SMART GREEN BUILDINGS

CONSTRUCTING BUILDINGS MORE EFFICIENTLY

Topics in this Issue

MORE EFFICIENT THANKS TO BUILDING AUTOMATION!

BECAUSE GREEN IS SMART

Building requirements are increasing – especially with regard to energy and resource efficiency. As a partner for building installation and automation, we support you in finding suitable and sustainable solutions for your project – regardless of whether it is an existing building or a new construction.

WAGO

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SUSTAINABILITY IN BUILDINGS:
NOT NEW, BUT MORE PERTINENT THAN EVER

Dear Reader,

Climate action is one of the stated goals requiring global, political endeavors. The EU has claimed it will reduce its CO_2 emissions by 55 percent by 2030, and become climate-neutral by 2050 – a more than ambitious goal. The opening statement by the Federal Ministry of Economic Affairs and Climate Action, published at the beginning of the year, expressed the determination that a tripling of the previous speed of emissions reduction is necessary for climate action. Therefore, additional fast-acting measures are needed in all sectors. What those precisely are and what guidelines will follow for the building technology industry, an energy-intensive sector, remains to be seen.

At the same time, sustainability is not new in building construction. A highly efficient, and thus also economic operation, has always been relevant. Energy management systems, which record data and provide it for improvement, have existed for more than 30 years. Sustainability, or efficiency, in buildings isn't novel; however, it is currently even more relevant, precisely because of concurrently increasing technical demands.

In this process, we're no longer talking about buildings with generally low energy consumption levels, but instead are already focused on the next generation of construction, Green Buildings. This is understood to mean buildings that, in their design, construction and operation, comprehensively follow sustainable approaches. They are designed so that over the entire life cycle of the building – from planning up to reconstruction or dismantling – they function efficiently and sparingly with resources like materials, water and energy. Green Buildings are thus generally smart buildings: automation technology is absolutely required, especially in the area of non-residential buildings, in order to coordinate all equipment and building systems to one another over the long term, and thus to efficiently control them.

It is clear that when we talk about sustainability in buildings, we must stop looking for individual solutions and instead consider the entire building life cycle. Therefore, we would like to provide you with a greater understanding of some of these approaches in the following pages of this issue of **WAGO DIRECTBUILDING**. Consequently, we have engaged with questions relating to the ways in which building automation and installations can contribute to Green Building, like how lighting – which is already quite efficient at current LED technology levels – can be configured to be even more energy efficient due to intelligent controllers, and which technical developments support an overall, efficient life cycle.

Enjoy reading!

Sincerely, Daniel Wehmeier

Vice President Industry Management Building Technologies at WAGO

WAGO DIRECTBUILDING: CONSTRUCTING BUILDINGS MORE EFFICIENTLY

The building sector is confronted by a major task: it must become significantly more energy efficient. The technology already exists, yet, the energy savings potentials in buildings have not been fully exploited nor employed in sufficient measures. Read in this issue of WAGO DIRECTBUILDING about the different approaches for configuring buildings to be more efficient and what these can look like.

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CURRENT NEWS FROM WAGO

WELL CUSHIONED

100% BIODEGRADABLE PAPER AIR CUSHIONS REPLACE PLASTIC PACKAGING AT WAGO.

Sustainability is a communal responsibility. WAGO is also confronted by these current challenges, which include waste prevention and the improvement of recycling loops, among other things. Logistics has succeeded in converting the filler in our transport packaging to air cushions made of 100% biodegradable paper. These air cushions, manufactured completely from recycled paper, contain an ultra-thin, compostable sealing layer that doesn't negatively impact recycling. Therefore, the new AirWave PaperWave® Bio air cushions can be recycled into different paper products or disposed of with compostable materials. The material even dissolves in water, which prevents the packaging from ending up in the oceans. This allows WAGO to save around 9 tons of plastic waste per year.

WAGO BREAKS THE BILLION EURO MARK

A REVENUE INCREASE OF MORE THAN 20 PERCENT OVER THE PREVIOUS YEAR

The WAGO Group has been able to take advantage of the overall economic growth and momentum in the electrical engineering and automation industries in 2021, breaking one billion in revenue at the end of the year. With this milestone, WAGO has achieved a revenue increase of more than 20 percent over the previous year and, according to the "Top 100" ranking by the Munich Strategy consulting firm, is one of the 100 fastest growing medium-sized companies in Germany, as reported by the Handelsblatt newspaper. Thank you for your trust!

"All signs at WAGO point to growth; we have our sights set firmly on another billion in revenue," emphasizes CEO Dr. Heiner Lang.

*flex*ROOM® WITH NEW FUNCTIONS AND OPTIONS

flexROOM® is a segment-based concept that supports modification of rooms and open spaces through variable wall positioning, even during use – no need to access or handle the cabling. The new version also allows direct connection of the room operating units from Thermokon's Novos Series, and supports an expanded selection of EnOcean® wireless room control units and sensors. In addition, an MP bus is now integrated into the application. Even more options exist when it is combined with the WAGO Application Weather Station, which now offers shade correction and dynamic wind monitoring to optimize sun protection control as well as expanded safety functions.

EFLEET GROWS

The WAGO vehicle fleet has added a VW ID4 and a Skoda ENYAQ, and in so doing gained two purely electric vehicles. The vehicles can be used by employees for driving between locations, allowing them to travel with minimal emission levels.

