BECKHOFF New Automation Technology

Urban Automation
PC-based Control for Urban Environments

IPC

I/O

Automation

Those who plan the future of a metropolis need enduring urban concepts.

A look forward to the year 2050: by this time 70 % of all humans will live in conurbations, in other words a series of connected metropolitan areas. Therefore, those who are responsible today for urban planning in a metropolis need the confidence to know that their decisions will prove to be sound for generations to come: to ensure highly efficient water and energy supplies, provide sufficient infrastructure capacities and reduce the carbon footprint as much as possible.

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Our contribution: PC-based controllers for building and infrastructure systems as well as water and energy supplies.

As a specialist in PC-based control technology, Beckhoff has more than 25 years of experience in the implementation of open, standards-based automation solutions. The company shows its full strength in the field of urban automation for planners and system integrators: the security of guaranteed long-term availability combined with the flexibility of high scalability and fully leveraged energy-saving techniques.

Beckhoff Automation at a glance:

- headquarters: Verl, Germany
- turnover 2011: 465 million €
- staff worldwide: more than 2,200
- engineers worldwide: 700
- branch offices in Germany: 11
- subsidiaries/branch offices worldwide: 30
- distributors worldwide: in over 60 countries

(as of 11/2012)

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From a small town to a megacity: optimised efficiency will become a core feature of future urban concepts.

The top criterion for the ecological competitiveness of a city: the carbon footprint. Optimising energy and process efficiency is thus becoming the key topic of future urban concepts in municipal and private sectors – and in all relevant areas at that – from building automation to infrastructure to the supply of water and energy. Solutions are called for that can be realised quickly and used on a long-term basis.

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From the Industrial PC to the control software: long-term availability is becoming a high quality standard.

Technical decision-makers and system integrators must look beyond the horizon: will a relied upon component or a technology still be available in 20 years from now? Is a supplier so firmly anchored in the market that its know-how will also be of use in the metropolis of the future? Is the solution conceived in such a way that future hardware potential can be fully leveraged? Beckhoff offers this security for all of its solutions and components through deliberate design, from Industrial PCs to automation software.

Beckhoff offers planners decision-making security:

- universal automation solutions for buildings, infrastructure, water supplies
- PC-based control as the basis for power monitoring, Smart Grid, Green IT
- guaranteed long-term availability of all products
- over 25 years of experience with PC-based control
- innovative force and stability of a mid-sized, family-owned company

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The goal: more buildings that consume less energy.

Obviously, the human population around the world is increasing, but the available area does not always grow with them. So how should the buildings of the future be designed to cope with this? The status quo demands answers: 41 % of the world's energy is consumed by buildings today. So, intelligent and highly efficient system solutions can unlock enormous savings potential in both new and modernised buildings – if they fulfil all efficiency classes, make use of system-spanning synergy strategies and support Smart Grid solutions.

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The way: integrated, system-spanning building automation.

Open PC-based control technology forms the basis of an integral building automation system that meets all requirements for a sustainable and efficient solution. A uniform hardware and software platform controls all building systems – from usage-based lighting to comfortable room automation to highly efficient HVAC control. The result: optimised matching of all building systems enables the full utilisation of energy-saving potential beyond the requirements of stipulated energy efficiency classes. In addition, integral building automation reduces the costs of hardware and software investments and operation.

- a universal hardware and software platform for all building systems
- the open communication system supports all common protocols, as BACnet, OPC UA, etc.
- very high potential for energy savings
- reduced costs for hardware, software investments and operation
- reduced engineering costs through pre-defined software components
- system adaptations are possible at any time

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Buildings that put the ideas of integrated building automation into practice …

The Scala in Milan is one of the buildings operated with Beckhoff know-how: the range of uses for building automation from Beckhoff is broadly diversified. Museums, theatres, congress centres and industrial complexes all over the world use the holistic building automation solution from Beckhoff. From the automation of individual systems to universal system-spanning building automation, there are virtually no limits in terms of scalability.

Microsoft Cologne, Germany

Ferry Porsche Congress Center, Zell am See, Austria

Oncological Center, Samara, Russia

Schüco Technology Center, Bielefeld, Germany

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… and the Beckhoff technology behind it.

Beckhoff offers the right technology for every building: from high-performance Industrial PCs or Embedded PCs as the main building control computer to local room controllers. The Beckhoff Bus Terminal system for the connection of the data points supports all common sensors and actuators as well as all communication protocols established in the building automation market. The programming of all systems is simplified using TwinCAT automation software in accordance with the IEC 61131-3 standard.

