

Installation of Process-Control System HydroDat® V8 at the Central Sewage-Treatment Plant in Borken

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Since 1996, the operation of the central sewage works in Borken had been controlled and monitored by the process-control systems InVisu and Datol. In order to increase the efficiency and reliability of the plant it was necessary to install a modern state-of-the-art PCS. The high demands on the new system (e.g. the linking of a number of external stations) prompted the operators to choose the tried and tested PCS HydroDat® V8.

The central sewage works in Borken began operation in 1983 with an extension capacity of 120,000 EGW. It is a conventional continuous-flow plant comprising the stages of coarse-particle purification, sand precipitation, preliminary sedimentation, bio-P absorption, preceding denitrification, sludge activation (oxidation), discharge homogenisation (clearing tank) and sludge treatment. Two thirds of the sewerage to the treatment plant is a separation system in order to save costs at the pumping stations due to the lower volumes than those pumped in mixed systems. In the early 1990s, the sewage-treatment plant was expanded to 140,000 EGW with an additional biological phase, flocculation filtering and sludge draining.

The InVisu and Datol control systems used in the plant which were automated via an L2 bus with six connected SPCs (Siemens S5) were no longer up to date and the procurement of spare parts was becoming difficult. In addition, the filtration stage also had its own separate PCS module. For these reasons, the Borken municipal authorities commissioned the engineering company Schweers Consult in Meerbusch to put a new PCS out to tender. The main criterion for the conversion was the gradual replacement of the existing control system and the integration of the external stations without loss of data and without restricting the function of the plant. In the first phase, the SPC in the control building (master SPC) was refitted to allow it to take over all the functions of the previous SPC immediately. The maximum downtime of 60 minutes was never required. The

conversion of the SPCs for the sludge-draining system, block-type thermal power station, filtration, iron dosage, sewage station and screening was carried out in the same way as for the master SPC.

Network Technology

During the subsequent phases in the conversion of the SPC, the L2 bus was replaced by an industrial Ethernet as TCP/IP bus system with a transmission rate of 100 Mbit per sec. In each case, the SPCs (Siemens S7) were connected to the network using industrial Ethernet optical switch modules (OSMs), which are specially adapted to cope with high demands. The network topology in ring form makes it possible for the network to continue operation if one of the switches develops problems or a wire fails.

Special features of HydroDat® V8

HydroDat® V8 is a complete software package for controlling water-management plant and facilities. Its modular structure with the PCS as fundamental system and integrated components of graphic process visualisation, graphic analysis of archived data, automatic alarm system (alarm server) and reporting system in accordance with DWA M 260 make it a well-coordinated and clearly designed product. The saving and processing of operating data (COM interface to MS Excel) covers all the monitoring requirements for normal operation and compliance with statutory requirements.

HydroDat® V8 is fitted with the standard interfaces used in automation technology



in accordance with OPC and IEC 60870-5-10x which means that the exchange of data via the field bus with equipment from other manufacturers using these standards is possible without any adjustment to individual control and monitoring infrastructures. For the conversion of networks (as at the Borken sewage works) the possibility of coupling it into existing treatment processes is particularly important.

Saving of Data with the Delta-Event Process

The Delta-Event Process is specially designed for saving analog process data (e.g. measurement readings) without compression. Data are only saved when a certain value changes with reference to the measurement range by an individually adjustable percentage (delta value), i.e. when an event occurs. Most of the process-control systems available on the market operate with data compression to save storage capacity, i.e. after a certain interval, readings are grouped in larger time-slot patterns and averaged. HydroDat® on the other hand, makes it possible to save individual events over long periods of time while substantially reducing the volume of data. It also achieves a very close approximation to the actual course of the measurement readings.

The Alarm Server

HydroDat® V8 has an alarm server with a number configuration variables for the remote alerting of standby personnel in case of abnormal events. When certain selected events occur, the alarm can be given as a fax, SMS, taped announcement



or even as speech synthesis. The alarm system can be perfectly adapted to existing standby plans or the local availability of plant personnel. A certain call sequence is laid down in the standby plan and the alarm continues to be given until receipt is acknowledged by a certain code. An optional module is also available for remote alerting by announcement or transmission of values by SMS.

Control Component RBS 15

In addition to the PCS HydroDat® V8, it is also planned to install an HST software solution to further increase the efficiency of the Borcken sewage-treatment plant. This will be the control component RBS 15 for controlling aeration phases (nitrification phases) and mixing phases (denitrification phases) for the removal of nitrogen in the sludge-activation process. These phases are triggered by online measurements of O₂ and redox values in the activation tank and permit dynamic control of the process in close relation to the actual load. The activation is adjusted to the actual requirement thereby saving energy.

All the requirements specified for the modernisation of process-control technology at the sewage-treatment plant in Borcken were fulfilled, and the installation of the HydroDat® V8 forms the perfect foundation for its efficient and economical operation in the long term.

Summary: Modernisation of Process Control Technology at the Sewage-Treatment Plant in Borcken

Glossary:

SPC:

stored program control

Client server:

network structure where data are provided to several computer workstations (clients) by a central computer (server)

Industrial Ethernet:

Ethernet standard for high standards, e.g. industrial production processes

Switch module:

device for controlling communication in computer networks

IEC:

International Electrotechnical Commission (standard committee for electrical technology)

TCP/IP:

Standard Internet protocol for communication within a network or with the Internet.

Requirements for the New Process Control System

- Client-server structure (consisting of 2 servers and 5 clients)
- Coupling to the PCS via the SPC component S7/CP343
- Communication of the PCS with all SPC stations via the master SPC
- Possibility of remote maintenance and diagnosis via ISDN and DSL
- Monitoring and control of treatment process by decentralised automation stations independent of the PCS
- Central monitoring, processing and visualisation of all process variables
- Automatic documentation of problem and normal operating signals
- Display and operation of process machinery in dynamic graphic images
- Saving and processing of all important process variables as well as recording and processing of manually entered data (e.g. laboratory values)
- Long-term storage of all data, e.g. high-resolution measurement data (10 sec.) for a period of 10 years for possible graphic analysis at a later date
- Automatic compiling of operation reports to DWA-M 260 on daily, monthly and yearly basis
- Online programming of system by convenient screen dialog and menu