WAGO LIGHTING MANAGEMENT

NOW WITH CLOUD CONNECTION AND OPC-UA INTERFACE

The new version of WAGO Lighting Management offers a solution that is now able to monitor and manage lighting from a central point: the cloud connection allows convenient access to the equipment data at any time, from anywhere in the world. In addition to WAGO Cloud and WAGO Cloud Building Operation and Control, other cloud applications are supported, such as Azure, AWS, IBM, SAP and native MQTT – likewise, multi-cloud connectivity is also possible. The OPC UA interface, via which data can be provided to higher-level systems for further processing and evaluation, is also new.

BUILDING AUTOMATION AS A KEY TO THE GREEN BUILDING?!

A green building sector with the lowest possible energy consumption levels, little wasting of resources and a high degree of comfort – that is the goal of current efforts at the national level of many countries, and also internationally. Building automation is thereby one topic that has increasingly gained in focus. And yet, how much does intelligent building control really have to do with energy efficiency?


GEBÄUDETECHNIK
Ihre Anforderungen im Fokus

Buildings are designated as green if they are sustainably built and also operated in a green way. Special attention is paid to the use of energy and resources. And not without reason: in the EU alone, the building sector is responsible for more than 40% of the total energy consumption and around 35% of all CO_2 emissions, making it one of the most energy-intensive sectors overall – and thus an important factor for the energy revolution. While the further development and expansion of renewable energies are important steps, the sector must simultaneously and primarily deal with the question of how energy consumption by buildings may be further reduced. Currently, non-residential buildings cover approximately 3,507 km² of heated, net floor space in Germany – about the land surface of Mallorca – according to the dena building report in 2021. At 204 TWh, the largest proportion of the energy consumed is allocated to room heating, followed by lighting at 56 TWh, hot water at 25 TWH and cooling at 9 TWh. "This does provide a lot of scope for optimizations," according to Dirk Dronia, Industry Management Building Automation at WAGO.

"Room automation is indispensable for optimal climate and also comfort at maximum energy efficiency." – Dirk Dronia, Global Industry Manager Building Automation at WAGO

New Standard: High Energy Efficiency in New Construction

"Standards for construction are currently already high," says Dronia. "Most new construction resembles a thermos flask in its level of insulation." The lighting is also increasingly efficient due to LED technology. A building's energy needs are thus already reduced in general. However, it has been demonstrated that, even in newer buildings with efficient construction and low-energy technologies, the energy consumed for room heating and cooling remains one of the largest energy line items in the area of non-residential buildings – not least because a pleasant room environment influences the users' comfort and productivity. In this case, it is valid to efficiently configure energy expenditures for an optimal indoor climate.

"Room automation – the combination of climate and lighting control, and also shading – thus plays an essential role, even in well-insulated construction, and is indispensable for an optimal climate and comfort while maintaining maximum energy efficiency. Before rooms need to be cooled in the summer, closed shades prevent sunlight from penetrating, thus heating, the rooms. In winter, rooms can be warmed by opening the blinds, which supports the heating systems, and provides a supply of warm air from the rooms for the heat recovery system via the exhaust air. If the blinds have a layer to separate between glare protection and light deflection, then sunlight can be directed into the rooms despite the glare protection, reducing the need for electric lighting," according to Dronia. A sophisticated room automation system thus ensures optimal room conditions and efficient use of energy, without requiring interventions by the users – a win-win situation for all sides,

"In order to make progress in the building sector to achieve reductions in energy consumption and lowered CO_2 emissions at the speed necessary for 2030, significantly more annual investments and more ambitious measures are necessary to increase energy efficiency and to exploit renewable energies in the building sector – both in new construction, as energy optimized buildings, and also in energy renovations of existing buildings."

Federal Ministry for Economic Affairs and Energy (BEG NWG, 2021)

which has led to so many new construction projects that are state of the art. Why then does the building sector cause such headaches for many politicians and climate experts?

The crux of the matter is that buildings, unlike quickly changing sectors – like automotive or IT – are designed for a much longer operating life. Change occurs slowly. For new buildings, it is possible to plan and implement available technology for more efficient operation from the outset. However, for each new, efficient building, there are numerous existing buildings that were true energy hogs, some of them for decades, and many remain so today. This means that in 2050, the year targeted for Europe's climate neutrality, more than 80 percent of currently existing buildings will still be standing. If the building sector is to become greener, then a large portion of extant buildings must be renovated to become energy efficient.
Renovations have therefore long been under discussion across Europe, and have received focus as a specific goal during the "Renovation Wave" initiative of 2020.

Fieldbus-independent with maximum flexibility: our I/O systems

The Renovation Wave: Rates of Renovation Must Increase

The "Renovation Wave" refers to an action plan by the European Commission within the context of the European Green Deal (see Building glossary, p. 24), which includes multiple measures to promote building renovation. The goal of the policy paper is to improve energy performance in buildings, and thus to contribute to climate neutrality and to the economic recovery. As is currently well known, in order to improve the climate footprint in the building sector, numerous flagship smart buildings are required, but what is truly needed are many more energy-efficient renovations across the extant building stock. According to the European commission, this currently stands at less than one percent of all buildings annually – too little to achieve the goal of climate neutrality by 2050.

This rate should therefore be at least doubled in the shortest possible time. Retrofitting of building automation also plays an important role in this. "The Renovation Wave described measures that were supposed to lead to efficient operation of extant building stock. For example, that, which WAGO currently enables through ***flex***ROOM®, will then become compulsory in some EU countries starting in 2030. Let's say that buildings must satisfy the requirements for Class A, described in EN 15232, or the requirements from the global ISO 52120 following from EN 15232. These state that interactions between shading, lighting, and heating and cooling must occur," explains Dronia. In addition to the decarbonization of heating and cooling, the renovation strategy additionally focuses on the currently worst performing buildings and – due to their function as role models – on public buildings. "Far too little is actually occurring," continues Dronia. "36 … 40% of global energy output is traced back to buildings, and the time for achieving the specified goals is already running out."

