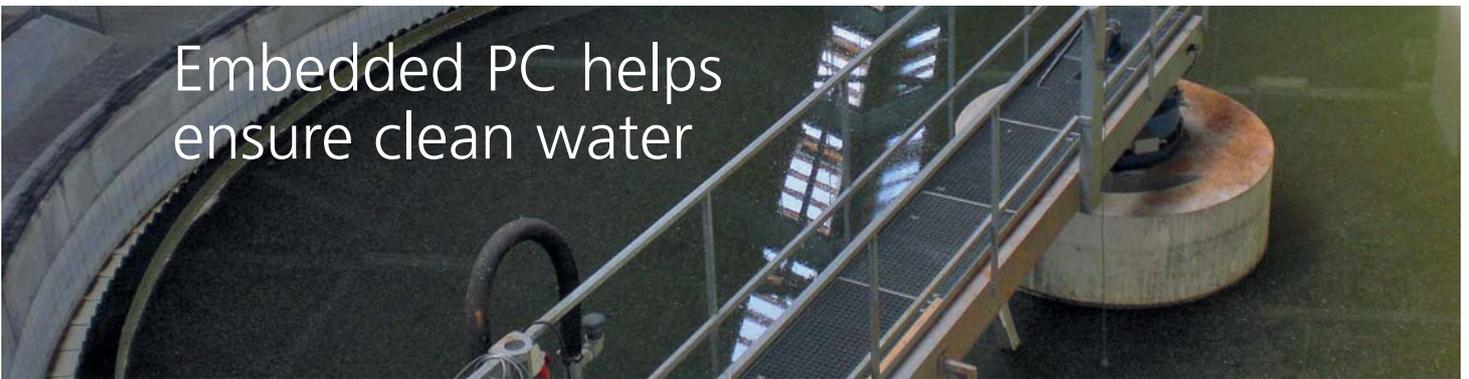


## Modernization of a wastewater treatment plant with PC-based control



The supply of drinking water and the disposal of wastewater represent a complex system in which many subprocesses must be controlled and monitored. The Vogtland Water Board (Zweckverband Wasser und Abwasser Vogtland – ZWAV), which is responsible for the supply and disposal of water for approx. 250,000 citizens, decided to use Beckhoff technology in order to modernize the Morgenröthe-Rautenkranz wastewater treatment plant: The process automation takes place via a Beckhoff control platform, consisting of an Industrial PC with Control Panel, Embedded PCs, TwinCAT automation software and EtherCAT I/O Terminals.

## Embedded PC helps ensure clean water



The Morgenröthe-Rautenkranz wastewater treatment plant has been in operation since 1994 and is responsible for the wastewater disposal for approx. 5,000 citizens. The conversion of the plant to a new PC-based controller took place inside only three months while the process continued to run.

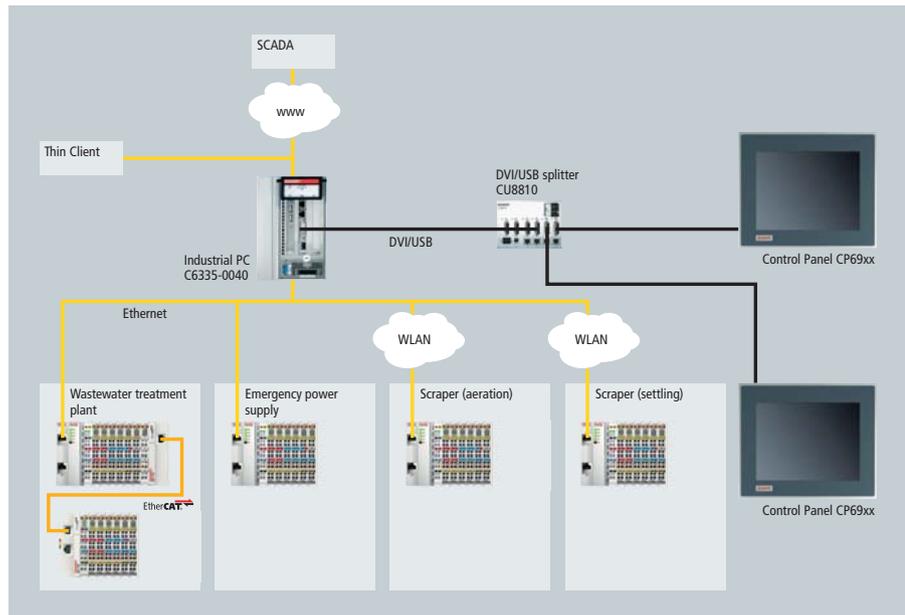
The Morgenröthe-Rautenkranz wastewater treatment plant in Germany, which has been in operation since 1994 and disposes of wastewater for approx. 5,000 citizens, was showing increasing signs of wear in the facility's switchgear as well as the automation technology. In addition, the PLC and process control technology no longer corresponded to the current technical requirements. The ZWAV therefore decided to modernize the plant on the basis of a PC-based control system. The challenge consisted of submitting the entire switchgear, including the process automation and the communication technology, to a retrofit, to change over to the new control system within three months while the process continued to run. In the first step, the ZWAV divided the plant into function groups on the basis of DIN EN 61346, in order to make all operating equipment unambiguously identifiable by means of reference marks. For the standardized representation of the plant overview as well as the

process flow chart, the function groups marked in this way were subsequently assigned to the stages: "inlet," "mechanical part," "biological part," "sludge treatment," "chemical part," "auxiliary plants," "process control" and "energy."