Urban structures need the assurance of growth potential.

Stadiums, airports, railway stations, underground railways: the urban infrastructure offers countless starting points for efficiency optimisation. But that is not the end of it, because the growth in metropolitan areas will continue at a rapid pace and create new demands – and not just on the traffic capacities of a city. For decision-makers this means: You must ensure today that the urban infrastructure is able to reflect and support this growth at any time.

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Unlock growth potential with scalable technology.

A control solution will only be sustainable if it offers the greatest possible flexibility with maximum scalability. Software-based automation concepts from Beckhoff exactly meet this requirement with Industrial PCs of different performance classes, precisely matching I/O components and modular control software that fully exploits the power of the hardware and makes not only initial implementation, but also future retrofits particularly simple.

Ready for Smart Cities: with PC-based control, Beckhoff already offers the basic technologies for "Smart Cities" today – from the "Smart Building" to the acquisition of energy and process data for "Smart Grids."

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Beckhoff know-how for transportation, traffic and sport …

Infrastructural automation solutions from Beckhoff can now be found in well-known reference projects: in the field of transportation and traffic, for example, there is the famous "Nordtangente" in Basel, Switzerland, and the "Metro M2" in Lausanne, Switzerland. In the field of sports, too, Beckhoff contributes to a smooth infrastructure, for example in the "Allianz Arena" in Munich and the "Esprit Arena" in Düsseldorf, Germany.

Nordtangente (ring road north), Basel, Switzerland

Esprit Arena, Germany

Car park management, Reus, Spain

LSG Sky Chefs, Germany

© Photographer: Jens Görlich

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… supported by technology infrastructure, offering long-term availability.

The universally applied Beckhoff automation components are just as flexible in use as the requirements in infrastructure projects are diverse. PC-based control enables integrated, vertical communication: from higher-level ERP or BACS (Building Automation Control System) into the field level through to the individual sensor. The basis for this is the openness of the control technology, i.e. support for all common fieldbus communication standards in the market, and on the software side by the integration of all communication protocols in TwinCAT.

The challenge: use less water and less energy for its treatment.

Water management must face numerous future challenges all at once: the supply of clean drinking water must be guaranteed, even with continuously growing population numbers. At the same time water – a resource that is only growing scarcer – demands sustainable handling. The energy consumption for sewage disposal and treatment requires optimisation – and the budgets for new plants and plant modernisations are limited.

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The answer: an open control platform that supports both areas.

Energy efficiency can be increased considerably using Beckhoff technology, not only in the fresh water supply, but particularly in the treatment of sewage. Whether this involves decentralised remote monitoring of the outstations or central control of sewage treatment plants: crucial parameters such as filling levels, oxygen content, etc. can be precisely measured; the modular control architecture enables energy-optimised sewage treatment.

- PC-based control technology for water and wastewater management
- uniform hardware and software platform supporting all communications standards from the process to the field level
- open communication supports telecontrol protocols according to IEC 60870-5-10-x, OPC UA, fieldbus/Ethernet, wireless, GPRS or UMTS
- compact controllers with integrated measurement technology for monitoring process parameters

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Highly efficient: water supply and sewage treatment with Beckhoff.

The demands on the limit values to be complied with and the demands on the resources needed for treating drinking water and cleaning sewage are increasing: energy, capacity and chemicals. An increase in the operating efficiency of existing and new plants is therefore absolutely necessary, and not just to protect the environment. In order to optimise the especially energy-intensive biological purification stages, you can simply transfer new control approaches from a simulation environment into the process controller. The result is energy savings, an increase in plant capacity and a gain in operational reliability.

Scalable automation technology as a universal control platform for all water management processes: from sewage treatment plants to outstations.

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Implemented with a scalable process controller, including remote monitoring.

In water system outstations, such as wells, pumping stations or storm water tanks, process data must be acquired, processed, stored and transmitted to a control station. Here small controllers or Embedded PCs are used, depending on the application. Different Bus Terminals for the acquisition of various signals allow precise and efficient PC-based control of the processes. The only prerequisite is TwinCAT automation software – and an interface to the data transmission system in use.

Build the technological foundation for the future of your city …

Precisely matching Control Panels, Embedded PCs, I/O systems and software solutions: in PC-based control Beckhoff offers you a highly modular and scalable system. The separation of the control function from dedicated hardware systems and the use of IT and automation standards enable a continuously progressive increase in performance and function as well as significant cost benefits. These can already be achieved during the implementation by eliminating special hardware – and afterwards you benefit from shorter engineering times, increased productivity, faster cycle times and open interfaces that enable inexpensive integration into existing environments.