Greatest Potential for Energy Efficiency in Non-Residential Buildings Lies in the Existing Stock

"Automation of buildings offers substantial advantages to users and operators in relation to energy monitoring, energy efficiency and comfort," emphasizes Dronia. "This represents an essential point, precisely in extant buildings, for saving energy and thus CO_2." The importance of renovation is also highlighted in current directives: the most recent version of the EU Guidelines for the Energy Performance of Buildings (EPBD) from 2018 states that larger, non-residential buildings, constructed before 2025, must be retrofitted with the most important functions of building

automation. This affects non-residential buildings with an installed output of 290 kW for heating, air conditioning, and ventilation systems, insofar as this is technically and economically feasible. The additional clause, 'economically feasible', is currently under discussion, as the goal of reducing CO_2 is rated higher than pure economic utilization. In any case, older, existing buildings, without networked building or room automation and energy monitoring, offer the greatest potential for energy savings in the sector. When renovating existing construction, automation therefore plays a decisive role, which is promoted across Europe by the EPBD as a guideline.

Flexible Automation: Key Role in Building Renovations

By using building automation, building technology processes can be efficiently monitored and controlled. Synergies arise, e.g., between heating, ventilation, and air conditioning systems, as well as between lighting and shading systems. Primary energy can then be used in a demand driven way. For example, energy is then only used when it is actually needed – like in the case of daylight-dependent lighting controls, or presence-dependent air conditioning. The controllers necessary for this can usually be retrofitted without much difficulty. In addition, building automation calls direct attention to faults and enables fast intervention, which in turn counteracts waste in resources.

For efficient automation, one needs the corresponding expertise in addition to the hardware. "However, by using the I/O System 750 from WAGO on the one hand and a sophisticated application on the other, pretty much everything can be executed. By using a modular system, like our WAGO I/O System 750, building operators can gain maximum flexibility in hardware design." This means that the necessary hardware can be adapted to the physical conditions as needed, and utilize already existing actuators and sensors. An important point in facilitating renovations. This is because, "The next 10-15 years will be an extreme balancing act for producers and also operators," acknowledges Dronia, who continues, "we must have maximal flexibility with existing systems, which means working with old field devices and with passive signals as needed there, while we have concurrently entered the IoT area in new construction. That is: smart sensors and everything is digital. Covering this with one product portfolio is a task that we already fulfill every day."

Summary: Building Automation as a Key to Green Buildings?

Well-controlled smart buildings have many advantages: they are more comfortable, make everyday life easier for the users, enable an optimal and efficient use of space, request services for housekeeping, technical maintenance and fault clearance actions as needed, and, not least, can improve the energy footprint – and thus make important contributions to the energy revolution. Therefore, we already rely, almost universally, on corresponding automation measures for new construction – not only for energy efficiency, but also for greater comfort and smart services. The savings potentials attributed to building automation in extant building stock have not been consistently applied nor sufficiently exploited. Yet these energy saving renovations with retrofitted, sophisticated automation systems are precisely what is needed in order to achieve climate neutrality in the building sector over the long term. It is therefore necessary to consider renovation more closely – and thereby also to focus again on building automation.

Dirk Dronia is the Global Industry Manager Building Automation at WAGO and, after 30 years spent in the building automation market, understands its challenges, developments, and opportunities.

WAGO Solution Builder
Register, download and use for one year free of charge!