### **Standardization of hardware and software facilitates improved plant handling**

"One of the main reasons for changing to Beckhoff technology is the standardization in accordance with the principles of PLCopen in conjunction with the international PLC standard IEC 61131," explains Silvio Merz, electrical and process equipment group leader at the ZWAV. "That ensures the reusability of hardware and software and simplifies the plant handling. A further advantage for us is the compact design of the Beckhoff Embedded PC, which helps us save valuable space in

A Beckhoff C6335 fanless control cabinet Industrial PC, as the higher-level PC, provides the visualization and is tasked with acquiring process data and statuses from the local units and passing them on to the central controller.



Control architecture of the Morgenröthe-Rautenkranz wastewater treatment plant

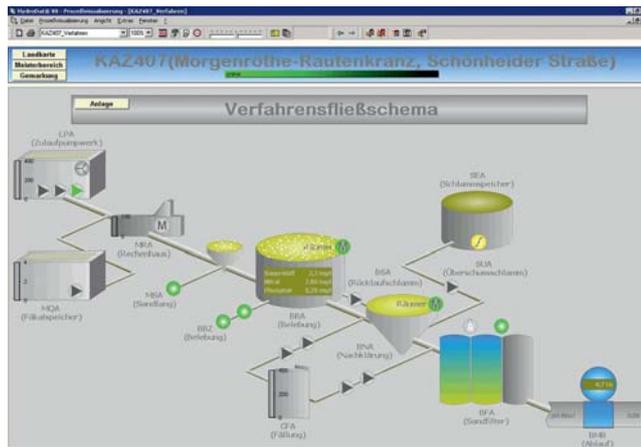
the control cabinet.” In the original development more than 10 control cabinets were distributed across the plant. “We have now integrated all functions (switchgear, process automation, building distribution and LAN components) into the control room, which means that we have been able to remove the control cabinets in the field,” explains Silvio Merz. A further important argument for changing to Beckhoff technology was the large variety of Bus Terminals. “For example, the power measurement I/O terminal makes it possible for us to specifically record energy parameters for optimization measures,” says the group leader. All software and hardware components comply exactly with the ZWAV specification sheet. “This includes not only the hardware solutions previously mentioned, but also and above all the software, which is ‘readable.’ The advantage of this is that we, as the technical service staff, are also able to localize and rectify faults after commissioning,” explains Silvio

Merz. HST Wates GmbH from Dresden, Germany, which was entrusted with the implementation of the automation, solved this task with clearly defined modules and functions which, as demanded by the client, were written exclusively in the Structured Text (ST) programming language.

#### Embedded PC as the compact central control unit

The actual wastewater treatment plant process is executed on a compact CX9010 Embedded PC. Due to its high performance and the infrastructure of the plant, only a few function groups, such as the control system of the emergency power supply as well as the scrapers of the aeration tank and the secondary settling tank, had to be decentralized. A Beckhoff C6335 fan-less control cabinet Industrial PC, as the higher-level PC, provides the visualization and is tasked with acquiring process data and statuses from

The process flow chart gives the operator a structured overview of the condition of the plant.



A CP69xx 15-inch 'Economy' touchpanel without function keys installed on the plant allows the visualization of the sequences in parallel to the control room.



the local units and passing them on to the SCADA process in the central controller or, in the event of a communication failure, to store them and to pass them on later. Publisher and Subscriber variables, which are divided into strictly defined communication structures and modules, are provided for the communication of the Embedded PCs with one another and with the higher-level PC. "Furthermore the IPC is designed as a service PC, which should permit us, for example, to load PLC programs or parameter sets with prefabricated tools into the respective devices," explains Silvio Merz.

**High recognition value of the user interface**

The plant is visualized and operated via two Beckhoff CP69xx 15-inch 'Economy' touchpanels without function keys. The sequences are visualized via DVI extension technology on the second panel installed within the plant, in parallel to the control room. Two basic representations, "Plant" and "Process," give the operator a structured overview of the condition of the plant. Clicking the respective unit leads to detailed im-

ages or to further information. A particular advantage is that the use of standardized visualizations carries with it a high recognition value which facilitates the plant operator's work.

**Planned plant extension**

In a further project, the Vogtland Water Board will likewise be equipping the nine wastewater pumping stations placed around the wastewater treatment plant with Beckhoff technology and connecting them to the HydroDat® V8 central control system. "We are taking care of all planning, programming and configuration work ourselves, with the exception of the data transmission application, which we are purchasing as a license," explains Silvio Merz. "We are using the 'TeleMatic' communication software from HST-Systemtechnik, which is installed on the first runtime of the TwinCAT PLC. The actual application, created by us, is installed on the second runtime of the controller."

Zweckverband Wasser und Abwasser Vogtland [www.zwav.de](http://www.zwav.de)