Reference

Automation for less wet feet

Modern technology ensures enough water beneath the sluice gate

The Deich- und Hauptsielverband (abbreviated to DHSV) Eiderstedt is responsible for flood protection and maintenance of basins and ditches. That also includes the drainage of excess rainwater. Levees on Eiderstedt not only keep the North Sea out, they also keep the rainwater in. Almost half of the area of Eiderstedt has to be freed from rainwater by eleven pumping stations. For the drainage concept for around 18,800 hectares, 30 tidal sluice gates are used. Tidal sluice gates are outlet structures in the levee that work on the same principle as heart valves: when the tide is high, the greater pressure on the seaside closes the freely-hinged flap gates automatically, preventing the unwanted entry of seawater. When the water level is higher on the landside, the sluice gate opens automatically and allows the water to drain into the sea.

Water management as a source of dispute

The special relationship with water and its management on Eiderstedt has resulted in a unique cultivated landscape. Alongside farming, a considerable variety of species has developed over the centuries. Changes to pastoral agriculture, the new system of contractual conservation, and the bird sanctuary set up in 2007 present challenges in the work of the DHSV. For example,

Water is omnipresent on the North Sea peninsula Eiderstedt and forms the basis of life in many ways. But it also creates the potential for conflict between farmers and bird conservationists. An intelligent drainage concept and the use of modern automation technology now enable the protection of birds and agricultural land use on Eiderstedt.

Modernized and remote-controlled: the Adenbüllersiel is one of five tidal sluice gates that were connected to the central control system as part of a pilot project.

Always well connected: SCALANCE M mobile wireless routers from Siemens ensure reliable transmission of data for remote control of the double sluice gates despite difficult cellular network coverage.

water levels resulted in years of dispute between farmers and bird conservationists: while low water levels in the summer months provide dry and therefore productive areas for agriculture, higher water levels are necessary for the black tern to nest or for barnacle geese and lapwings to settle in. It was only possible to defuse the conflict in 2013 with an agreement on objectives. This rules that water levels in specific areas must be kept at an agreed level between March 1 and August 15. Improved tracking of the water levels was also agreed. These objectives were to be met using a centrally monitored automation system for selected sluice gates and the corresponding measurement.

Pilot project Tetenbüllspieker sluice gate association

Large parts of the bird sanctuary are in the area of the Tetenbüllspieker association, drained by five tidal sluice gates. To implement the objectives, the tidal sluice gates were to be structurally and electrically converted so that automated water level management is possible from the DHSV control center in Garding. Implementation of these measures started in 2016. In the meantime, the target water levels had to be controlled manually. "On every rainfall event in the summer months, employees of the DHSV had to control the drainage as a function of the measured water levels manually. This was a lot of work for us and we still did not have publically accessible water level records," was how Jan-Jürgen Rabeler, who heads the DHSV as the chief water manager, described the transition period.

Proven principle – modern technology

The engineering consultants Lindemann + Ulrich planned and supported the modernization work. Project engineer Christopher Meyers summarizes the planning objectives: "We first had to adapt the structure of the tidal sluice gates affected in such way that they will provide protection for decades to come. Equipment with electrically operated vertical sluice gates followed. For automated water management to ensure bird and nature conservation, the most important task was providing the outer structures with suitable measurement, control, and telecontrol technology. Finally, a central server and workstation had to be set up on the business premises of the DHSV in Garding." In 2017, the individual structures were modernized. For level regulation, double sluice gates are now used, which have a headwater and tailwater gate. "Level regulation works on the old principle. Unlike the freely-hinged flap gates, the double sluice gates give us the certainty that the sluice gate will really close tight and that we can regulate much faster and more flexibly today," DHSV managing director Jan-Paul Bonse explains. For control, all tidal sluice gates are equipped with local control cabinets. The contractors can be operated manually from these.

Preparation for digitalization

The value added of modernization is primarily achieved with the automation and telecontrol technology used. The infrastructure for this was built by Bilfinger GreyLogix Aqua. In the control cabinets, the SIMATIC S7-1200 controllers from Siemens ensure, among other tasks, that the double sluice gates are operated according to the setpoints and that alarms are generated when limits are violated.