https://www.wago.com/us/automation-technology/discover-software/solution-builder

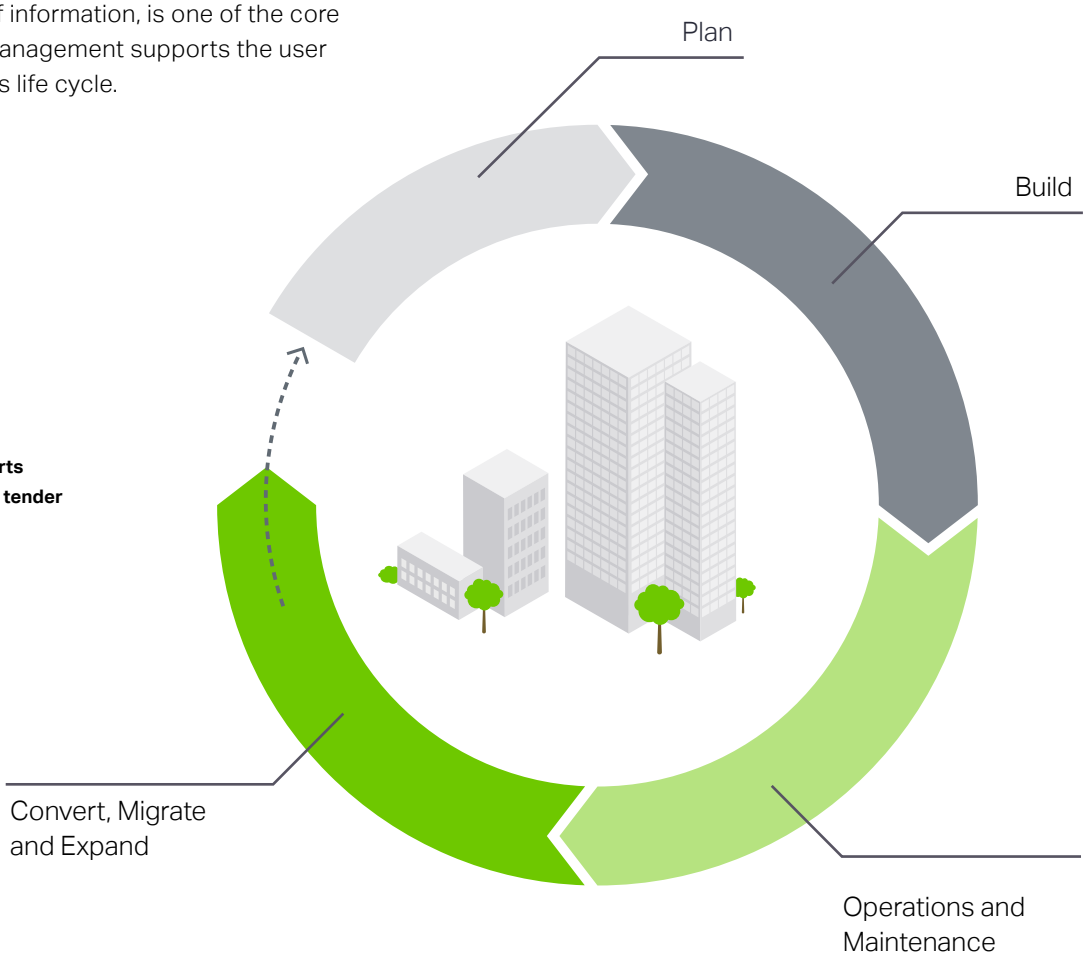
AN INTEGRATED APPROACH TO PROJECT ENGINEERING IN BUILDING AUTOMATION

WAGO SOLUTION BUILDER CAN MANAGE HUNDREDS OF DEVICES THROUGH A CENTRAL INTERFACE.

As an integrated software solution tailored to building applications, WAGO Solution Builder supports you in setting up building automation systems. This simple, efficient tool for building projects enables a platform-independent setup process for the entire building through a Web interface – even offline. Technologies like BACnet® and subsystems like DALI are seamlessly integrated into the workflow. All the project documentation can be generated with the push of a button. Applications can also be saved as templates for easy reuse. All user groups work together through the new software solution's central interface, which simplifies operation and allows a consistent workflow. The bulk handling and intelligent bulk processing options also save time and money. With WAGO Solution Builder, you can manage hundreds of devices, such as automation stations, fieldbus couplers, switches and third-party devices. Processing a large number of applications and data points, including automatic inheritance of information, is one of the core functions. The device management supports the user throughout the building's life cycle.

Your benefits:

- **A clearly organized representation of the system on a Web interface**
- **An efficient workflow to save time during engineering**
- **Intelligent bulk processing of data and devices helps prevent errors**
- **Simple, comprehensive project documentation with one mouse click**



WAGO Solution Builder supports your building project from the tender to maintenance.

INTERVIEW

RAINER KNODEL

WAGO's system specialist in BACnet® and building management systems talks about the WAGO Solution Builder and its development.

Mr Knodel, what intentions did WAGO pursue in the development of the WAGO Solution Builder?

Rainer Knodel: »Our concern was primarily the topic of holistic project engineering in building automation. The world of building automation continues to develop. While previously the focus was on programming just one automation station (controller), many controllers might now be used in one project, and they need to be programmed and managed across property lines and proprietary systems. While programming applications had already moved into the background, this has only increased due to standardization and the availability of macro libraries. This, in turn has shifted the focus to management and modern data storage. Therefore, it is important to pay attention to data exchange with third parties – for example, when we are considering new design processes using Building Information Modeling (BIM).«

What were the challenges during this development?

Knodel: »Complexity is increasing in project design engineering! Let's take a look at current tasks in HVAC automation, room automation, or lighting management: the number of installed components in use there has massively increased in the last few years. This relates primarily to smart, communicative components, in addition to the controllers. In the meantime, the primary tasks have changed – to data recording, transmitting data via various protocols, storing, evaluating, analyzing and, not least, visualizing the information. This involves updating software and firmware, while keeping cybersecurity in mind – from managing passwords through automation and management levels up to closing security breaches.«

In your opinion, what is the greatest benefit of the WAGO Solution Builder?

Knodel: »It is important to understand that nothing can be considered in isolation. Automation for building systems is part of a building project and must be seamlessly linked into the construction process, from design to the transfer to the end user. In general, however, the sector is subjected to enormous time pressures, and the current lack of skilled workers exacerbates the situation. This is why WAGO developed the WAGO Solution Builder, in order to simplify work during the design of construction projects.«

What added value does the WAGO Solution Builder offer to users?

Knodel: »The WAGO Solution Builder works using so-called software wizards. These allow users to easily generate applications without in-depth expert knowledge. A wizard asks the user questions that build on one another, for example, what should be achieved, and then generates an executable program from the responses. Using modern tools to create building automation systems provides an option for operating buildings and properties more efficiently and easily. Harmonization and standardization can then be exploited to yield economies of scale.«

Who did WAGO develop the WAGO Solution Builder for?

Knodel: »We want to use the solution to especially support building automation system builders and operators over the entire life cycle of a building.«

What are you particularly proud of in the WAGO Solution Builder?

Knodel: »So many features: firstly, the ability to work on multiple projects, which allows for parallel generation of multiple solutions for building automation in one software program, and also project generation and controller configuration without requiring the devices to be connected, that is, they can be offline, and the option for commissioning controllers 'out of the box' with the WAGO Solution Builder – we're very proud of this. In addition, we use addressing systems as the basis for the project tree. This allows users to profit from automatic key generation for BACnet® projects.«

As a systems specialist, Rainer Knodel knows what is important on the system side when it comes to designing. He has been working on building automation for 25 years; 16 of them at WAGO. His specialty is large projects that use BACnet®.

