Integrated building automation for intelligent lighting solutions

Maximizing productivity with intelligent lighting solutions is the shared goal pursued by Beckhoff, Microsoft and Osram with their jointly developed Smart Lighting Solutions concept. The intelligent lighting solution not only makes a significant contribution to energy savings, it also enhances comfort for occupants. Ronald Heinze, editor-in-chief of Building & Automation, discussed these subjects and others with Georg Schemmann from Beckhoff, Thomas Schneider from Osram and Oliver Niedung from Microsoft.
People who feel comfortable in their workplace are more productive, more motivated and can concentrate better for longer periods of time. Optimized lighting conditions in the workplace have a significant influence on employee well-being and on the quality of work. According to Thomas Schneider, the ideal solution is to maximize employee comfort with Human Centric Lighting (HCL): “Lighting is provided exactly when and where it is needed. One positive side effect constitutes, in part, significant energy savings.” HCL consistently combines the possibilities of modern LED technology, advanced automation technology and the IoT. “An important enabler here is LED technology, which has become more than competitive in terms of both technology and price,” Schneider emphasizes. “On top of that, LED is much more environmentally friendly,” he adds. HCL is a key strategy for Osram, in public building areas in particular. “The planning concept incorporates the advantages of natural light in the room,” Schneider

Georg Schemmann, Business Manager Building Automation at Beckhoff
Thomas Schneider, Lighting Solutions at Osram subsidiary Siteco

says. The amount of artificial lighting provided depends on how much natural daylight is already available from the outside.

**Integrated building automation maximizes savings potential**

“Automation specialist Beckhoff contributes the control expertise,” Schneider emphasizes. “After being embedded into the smart IoT environment, HCL becomes a holistically integrated part of the building automation platform.” With Smart Lighting Solutions, Osram subsidiary Siteco and Beckhoff, supplier of integrated building automation systems, together offer a solution that provides connectivity via the Microsoft Azure™ cloud platform, making data available for location-independent analysis and ongoing system optimization.

The open PC-based control systems for building automation from Beckhoff fully maximize savings potential. “With integrated automation technology, energy costs can be drastically reduced,” says Georg Schemmann, Business Manager Building Automation at Beckhoff. He points to a user who integrated the technology in large warehouses and achieved savings in the six-digit range.

The key benefit is that PC Control from Beckhoff not only enables end-to-end automation solutions for all technical building systems, it also offers retrofit options for IoT-enabled products to implement simple and secure cloud connections. Cloud solutions can be used to further optimize systems during operation. The lighting concept benefits from IoT integration in building control systems, fast engineering, centralized and cloud-based energy data analysis, trend mapping and simplified big data handling. “The data acquired by the power measurement terminal is available in the Microsoft Azure™ cloud for system-spanning processing and data analysis, but could also be stored in any other cloud system if the customer so desires,” Schemmann continues.

“The Azure™ IoT Hub service not only makes operational data from the building control system available centrally, it also provides control functions from the cloud via a secure return channel in the other direction,” says Oliver Niedung, IoT specialist at Microsoft. The Azure™ service also offers options for device maintenance and updates. “The visualization of equipment status and data on different devices can be individualized depending on the user’s role. We were able to integrate the visualization for PCs and mobile devices in a very short time by using “PowerBI,”” adds Niedung. We also demonstrated the integration of a new 828 wearable running under Windows 10 IoT Core. “Although the wearable has a lower display resolution compared to larger end devices, it offers tremendous mobility benefits, and through the integration of Azure™ cognitive services it can also be voice-controlled for hands-free operation,” Niedung says.

The controller can be directly connected to the cloud via the Beckhoff EK9160 IoT Bus Coupler, which can be used with standardized cloud protocols such as MQTT, AMQP or OPC UA. HCL uses OPC UA communication technology, which is an internationally recognized interoperability standard for Industrie 4.0 implementations. The TC3 IoT Communicator App from Beckhoff provides direct mobile access to the TwinCAT control software platform. TwinCAT Analytics, a complementary IoT product within the TwinCAT software suite, enables complete, cycle-synchronous data acquisition as a basis for predictive maintenance and trend analyses. Lighting can also be controlled using process data from the cloud, which simplifies efficient energy management.

**Access lighting system status from anywhere**

The automation of buildings and real estate is usually not possible without access to remote diagnostics, remote maintenance and remote control. Swift support from specialists is essential for troubleshooting, software maintenance and installation of updates in order to avoid unnecessary costs caused by system failures. Information on process variables, along with warning and error messages, is also helpful in the ongoing operation and optimization of building systems. All this information can be made readily available by cloud services.

