VALVES TECHNOLOGY

INTERNET CONNECTED PC NETWORK MANAGES GIANT EIFEL VALVES

50 cubic meters water per second run through each of the massive valves.

by Ingrid Einsiedler and Mario Anich, Kontron

After sixty years of service, the valves and pipes in one of the valve chambers of the second largest water reservoir in Germany were worn out and could no longer be repaired, so they had to be replaced. For the remote controlling functions, the new system relies primarely on PC technology, with communications via the Internet.

Every second, 100,000 liters of water roars through the two 22 metric ton valves of the Eifel Rurtalsperre Schwammenauel, the second largest reservoir in Germany with a capacity of 200 million m³. This reservoir belongs to the Wasserverband Eifel-Rur (WVER), which operates a total of six dams with a capacity of 300 million m³ in the northern Eifel. They serve primarily as flood control, but are also used for the drinking water supply and as a local recreation area. The Rurtalsperre is the largest of the six reservoirs and, with the Urfttalsperre, forms a connected lake region which lies, for the most part, in the Eifel national park.

When it came time to update the electronics of this massive system, Kontron was chosen as a partner along with its Think IO system. This system was chosen because it is a maintenance-free system with lots of connectivity potential.

How does the system work?

Overall, what happens in the pipes, valves, and burst pipe protections while the torrents of water churn through is illustrated in abstract form on a flat-screen monitor, installed in the door of the control cabinet in the valve chamber. If the cabinet is opened, the intelligent "monarch" of the waters can be seen. The ThinkIO hides its PC functionality and everything that goes along with it in a compact housing suitable for control cabinets, just 224 x 100 x 70 mm. It controls, monitors, and visualizes all of the fittings in the valve chamber.

The control cabinet in the valve chamber – only the Kontron flat-screen points to the hidden PC intelligence of the ThinkIO behind the doors.

In addition to the two pipes of the bottom outlet, there is a third which branches to a small hydroelectric station. It displays a real-time visualization of the entire facility on the flat panel in the door. Furthermore, it is connected to the central monitoring of the dam in a neighboring building via an analog dedicated line; later, the connection will be realized via the Internet.

Major bottom outlet project

The pipes and valves of the bottom outlet in the valve chamber (this term is generally used to describe the buildings which house the pipes and fittings at water facilities) were already implemented in the first building phase of the Rurtalsperre in 1936. After sixty years of service, they were worn out and could no longer be repaired, so the WVER had them replaced, a major project in construction and water technology that was even presented by German television channel ZDF in its series "Abenteuer Wissen".

Electrical engineering

The engineering company Theo Hell Industrieelektrik is responsible for the electrical engineering of the entire dam association and thus also in the Rurtalsperren valve chamber. Each dam has its own central monitoring station, which has been equipped by the Krefeld-based engineers. With Hell-MDÜS the international, mid-sized company, which employs 230 people, has developed its own modular data transmission system, which also covers the communications for the Eifel dam network. Computer protected, it reports malfunctions, captures measurement data, and offers full PLC functionality. Together with a partner, Hell specially developed the Webaqua visualization software for use on water facilities.

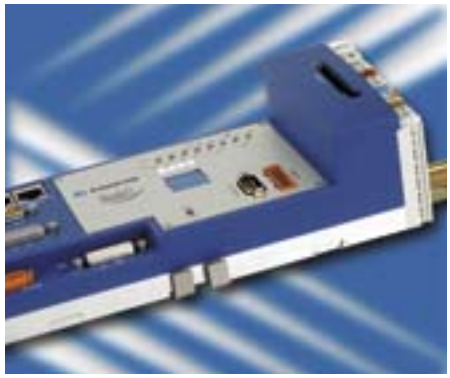
PC technology

In the future, Hell will rely primarily on PC technology for HELL-MDÜS in order to use the wide variety of connectivity and communication options. With their communications and device interfaces, PCs can be used in any infrastructure without difficulty and controlled via the Internet. This is a crucial point, especially in remote systems, such as those represented by the electronics for the six WVER dams spread across more than 1000 square kilometers. That is why all 30 remote workstations, which so far have been connected via a dedicated line, will gradually be replaced and equipped with top-hat rail PCs (Kontron ThinkIO). Then WVER can take its pick: DSL, ISDN, GSM, UMTS, LAN, or analog; every communication medium is possible with the Kontron PC.