How does the WAGO Solution Builder support integrated project engineering?

Knodel: »The WAGO Solution Builder primarily gains time for its users as well as a minimization of errors during design and documentation, precisely because projects are becoming more complicated and comprehensive. Our solution supports users when organizing (large) projects, co-working on projects (for example, through a simple transfer of data between colleagues), in the device management of multiple controllers and when securing the controllers as an aspect of cybersecurity. The WAGO Solution Builder is, as stated, a software program for the entire building life cycle, and provides support during each phase.«

Thank you, Mr Knodel!

WAGO Solution Builder supports your project, from winning the contract, to commissioning, execution and documentation, all the way to periodic servicing and hardware and software maintenance.

AUTOMATION DATA AS THE FOUNDATION FOR GREATER SUSTAINABILITY

BUILDING AUTOMATION PUSHES EFFICIENCY AND INNOVATION IN WILOPARK

The Wilo Group has invested approximately €300 million in their Dortmund facility. The Wilopark includes a cutting edge Smart Factory, an office building, dubbed the Pioneer Cube, a customer service center, and areas devoted to product development and other needs.

Are sustainability, energy transition and climate protection a solid component of your own company's philosophy? The Wilo Group, one of the world's leading premium providers of pumps and pump systems, uses "green solutions for a better climate" to embody this self-image, and constantly proves it with its products. One ambitious construction project, the innovative Wilopark facility, engages with this topic and implements it in a construction example. Building automation takes on a key role in this project.

Pioneering Project Wilopark

The Wilo Group, global leader in supplying pumps and pump systems for building technology, water resource management and industry, is combining its 150 years of tradition with a sustainable vision of the future: "We move water – intelligently, efficiently and in a climate friendly way." An impressive concept has been implemented at the Wilopark construction site that spans 20 hectares in Dortmund: A modern innovation center – consisting of a factory, management and production areas

as well as a networking center for the exchange of information with customers – is under construction here in order to more efficiently exploit synergies from different sectors. The goal is energy-efficient buildings, smart and lean production, energy generation from renewable sources and the implementation of digital processes to gain added value on the part of the employees, customers and the environment. The implementation primarily requires a sophisticated building automation: Hermes Systeme GmbH was selected to design and implement the ICA and automation technology, and WAGO system technology forms the foundation.

The Technical Building Equipment

The innovative design of the Wilopark presents a special challenge for building technology. The object was to configure the individual areas as flexibly as possible, and to thereby integrate the building equipment so that it can correctly react to all current and future demands. Special emphasis was placed on area neutrality, flexibility and efficiency.

Therefore, all lights, meters, presence sensors, volumetric flow controllers, pumps and shading systems in the new construction were integrated into the building management system (BMS). "In this project, we're talking about a good 6,500 hardware data points and around 100,000 virtual data points," reports Christian Nölker, Project Manager BMS at Hermes Systeme GmbH. The company has specialized in automation and industrial wiring projects for 30 years, and was entrusted with managing the HVAC work, boilers and air conditioning controllers as well as lighting and blinds in the Wilopark project. Markus Kauling, who is responsible for the supply technology and energy supply at Wilo, explains the goals required from the building automation, "We want to be able to view everything at once, and have the necessary access to all operating and diagnostic data from the data points. They also must be controllable, because every data point generates valuable information for us."

Building Automation in a Key Role

"In order to be able to reliably and consistently provide all of the data, we rely on a completely integrated automation solution and object oriented programming," explains Nölker, the project leader from Hermes. "Our customers expect reliability and we expect the same from the hardware we install. This is one of the main reasons that we decided on WAGO." The entire control level at Wilopark is implemented using WAGO products: Hermes has integrated a total of 125 PFC200 Controllers from the WAGO modular I/O system. "The variety of supported protocols is the second aspect, that clearly and obviously pointed toward controllers from WAGO," adds Nölker. In this way, the hardware has overcome one of the greatest challenges in the pump manufacturer's BMS: the sensors and actuators can be linked to the controller using a good dozen different interfaces, like Modbus TCP, Modbus RTU, or BACnet®, which provides a high degree of flexibility.

Another important aspect of the building automation system lies in systematic maintenance management: the operating and diagnostic data generated from the data points can be output as error messages by the higher level control system. Due to these networked error messages, the building technology can ensure a uniformly high quality for the work environment and air conditioning at higher efficiency.

The Pioneer Cube (see picture) has already been completed. A majority of the remaining construction will be completed for the company's 150th anniversary in 2022.

Uniform System Landscape, Different Demands

Although Wilo strongly connected the management and production areas with each other, different demands are placed on the respective building automation systems: "In the office area, the BMS supports us with an efficient implementation of flexible work space designs," explains David Wiethölter, a technical building equipment engineer at Wilo. "Each workspace is individually controllable with regards to light, shading, heat and ventilation. Other demands prevail in the factory area. Constant air quality is necessary here for the highly sensitive electronics." Nölker presents this from the viewpoint of a system integrator, "We divided the 55,000 m² manufacturing space of Wilo's smart factory into a grid. Each light is assigned to a specific grid segment. Individual segments can be aggregated into areas, which then form a mutual lighting scenario." Based on this concept and due to the WAGO controllers, Wilo can flexibly establish the individual production islands, while taking pending order types and loads into account, and simultaneously operate in an energy efficient manner.

Hermes uses the WAGO ***e!****COCKPIT* software platform to generate the automation programs.

