Holiday Inn Samara: PC- and Ethernet-based monitoring
and control of supply systems

Top hotel makes high-end building automation its permanent guest

Conferences, festivities, culinary delights, wellness, culture, sophisticated architecture and high technology – the "intelligent" Holiday Inn Samara business hotel, which opened in the Russian city of Samara in summer 2007, has it all. Invisible to the guests, advanced automation technology from Beckhoff handles acquisition and individual control of more than 20,000 data points.

The 4-star hotel "Holiday Inn Samara" with views of the Volga River lies in the historic district of Samara. The atrium was awarded first prize in the "Public interior" category of the international "Under the Rooftop IX" competition for architecture and interior design. The hotel has nine floors and two basement levels containing 177 guest rooms, nine conference rooms, catering and wellness facilities. All rooms are equipped with individually controlled air conditioning, LCD TV or projector and an Internet connection.

Beckhoff technology controls all automated systems

The design objectives for the "intelligent hotel" were maximum comfort for the guests, reduced energy consumption and flexibility regarding future adaptation and modifications. All supply systems for air-conditioning, heating, ventilation, de-smoking, warm/cold water and waste water are automated through PC- and Ethernet-based controllers from Beckhoff. "The crucial factors in the decision in favor of Beckhoff technology included the convenient integration of all common building services bus systems such as EIB or LON and the integrated programming interface of TwinCAT automation software," Ivan Golubtsov, director of the Beckhoff agency in Moscow, said. Project design, installation and on-site commissioning were carried out by Bliss GmbH Samara, a Beckhoff integration partner in Russia.

Enhanced comfort – optimized energy consumption

Beckhoff Embedded PCs and Bus Terminal Controllers are used for monitoring and controlling the supply systems. Data exchange between the PCs and the Bus Terminal Controllers takes place via Ethernet. Bus Terminals log and control more than 20,000 data points distributed across the hotel.

TwinCAT automation software forms the centerpiece of the control system. At "Holiday Inn Samara" it deals with monitoring and controlling the following functionalities:

| Signaling functions: error messages and building monitoring with central logging and communication activation via SMS

| Room control: temperature and climate control

| Power management: measurement, logging and optimization of energy consumption

The freely programmable PC controller offers almost inexhaustible functionality. Modifications or extensions of functions can be conveniently configured or amended via software. To make programming according to IEC 61131-3 easier, a standard library for solving basic functions is available. TwinCAT supports connection of all common fieldbuses and PC interfaces, as well as data interfacing via open standards such as OPC. "A commercially available SCADA system for visualization and monitoring of the supply systems is integrated in the control system at the Holiday Inn Samara via OPC," Ivan Golubtsov said. "Functions such as remote diagnostics and maintenance can be realized in conjunction with TwinCAT. In the event of a problem with the gas burner for the warm water system or the ventilating fan, for example, the control system generates an error

A control cabinet with CX1000 Embedded PCs and CAN master is located on each level of the hotel. Via CANopen, the Embedded PCs control a total of 200 "Low Cost" LC5100 Bus Couplers.

Architects "Samogorov & Pastuschenko" (Samara) were awarded first prize in the "public interior" category of the international "Under the Rooftop IX" competition for the atrium of the Holiday Inn Samara hotel.

22 CX1000 Embedded PCs, 40 BC9100 Bus Terminal Controllers and 200 "Low Cost" LC5100 Bus Couplers deal with control and monitoring via 20,000 data points distributed across the hotel.

Topology diagram labels:

30x — Upper floor — 22 x ventilation — CANopen — Fire dampers / Extract fans — EIB

2nd-7th floor

17x — 1st floor — CANopen — Fire dampers / Extract fans — EIB

17x — Ground floor — 3 x warm water — CANopen — Fire dampers / Extract fans — EIB

17x — Basement 1 — 6 x water pumps — Ethernet — CANopen — Fire dampers / Extract fans — EIB