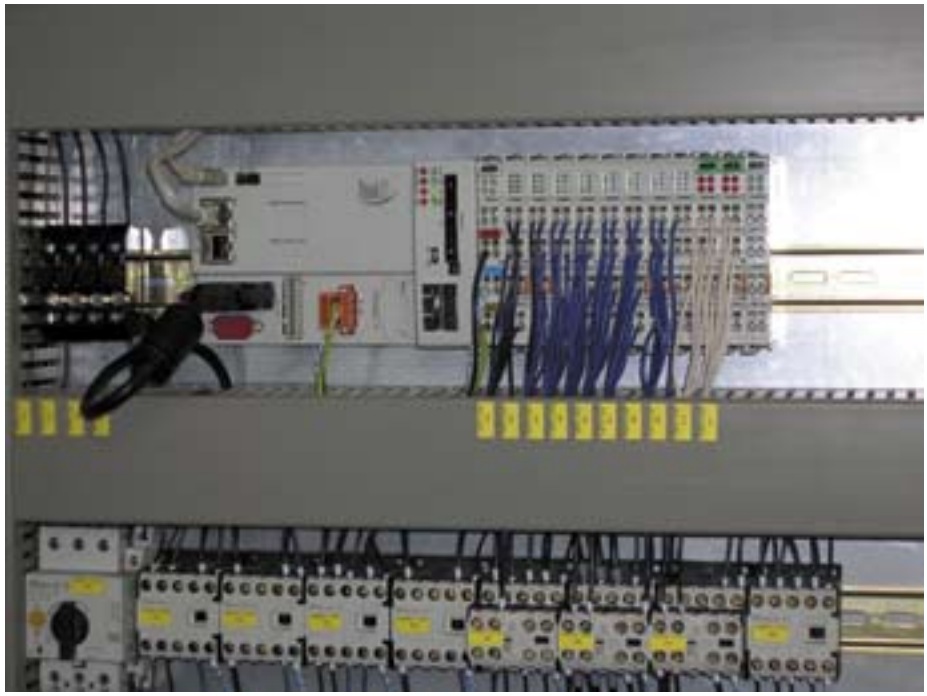
Failproof

Besides its appropriate technical specifications, the ThinkIO offers a

The ThinkIO - almost invisible among the electronic components. The compact rack PC hides to the left on the second top hat-rail.



The ThinkIO (on left) collects and processes data from the valves and visualises the throughput on a flat-screen (on right) in real time.



Controlling cabinet, including the complete PC.

complete bundle of qualities and functions: first of all, the top-hat rail PC is only 70 mm deep, which makes it slimmer than most competing systems, and it also finds plenty of room in a 90 mm control cabinet. Inside the robust, heat-dissipating aluminum housing, there are no moving or active parts like rotating fans or hard drives that are subject to deterioration or failure. Thus, the Kontron ThinkIO is fail-proof and maintenance-free – also an absolute must for geographically widely distributed systems. Also very practical for HELL: with four spring-loaded quick-locks, the control cabinet PC can be clicked onto the top-hat rails without tools.

With I/O module clamps, and a form-fitting and industrially tight connection to the computer via the WAGO-I/O system, the ThinkIO is adaptable and expandable to all applications. Up to 64 clamps can be added directly and up to 252 are possible with an extension clamp. There are well over 100 WAGO clamp versions on the market, including interface modules for ASI, SSI, incremental decoder, RS232 or RS485.

The ThinkIO also earned points on the HELL evaluation checklist with its software configuration: it is equipped with a real-time Linux operating system, a web server, and a CoDeSys runtime environment for executing applications programmed with the l IEC-61131-3-compliant, SOFT-PLC development environment of the same name.

About the ThinkIO

For the WVER, HELL uses the "small" ThinkIO-C. Its 266MHz Geode processor is powerful enough to handle the physically sluggish processes in the pipes and valves. For more complex or time-critical computations, Kontron offers the ThinkIO-P, which goes to work with Intel Pentium M processors up to 1.4GHz. It is currently one of the fastest top-hat rail PCs on the market, particularly since the 1.4GHz of the "mobile" Pentium processor corresponds to approximately 2.2GHz in a normal desktop PC. And if the Kontron ThinkIO is to be used in situations where it gets really hot or cold, there is the extended-temperature version. The Intel Celeron M processor in this control cabinet PC performs its duties on the top-hat rail faultlessly in a temperature range from -40 to +70 degrees Celsius.

The Kontron ThinkIO communicates via two Ethernet interfaces with RJ45 plugs and 100 Mb/s, one RS232 interface, a Profibus-Master connection, and two optional USB ports. More I/Os can be connected via the WAGO-I/O system.

The processor of the Kontron ThinkIO-C has 128MB of RAM available. The internal mass storage comes on a CompactFlash card with the same volume. An additional CompactFlash can be added externally.

The Kontron ThinkIO works with a choice of Linux and Windows CE 5.0. A CoDeSys runtime system is included in the delivery as an IEC-61131-3-compliant Soft-PLC. Thus all applications programmed in the development environment can be run on the Kontron ThinkIO. <<

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