"It was already clear in the design stage how efficient we already are due to the uniform WAGO system landscape,"- explains Nölker, who continues, "Objects that are commonly used, like lights, pumps, fans, frequency converters, or also common functions or function blocks are organized in libraries, so they can be easily reused, and function as instances for the automation programs. If an object is functionally expanded, this occurs centrally in the library, and this expanded function is subsequently available in all object instances in which it is used. This is super efficient."

Constant Development as an Important Factor in Increased Efficiency

In the first year following the start of production, after a few basic optimizations were implemented and large amounts of data were collected and evaluated, Wilo was able to implement data-driven optimization measures. "We now had a lot of adjusting points available, so that we can constantly get closer to our climate protection goals," exclaims Wiethölter. "However, we also benefit from the continuous diagnostic messages. For example, the ventilation system reports autonomously when a filter needs to be changed, to name just one example from many." His colleague, Kauling, adds,

»Our customers expect reliability and we expect the same from the hardware we install.«

Christian Nölker, Project Leader BMS at Hermes Systeme GmbH

"Wilo has continuously developed over the past 150 years due to our innovative force, and Wilopark precisely embodies the qualities that customers expect from out products: innovation and energy efficiency." Our building technology, the design from Hermes and the hardware from WAGO, forms a strong backbone for it."

Sustainability as Part of the Strategy

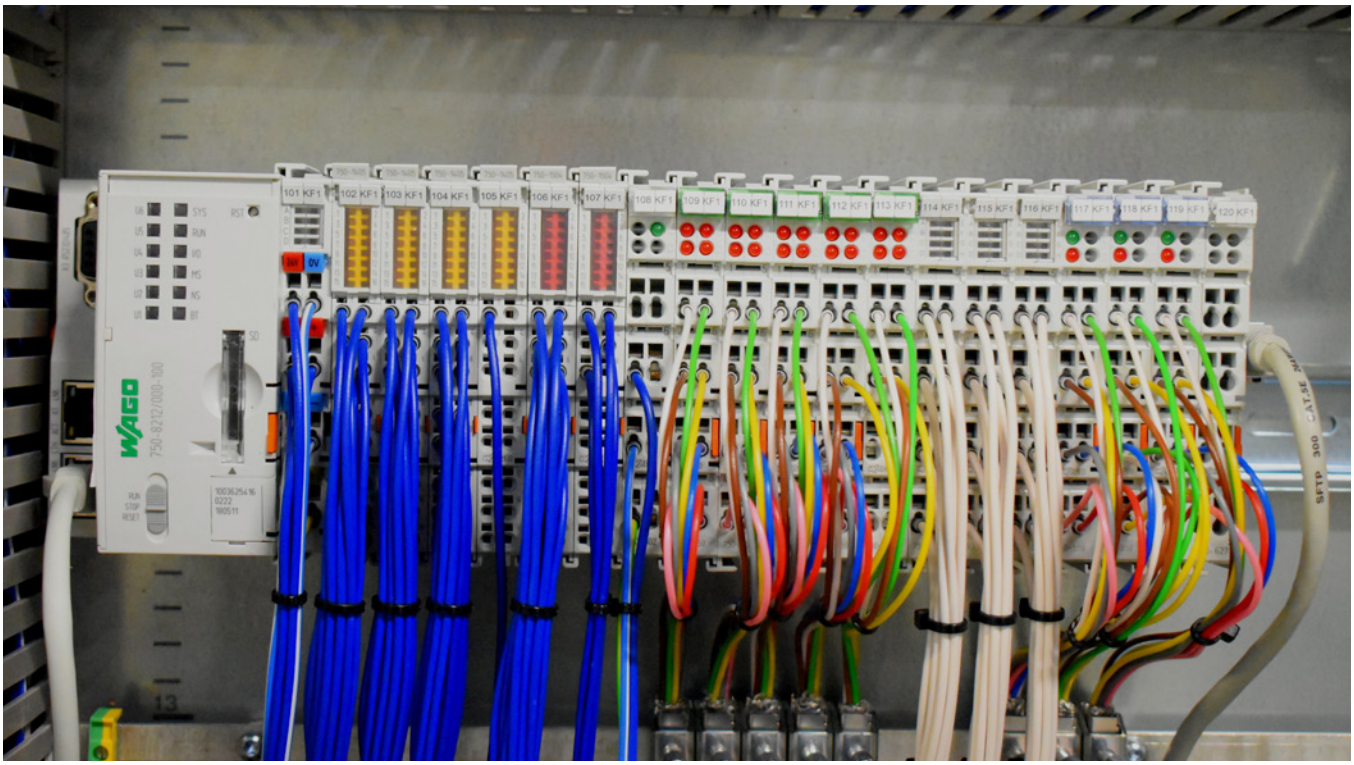
"Climate protection is part of our business model," explains Kauling. "With Wilopark, we want to express the innovative strength of our company and our sustainability strategy in the form of architecture, with the aid of modern building control technology." Building automation correspondingly ensures both optimal and safe working conditions in the offices and production sites, and also assists in implementing the pump manufacturer's sustainability strategy.