For transmission of the data and parameters to the control center, the experts from Bilfinger GreyLogix Aqua chose reliable mobile wireless routers of the SCALANCE M family. SCALANCE M876-4 LTE routers are used, which ensure high data transmission rates and can be operated with a redundant power supply. They support high security standards (such as VPN encryption) and generate SMS messages for alarming. "Bird conservation and transmission masts are not compatible. This made adequate cellular network coverage difficult," Rabeler explains. "Thanks to the support of several standards, such as UMTS or LTE and automatic frequency changeover, we are now reliably connected with the flexible routers of Siemens."

As the head-end in the control center, a SIMATIC S7-1500 is used. The controller processes the data before it is visualized via SIMATIC WinCC. The SCADA system is designed as a client-server system and enables monitoring and control of the five outside facilities of Garding. At one workstation computer, the operating mimics of all plants can be called and the water levels regulated accordingly in the sluice systems.

To provide the agreed transparency, all water level values are prepared in such a way that they can be viewed via the Internet. The DHSV benefits from more convenience and working efficiency in particular because employees on standby are always informed about problems on the sluice gates: fault messages are forwarded by SMS notification. To ensure that the cause can be identified quickly, Bilfinger GreyLogix Aqua also integrated secured access via tablet into the operating and control concept. Employees have the same information

Everything under control: thanks to the automation and telecontrol technology, association technician Helge Schreiber can monitor and control the connected tidal sluice gates from the control center in Garding.

when out and about as they do on the workstation computer in the control center. A security concept supported by Siemens ensures network security with firewall and VPN functions, which are implemented with SCALANCE S Industrial Security Appliances.

Sound basis for big plans

"We have designed the automation concept in such a way that the DHSV can integrate further substations simply into the central control system in the future according to the same system with the technology used," Olaf Kremsier from Bilfinger GreyLogix Aqua explains.

All control cabinets on the sluice gates have an identical design, the data transmission works according to uniform standards, and even the configuration of WinCC is performed exclusively with standard elements. "This high level of standardization and the use of wide-spread, common Siemens technology enables us to involve a wide range of bidders in future tendering processes," says managing director Bonse. Connection of further tidal sluice gates and pumping stations is already being planned. "The more structures are incorporated in the central control system, the greater the benefit for Eiderstedt. We are planning to implement intelligent water management over a wide area, which

will enable us to retain water in higher areas and drain the lower lying areas first from the control center," chief water manager Rabeler explains.

However, the plans go further: "Digitalization will also be introduced here," Bonse explains. "We would like to develop predictive drainage, which can automatically drain to achieve agreed water levels based predictively on weather data and forecasts. That means that we keep water levels more constant despite increasing heavy rainfall events."

With the pilot project, the first step has been taken toward a digital future. For the time being, it is much more important that the conflict of many years has been defused by these measures. "We are very pleased with the technology, its implementation, and the result," Rabeler concludes. "Water levels can now be publically accessed at any time. One of the most important objectives of the DHSV is that Eiderstedt provide quality of life in the future, too – for human beings and animals."

Deich- und Hauptsielverband Eiderstedt (DHSV)
Levees have been raised on Eiderstedt on the North German coast for centuries. The peninsula owes its present shape solely to land reclamation. The inhabitants first claimed the land from the sea with levees. Levees have protected them from North Sea tides ever since. But the protective walls also prevent rainwater from flowing away. Since large parts of Eiderstedt are at or even below sea level, rainwater would flood the peninsula. The construction of levees was therefore accompanied by the digging of ditches and building of pumping stations to drain the interior. The construction and maintenance of these facilities has always been handled on a cooperative basis on Eiderstedt. Today, 17 tidal sluice gate associations are responsible for tasks relating to the drainage structures. These associations are united in the DHSV Eiderstedt. Since 2007, Jan-Jürgen Rabeler has been the chief water manager, who heads the DHSV. Jan-Paul Bonse has been the managing director since 2014. The DHSV looks after a total area of 37,000 hectares. In winter, monthly rainfall in excess of 100 mm is not unusual on Eiderstedt. To ensure the water drains away, the DHSV is responsible for the digging and maintenance of more than 900 km of association detention basins, 57 ha storage basins, and supervision of 4,500 km of private field ditches.

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Security information

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