the respective processes from anywhere and supply the data required for setting up preventive maintenance, adds board manager Achim Grossmann to the list of requirements stated by the Haldensleben water and sewage board Untere Ohre.

A fundamental migration to the SIMATIC S7 controller from Siemens that was initiated in 2007 and finalized in the summer of 2011 brought along the change. But it was not enough to replace the control system. A major goal was the seamless integration of the 53 pumping stations that were distributed across the entire coverage area of the board-owned wastewater treatment plant.



...it includes wastewater pumps at locations that are not all connected by phone lines.

## Transparency independent of distances

The Siemens Solution Partner was the H&F Industry Data GmbH located in Rostock-Kavelsdorf. The specialist for industry automation has already equipped numerous wastewater treatment plants with the necessary automation technology and has comprehensive experience in this area. The particular challenge in Haldesleben was the implementation of a complete system that included all pumping stations and supported a long-term preventive maintenance.

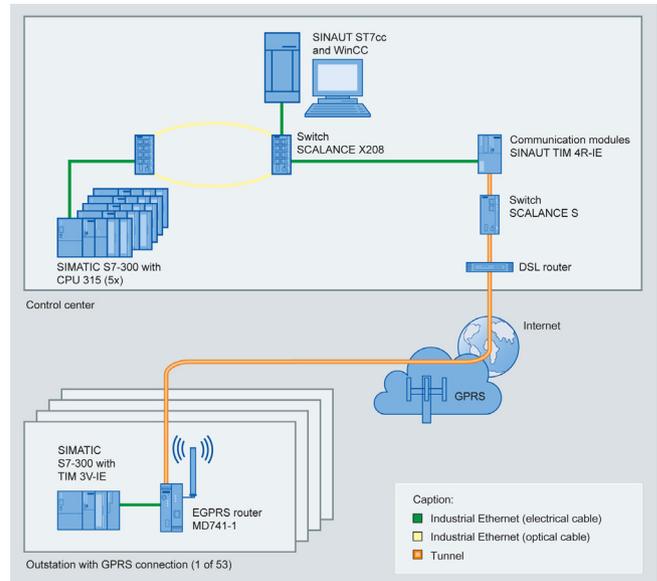
“The solution consists of a SIMATIC S7-300 controller at each pump location that communicates with the process control system in Hillersleben via the TeleControl Professional TeleControl system from Siemens”, explains Torsten Morwinsky, H&F project manager .

A glance into the control cabinet of a pumping station shows us what this means. The PLC with the TIM3V-IE TeleControl communication module is connected with an MD741-1 GPRS router via Ethernet cable so that it is always in touch with the control center. The latest process values, such as water level, flow rate, pump behavior and power consumption, are transmitted to the control center every five minutes. But fault messages or alarms are transmitted to the control center immediately.

All events and archive values including time stamp are buffered in the TeleControl station in case the data connection is interrupted. The entire system will run independently and without data loss even when the control system is turned off or fails. In combination with an uninterruptible power supply (UPS), uninterrupted process documentation is ensured even in case of a power failure.



The remote stations are always connected with the control center via GPRS to transfer process data, such as the water level.



The solution consists of a WinCC/SINAUT ST7cc control system in the control center which ensures reliable transmission of control and process data from the distributed remote stations via a TIM 4R-IE communication module (TeleControl Interface Module). These are connected with the TIM 3V-IE via a SIMATIC S7-300 controller.

H&F did not take a completely new approach with this solution. But this system was a pilot project when it comes to TeleControl technology. It turned out that the integration of 53 remote stations via GPRS represented a dimension with completely new challenges regarding data security. A secure IPSec connection was established with the SCALANCE S and MD741-1 switches via the Internet using closed VPN technology. “We learned a lot in Hillersleben”, says project manager Morwinsky and adds: “That’s why we are so relaxed now when we are entering the next phase of the project in which the system is to be expanded considerably”.

## The more you know the better you can respond

The integration of all pumping stations into one complete system does not only offer benefits when it comes to transparency of the process sequences and complete acquisition of data. Maintenance and emergency service of the sewage system can be set up on a completely new basis as well. "In the old days, I had to drive out to see what the problem was when I received an alarm message from the plant", explains Teggatz. "Today I can access the control center from my notebook at home and use the WinCC interface to look at the system as though I were in my office".

The same is true for the main office of the water and sewage board in Haldensleben. Technical management is also connected with the control system in the wastewater treatment plant via GPRS and can oversee the entire process.

Critical operating states become visible this way long before they can result in a problem. If the power consumption of a drive increases constantly, for example, it can be replaced during the next routine maintenance call before it fails completely and endangers the process. A graphical visualization of the power flow also indicates if a pump exhibits unusual cycles of operation or excessive energy consumption. People familiar with the process know that this most likely indicates a blockage which has to be removed on site.

An alarm is automatically triggered if one of the process parameters in the wastewater treatment plant itself or in one of the pumping stations reaches its limit. During the day, a voice message will be received via the phone system. A text message is sent at night or on the weekends which will be forwarded to the employee next in the line of command until it reaches a recipient to ensure that someone takes care of the problem.

## A solution with potential

TeleControl Professional can basically be used anywhere where there is a power outlet and enables data communication between components in a process plant even across long distances. The installation on site is relatively simple; the operating costs are lower than with other possible solutions and availability is ensured in areas reached by cell phone, Internet or data connections provided by the customer.

Frank Teggatz is not only excited about the continuous transparency of the entire sewage system that can be accomplished with the TeleControl system. He also points out the tremendous savings: "We have cut the cost for data transmission in half".

The TeleControl system proved for the first time in the Haldensleben water and sewage board project that it can effectively manage comprehensive systems with many external stations. They are already planning the next step in Haldensleben: The area covered by the board has expanded from 83.78 to 133.59 square miles (217 to 346 sq. km) – and the number of pumping stations has grown from 53 to 69.

### Competency not limited to water alone

The H&F Industry Data GmbH is headquartered in Rostock-Kavelsdorf with offices in Bremen-Worpswede. And there are Service Points in Kothen, Reinfeld and Marlow. The company was founded in 1991 and has 121 employees as of today. As certified Siemens Solution Partner, H&F covers the entire area of industrial and municipal process automation. Its experience is mainly focused on water and wastewater technology. In addition, the company offers systems in other areas, such as biogas generation, environmental technology, supply engineering as well as transportation and storage technology.

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