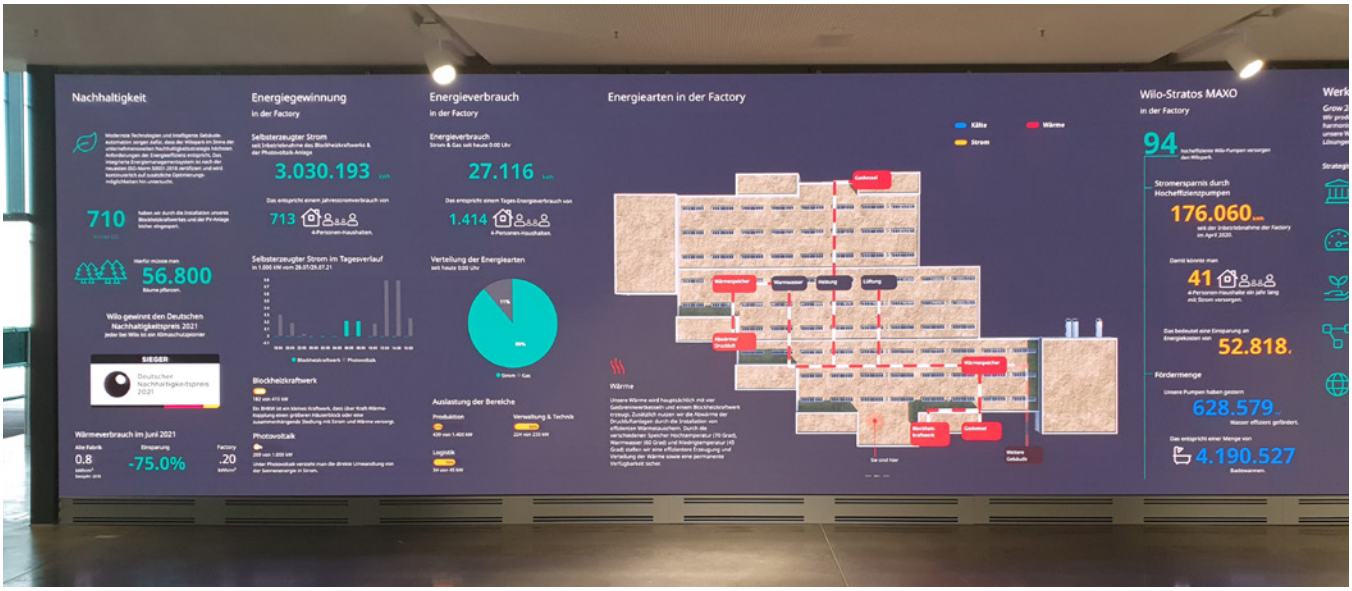
One of the ambitious goals is to reduce energy consumption by one-third by modernizing the production lines. The technical building equipment plays an important role here. "Introducing temperature changes into halls of this size is very energy intensive. Therefore, the controller considers the weather predictions for the next three days when setting the heat or cooling for our five primary hall spaces," according to Wiethölter. "Values like wind strength and direction, air pressure, humidity, and predictive data from the German weather services are entered into an algorithm, which ensures that the necessary indoor air quality is maintained, and that only a minimum amount of energy has to be used for this." WAGO controllers are used as central control elements in the HVAC and lighting technology systems.

Wilopark as a 'Living Lab'

Wilo is additionally following the 'Living Lab' approach with their new innovation center. A type of experimental research is carried out here under real conditions and with high levels of user participation. Kauling, the team leader from Wilo. describes the thought process behind it, "We naturally rely on our own products in supply technology. Just under 100 Wilo pumps make the facility into a major test center for our own technology." Since the large aggregates primarily have autonomous control functions, it is important that they safely communicate with the higher-level WAGO PFC200 Controllers, as Kauling explains. "If colleagues remove one pump from the aggregate, the WAGO controller receives this message through Modbus® and then forwards it to the higher-level building management system via OPC/UA. The entire operation must run reliably, as we ultimately supply systems that are relevant to production."

Wilo and Hermes Systeme rely on WAGO's modular I/O system to control the building automation: a total of 125 PFC200 Controllers are installed at Wilopark. The flexible system provides a lot of space for future expansions.





Digitally networked building technology as part of the digital transformation: All data points, that are integrated via the WAGO controllers, generate a transparent image of the key energy figures.

The knowledge gained from the Wilopark data points is being used by the Dortmund company to visualize all of the energy flows and to sustainably optimize the energy efficiency. The University of Wuppertal is also assisting with this. Wilo is participating in the VeProB joint project (Vernetzte Energieströme von Produktions- und Bürogebäuden), related to networked energy flows from production and office buildings. The focus of the research project, supported by the Federal Ministry for Economy and Climate Protection, lies in the recording, evaluation, and optimization of energy flows in interconnected office and production buildings.

Summary

With the realization of their Dortmund headquarters, the Wilo Group has definitively proven that explicit sustainability strategies are viable, when taking into account all company aspects, and also are supported by construction measures.
A future-oriented operation concept, based on digitally networked building technology, supports the pump specialists on the path to becoming an innovative climate protection company. Wilo can rely on automation technology from WAGO for the necessary flexibility.

Project Partner

Wilo Group
A copper and brassware factory, founded in Dortmund in 1872, was the predecessor to Wilo Group. The company is currently a global leader in the manufacturing of premium pumps and pump systems for building technology, water management and industrial clients.

www.wilo.com/de

Hermes Systeme GmbH
The company, headquartered in Wildeshausen, develops innovative solutions for various individual job specifications in ICA and automation technologies.

www.hermes-systeme.de

GLOSSARY OF A GREEN BUILDING

The desired climate aims, the higher level of environmental consciousness and increasing prices for heating oil, gas, and electricity, also require changes in building construction. The most energy efficient construction method is therefore already standard today. We will introduce some important terms, which you should recognize in this context, in more detail at this point.

Digital Twin:

A digital twin is a digital representation of a material or immaterial object, a process, or a real world service. It enables maximum data transparency and ensures increased efficiency due to its potential for analysis. A digital building twin consists of various factors: a uniform, manufacturer-neutral information architecture and data structure, IoT sensors (which detect and react to all building states) and an IoT platform (which processes and illustrates all of the data). In each life cycle phase – both for new construction and also for existing buildings – digital twins offer a number of advantages: e.g., shorter construction times, lower operating costs and increased efficiency for the entire building operation.