Robust and highly flexible Control Panels

With the Control Panel series, Beckhoff offers an extensive and modular product range of industrially compatible operating and display devices. The latest generation can be equipped with multi-touch displays and is available in numerous versions: from various display sizes from 7 to 24-inch (16:9, 5:4, 4:3) up to a high-performance Panel PC with a Core™ i7 CPU.

Scalable control technology

The scalable, modular control system from Beckhoff offers an ideal solution for every task: from the high-performance Industrial PC or Embedded PC as the main building control computer to the decentralised controller for the pre-processing of data in a water outstation. PC-based control offers sufficient power reserves for extensions or retrofits to implement additional functions.

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… with PC-based control from Beckhoff.

PC-based control offers cost benefits from the implementation phase on throughout the lifecyle of building and infrastructure systems, and further benefits in operation: faster engineering, increased productivity, shorter cycle times and cost-effective integration in existing environments with the interfaces of the open control solution.

The I/O automation kit

The Beckhoff Bus Terminal system for the connection of data points features over 400 different I/O terminals and supports all common sensors and actuators. Through the support for all common signal types, fieldbus systems and Ethernet systems, the Beckhoff system can be universally applied: from the high rise to the theatre stage to the production machine to the wind turbine.

TwinCAT – software-based control technology

The programming or parameterisation of all systems takes place consistently using TwinCAT automation software. The engineering environment is designed for all common programming standards in IT and automation technology: from IEC 61131-3 to C/C++. Pre-defined software function blocks simplify the engineering. Functional extensions or changes are possible at any time.

Connectivity in the city: communication needs continue to grow.

With the increasingly intelligent infrastructure of cities, the need grows for network connectivity to each part of the infrastructure. Local traffic systems, for example, can be better coordinated, and public buildings can be integrated into a Smart Grid. Communication is the key success factor for smart cities. With the inherently open and flexible control platform, Beckhoff supports all common communication protocols on both the software and hardware side. This allows fast responses to new standards as they become accepted in the market. For example, TwinCAT control software supports international standards such as the telecontrol protocols IEC 60870-5-101, -102, -103 and -104 as well as the IEC 61850 and IEC 61400-25. Standards widely used in buildings such as Ethernet TCP/IP or BACnet/IP are also implemented. OPC UA offers outstanding security characteristics. At the field level, energy meters can be read out via M-bus or Modbus.

Communication protocols supported:
Ethernet TCP/IP,
BACnet/IP,
Modbus RTU/TCP,
OPC UA,
IEC 61850,
IEC 61400-25,
IEC 60870-5-10x

Current measure-ment | Energy monitoring | Tempera-ture | Resis-tance | Pressure | Vibration

Measuring data acquisition

- direct sensor connection
- fieldbus: EtherCAT, PROFIBUS, PROFINET, etc.
- subsystems: M-Bus, LON, EIB/KNX, EnOcean, etc.

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Minimise the carbon footprint: with high-end energy monitoring.

Due to increasingly scarce energy resources, rising operating costs and the call for centralised management of buildings and properties, the need for precise acquisition of energy and consumption data is growing. Combining PC technology with an extensive range of Bus Terminals, Beckhoff provides the ideal platform for meeting this requirement. Seamless integration of energy consumption data acquisition for all building systems into the automation platform results in greater savings potential and synergy effects during the installation and operation of the building. On the basis of the data collected, the required resources can be optimised, and continuous monitoring can take place via benchmarking with the help of an energy management system.

PC-based control goes to town.

Beckhoff implements open automation systems based on PC Control technology. The product range covers Industrial PCs, I/O and Fieldbus Components, Drive Technology and automation software. Products that can be used as separate components or integrated into a complete and seamless control system are available for all industries. The Beckhoff "New Automation Technology" philosophy represents universal and open control and automation solutions that are used worldwide in a wide variety of different applications, ranging from CNC-controlled machine tools to intelligent building automation.

▶ www.beckhoff.com

Turnover development

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Worldwide presence on all continents

The central divisions of Beckhoff, such as development, production, administration, distribution, marketing, support and service, are located at Beckhoff Automation GmbH headquarters in Verl, Germany. Rapidly growing presence in the international market is taking place through 30 subsidiaries. Through worldwide co-operation with partners, Beckhoff is represented in more than 60 countries.

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PC-based Control for Building Automation

PC-based Control for Water Management

Main catalog

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