Fast communication lowers risk of flooding

Easy control and monitoring of remote trunk sewer substations

The public utility company, Spildevandscenter Avedøre (wastewater treatment plant Avedore), has recently started to replace its outdated control and data acquisition systems in the pumping stations and at the measuring points of its channel network. The existing control systems from different manufacturers in the substations are being replaced with the modular SIMATIC S7-1200 controllers with GPRS communication.

“In the past it was normal that the data in the substations was only acquired once every hour. We have reduced this interval to one minute,” explains Leif Tångberg, director of Tångberg Pro-Consult, a Siemens Solution Partner in the area of automation and specialist for PCS7. The reason: “When heavy downpours occur, as we have experienced in recent years, one hour is a very long time to wait for the latest data about flow and water level in the sewage system. This delay also makes it harder for our employees to intervene in time if the rising water levels become dangerous.”

Tångberg Pro-Consult has worked as system supplier for the Avedøre wastewater treatment plant in recent years. It was therefore not surprising when the company was asked to form a partnership to help implement a modern solution that would offer organized and uniform communication between the substations.
Open for future expansions with TeleControl Basic

The Siemens concept, TeleControl Server Basic, together with the modular S7-1200 controller with GPRS communication module turned out to be the perfect solution. A major advantage of this system is the fact that additional substations can be added in the future as necessary. To ensure that the selected system would meet the technical requirements of the Avedøre wastewater treatment plant, Siemens was also involved in answering this question. “This way we can offer our customers more expertise,” says Tångberg.

The entire network of channels in their care includes about 80 substations including pumping stations, measuring stations and oil separators. New devices have already been delivered and commissioned for three pumping stations, three oil skimmers and three measuring stations. Six to nine additional substations are expected to be connected over the course of next year.

Modular RTU solution based on SIMATIC S7-1200

One S7-1200 controller with GPRS communication module and one CP 1242-7 communication processor is used per RTU (Remote Terminal Unit). Depending on the control required, a CPU 1212 or 1214 is used and expanded by several I/O modules. A Basic Panel KTP600 with touch operation is installed into the control panel of each RTU. It is partly used for manual operation on site as well as display of maintenance information.

The devices are installed in a free-standing control cabinet made of sheet steel which is freely accessible for service personnel with a vandal-proof GSM antenna mounted on top.

To ensure that the important data is still collected and transmitted even in case of power failures, such as those that can occur during thunderstorms, the control system comes equipped with a Sitop UPS uninterruptible power supply, which ensures operation and communication of the PLC for up to two hours.
The challenge of software migration

“We have a lot of experience with wastewater treatment plants and pumping stations. This is why we developed our own library with software modules for the SIMATIC S7-300 and S7-400 in the past. We assumed that these function blocks would also be used without changes in the new S7-1200 controllers. But with every call (for example, of a motor function block), an instance data block (Instance DB) is created at the same time, which has to be retentive, of course. However, the retentive memory of a SIMATIC S7-1200 is somewhat limited. This means we had to change our function blocks so that they only use minimum instance DBs. The memory is now sufficient,” says Leif Tångberg in describing his experiences with SIMATIC S7-1200.

And regarding the main station he adds: “It took us a while to understand the mode of operation behind the Telecontrol software. However, now that we understand the philosophy behind it, we can see how wonderful it is to work with the software.” The existing SCADA system of the customer includes an OPC client that retrieves its data from the OPC server on one of the engineering computers. The data was usually collected every minute. However, now it is possible to monitor the substations per “online access” during operation and set up a permanent link, which reduces the response time to 3 to 4 seconds. This is completely sufficient for a system of this type.”
Benefits of the TeleControl Basic telecontrol system

TeleControl Basic connects the control room with the substations by means of the TeleControl Server Basic control room software. In the application mentioned above, encrypted data is transmitted via public GPRS network. This makes for cost-efficient and secure connection of the substations. The communication processor can buffer several thousand data values to compensate for any downtimes of the transmission path. Fully automatic time stamps are used to correctly archive the process data in the control system later. Highlights of the new system at a glance:

- Quick and easy commissioning thanks to perfectly interacting system components
- Easy and convenient configuration of substations
- Changes and expansions are possible during normal operation at any time
- Convenient and secure alarming by means of multi-stage escalation management
- Station failure can be detected immediately

Numbers and facts of the Avedøre wastewater treatment plant

The Avedøre wastewater treatment plant is jointly owned by ten communities to the west and south of Copenhagen. In addition to the wastewater treatment plants, the company also operates a water treatment plant and the distribution system, which consists of 50 kilometers of pipelines, four water storage tanks and two main pumping stations. About 25 to 30 million cubic meters of sewage from the communities in the catchment area of the company flow through the pipelines annually.