Azure™ is a cloud offering from Microsoft that is trusted to deliver the highest levels of data security and privacy. It was developed with the goal to empower such IoT scenarios as Smart Lighting Solutions. The remote connectivity functions enable users to monitor the status of systems and devices, while predictive maintenance can anticipate the need for service to avoid unplanned downtime.

Smart Lighting Solutions can monitor the status of an entire lighting system, or even an individual light, in real-time from anywhere in the world. Information on energy consumption, service life and maintenance requirements is available at any time. There are virtually no limits as to how the data on energy consumption, switch-on times, frequency of use and service life can be analyzed. “Such topics as predictive maintenance, consumption data acquisition and optimization are
processed by the cloud solution – from individual systems to installations that are widely distributed across different locations,” explains Georg Schemmann.

The user employs a dashboard tailored exactly to their requirements to retrieve the information needed. It can be operated conventionally using the screen or even via Microsoft HoloLens. “The data can be accessed in the future from a remote location with these augmented reality glasses in the simulation phase and in operation. Only when service is required does a technician have to be on-site,” Schemmann says. The advantage of the cloud solution is that operational processes are centrally monitored and controlled. “The energy efficiency of a building can be continuously monitored, visualized and optimized,” Schemmann continues. “Another positive aspect is that a report, which can be used for DIN ISO 50001 compliance, can also be easily generated using the existing data.”

Joint projects of all sizes
Partners Beckhoff and Osram/Siteco are working together on projects of many different sizes. The spectrum of applications ranges from sports facilities to mega-logistics companies, from the reception desk at Lufthansa to large industrial projects. “The combination of the efficient lighting concept and the powerful control and communication solution has proven itself many times over,” emphasizes Georg Schemmann.

Several projects have already been installed with clearly measurable success. “The amount of money that can be saved with efficient lighting control, which is small at first, can quickly add up,” says Thomas Schneider, pointing out benefits for operators. “In a warehouse with several thousand lights, however, this pays off very quickly,” he continues, quoting an example of a “follow me” solution in which “the light follows a moving forklift as required and energy is consumed only in the area of traffic or activity.”

What’s more, in this application case, the total lighting of previously 22 kW of fluorescent tubes was reduced to 11 kW of LED light output, which could be cut to below 2 kW with the “follow me” technology – resulting in energy savings of more than 90%. “Not only do we reduce the maintenance costs of lamps and lighting systems, the needs-oriented control of lighting depending on user presence also saves a huge amount of energy,” says Schneider. “Each project is customer-specific and is developed together with the customer according to their individual needs.” With the advance of Industrie 4.0, so-called DTSs (driver-less transport systems) are an essential component of automated warehouses and production facilities. “If such systems are used, the light can follow the transporter by means of ‘follow me’ technology and thus only use energy where it is needed,” he points out and goes on to describe the paradigm shift: “To bring these concepts into reality, our lighting solutions are increasingly dominated by intelligent software.”

Of course, what the customer wants and needs are the top priorities. “In a data center, however, where each individual server consumes a great deal of energy, the money that can potentially be saved with the lighting system might play a more secondary role. Nevertheless, it is also important to seek contact with these customers as well, because lighting is still an aspect of a holistically integrated point of view,” says Schneider. “To this end, we provide these customers additional services such as energy metering and the corresponding analyses.”

Another project involved the automation of lighting as well as heating, ventilation and air conditioning. “In the past, the entire building was always completely air-conditioned – something that was not necessary because there were only a few people in certain areas of the building at any given time,” explains Georg Schemmann. “The data from the lighting control system were used to determine where the people in the building were, to control HVAC systems accordingly and save energy.” This is also a good example of how to take advantage of the benefits of integrated building automation.

“New ideas for building automation are developed together with the customer,” continues Schemmann. “There is seldom a solution for only one building system. More advantages arise from a cross-system, holistically integrated approach.” According to Schemmann, the partnership between lighting expert Osram, cloud solutions provider Microsoft and automation specialist Beckhoff significantly improves market opportunities all around: “Together, we are able to successfully capitalize on savings potentials for projects large and small,” he concludes.

In a nutshell
The three partners Osram, Beckhoff and Microsoft have joined forces to create Smart Lighting Solutions in order to provide fast, affordable systems based on standards. Osram lamps save energy, ensure user comfort for productive employees and deliver all essential data for predictive maintenance efforts. Beckhoff components are highly robust, flexible, and enable fast integration and efficient system expansion even in the context of cloud scenarios. In addition, Microsoft Azure™ dramatically simplifies the visualization of key figures and the implementation of predictive analysis.

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