17x — Basement 2 — 3 x fire pumps — 6 x sewage system — CANopen — EIB — Fire dampers / Extract fans
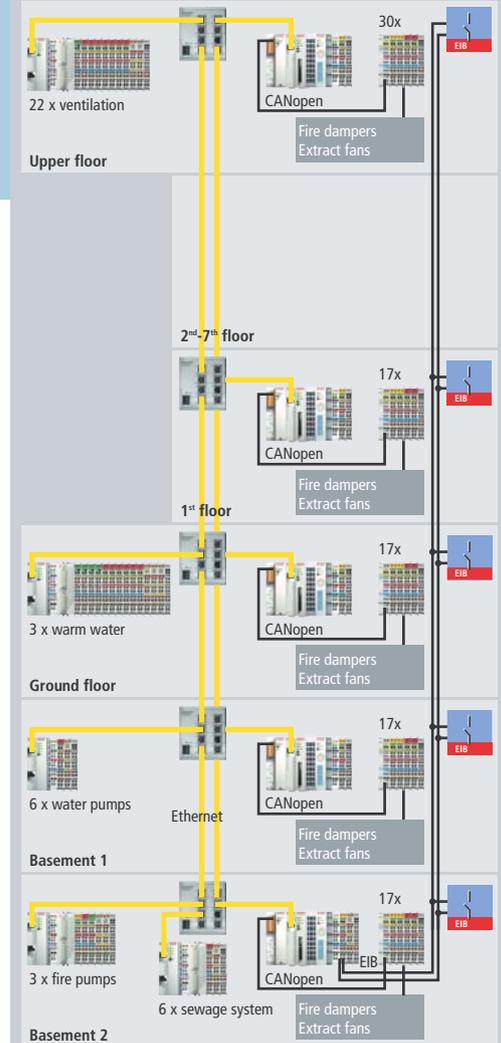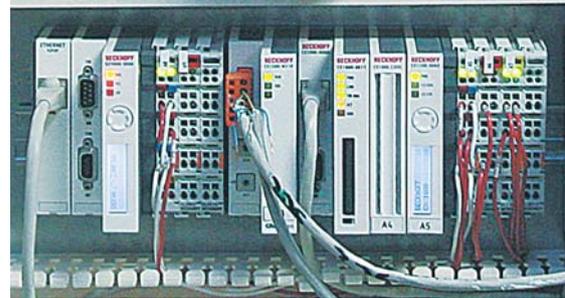
message specifying the type and location of the fault and sends it to the service technician via SMS."

The building data are analyzed for optimizing the control of components and minimizing energy consumption.

Communication from rooftop to basement for added safety

The control technology is basically the same on all 11 levels of the hotel (see topology diagram). Each floor control system consists of a CX1000 Embedded PC with Windows CE as the operating system and subordinate CANopen slaves:

The 4-star business hotel with views of the Volga River lies in the historic district of Samara.

17 or 30 I/O stations with LC5100 Bus Couplers monitor the fire protection flaps and extract fans of the smoke extraction system. A hand switch for manual activation of the smoke extraction system is located on each floor. The hand switches are connected via the EIB bus system and with the higher-level Ethernet bus system via the KL6301.

The supply systems for air-conditioning, heating, ventilation, warm/cold water and waste water are controlled via 40 I/O stations with BC9100 Ethernet controllers. "A key advantage of this control system is that all safety-relevant functions are maintained in the event of a network failure," Ivan Golubtsov said. The I/O stations are distributed across the upper level, the basement levels and the heating plant room.

A switch for data exchange between the CX1000 Embedded PCs and the BC9100 Bus Terminal Controllers is located on each floor. The switches are redundantly connected via optical fiber cables, which ensure cross-level communication of the PCs. The central data are brought together and analyzed in the host computer via Ethernet.

Ethernet integrates the IT and automation worlds

Ethernet as an integrated communication system connects the data worlds of office and building services. In addition to data communication for building services, high-performance Ethernet with high transfer rates offers sufficient reserve capacity for image and voice data or multimedia functions. Accordingly, the Holiday Inn Samara utilizes the data infrastructure for the IT network and for building management. The common Ethernet-based data network covers the sensor/actuator, PC and management levels. This means that the sensors and actuators such as temperature sensors and motors for the ventilation and extract fans can communicate with the higher-level control system. Dual data management is no longer required.

Integration of more than 20,000 data points

Beckhoff Bus Terminals integrate all 20,000 data points of the supply systems and support their monitoring and control functions. For example, they control the room climate based on individual user requirements. They log air quality sensor readings, transfer them to the bus system and send the control value to the ventilating fans. LON and EIB Bus Terminals integrate the corresponding components such as buttons for activating the smoke extraction system into the higher-level Ethernet or CANopen bus systems.

KL6023 wireless adapters receive radio signals from the EnOcean based smoke detectors and convert them to RS485 signals, which are processed by the KL6021 serial Bus Terminal and used for controlling the smoke extraction system. EnOcean is supported by the TwinCAT Serial Communication library. Serial devices such as modems for remote maintenance or diagnostics are also connected via serial Bus Terminals.

Convincing technology

Bliss GmbH successfully met the client's demanding requirements for an "intelligent" hotel through innovative and intelligent building services. Based on the positive experiences with this project, Bliss also intends to use Beckhoff technology for automating the cancer research center currently under construction in Samara.

→ Holiday Inn Samara **www.ichotelsgroup.com**
→ Bliss GmbH Samara **www.bliss-samara.ru**
→ Beckhoff Russia **www.beckhoff.ru**