Energy Self-Sufficient House:

An energy self-sufficient house is a building that gets by without external power supply – and often doesn't even have an external electrical or gas connection. In contrast to zero-energy and energy-plus buildings, energy self-sufficient buildings cover their own energy needs; this is achieved using seasonal heating and electrical storage, which makes excess energy from the summer months available into winter. Energy-saving building envelope surfaces, large storage measures in the building and energy-efficient devices are thereby essential.

Building Life Cycle:

The building life cycle includes multiple phases: planning, realization, use and recovery. Everything begins with an idea, which must initially be checked against its compatibility with building regulations and construction law, and also their technical feasibility and economics. Finally, the actual construction begins, which may last between 1-2 years, depending on the type of building. The subsequent use phase is represented by the intended use of the building – and is therefore the longest and most cost-intensive phase. The last phase of the building cycle is recovery. This includes multiple possibilities: either a complete demolition or a revitalization of the building, thus a conversion or renovation (partial or complete structural restoration).

European Green Deal:

The "European Green Deal" is the strategy for sustainability embraced by the European Union and its member states. It should contribute to large parts of Europe attaining climate neutrality by 2050. Sustainable products are also a point of focus in the strategy. This framework includes the use of recyclable or recycled material, reparability or reduced CO_2 emissions from products (e.g., Environmental Product Declarations), that is, topics, which the industry in general and also individual companies like WAGO must deal with intensively in the future.

Integrated Planning:

Integrated planning is a prerequisite for realizing sustainable, resource- and energy-saving buildings. Its goal is to increase a building's overall efficiency. Important pillars thereby include interdisciplinary cooperation and intense communication between all participants – because processes can be shortened, costs reduced, and the quality of the design phase increased only if the building is understood and designed as a complete system.

Low-Energy Building:

While the term, low-energy building, is indeed often used by stick built and prefabricated house manufacturers in advertizing, its meaning is both legally protected and established by standards in Germany. Low-energy building are characterized by low energy consumption, as is stipulated by

legal minimum requirements. This can be achieved by a compact building design, very good insulation of the building envelope and thermal insulating windows with multiple glazing.

Zero-Energy Building:

Zero-energy buildings represent an optimized variant of the passive building. In this case, external energy supply is completely compensated by its own power generation. A zero-energy building thus generates precisely as much energy during the year that it consumes. This is achieved, for example, through the installation of photovoltaic systems or combined heat and power systems.

Passive Building:

The passive house describes a technical standard with very dense construction methods, very good insulation and large window surfaces facing south. For optimal heat insulation, ventilation systems with waste heat recovery are installed, as a passive house may not consume more than 15 kWh/m² per year. It doesn't need a conventional furnace, as the majority of its heating needs arise from passive energy sources, like solar radiation and internal heat sources (waste heat from household devices and persons).

Energy-Plus Building:

Energy-plus buildings resemble zero-energy buildings; however, they generate more energy during the year than they consume (energetic plus). This is achieved primarily through a high-quality building envelope, efficient system technology (usually solar and photovoltaic-thermal systems) and high-efficiency household devices.

Primary Energy Demand:

The primary energy demand describes the amount of energy needed to cover the total energy consumption by a building, including the amount of energy required for heating the household. A split into different energy sources like oil or sustainable technologies is possible, which is why the primary energy demand can serve as an evaluation variable for ecological criteria, like CO_2 emissions. Primary energy demands are calculated as follows: the corresponding energy consumption is multiplied by the primary energy factor, while taking the energy sources into consideration. These factors are specified in the Energy Saving Ordinance (heating oil: 1.1; natural gas: 1.1; wood: 0.2; electricity: 2.7).

Reduce, Reuse, Recycle:

The motto, "reduce, reuse, recycle", stands for a sustainable concept of consumption. The first step consists of preventing waste, or reducing the number of things that one throws away. The second step represents the potential for direct reuse, in which one looks for new ways to use items again, instead of throwing them away. A material transformation occurs in the third and last step, in order to provide items, that are no longer needed, with a new meaning. This logic can also be transferred to architecture: the few changes that need to be carried out on existing buildings and the less energy is expended, then the more effective and sustainable the renovation strategy can be.

Smart Grid:

A smart grid is an intelligent electrical network, which is an important prerequisite for increasing the number of renewable energy sources. Using modern information and communication technologies, different parts of the energy system (e.g., electrical supply and consumption) can be linked to one another and harmonized with one another. Electricity from renewable sources is thus effectively integrated into the electrical network, and the grid is optimally used. Because smart grids can also transport data in addition to electricity, they are often referred to as the "internet of energy". An intelligent measuring system, the so-called 'smart meter', forms the core of a smart grid. By this means, network operators can obtain important information related to energy production and consumption, and can thus better control their networks.

3 Pillars Model:

The '3 pillars model of sustainability' (often cited as a concept or principle) refers to a hypothesis that sustainable development can only be achieved when economic, ecological, and social factors are set at equal importance and weight – and are mutually dependent. Only in this way, according to this premise, can economic, ecological, and social capacities be ensured and improved for a society.

WAGO SAVES ONE MILLION KILOWATT HOURS OF ENERGY

OPTIMIZED COMPRESSED AIR, HEATING AND COOLING INCREASE ENERGY EFFICIENCY AT THE SONDERSHAUSEN LOCATION.

Connection technology and automation specialist WAGO now saves over a million kilowatt hours of energy at its production and logistics facility in Sondershausen in Thuringia – an austerity measure to be embraced. The linchpin of this efficiency project is a combined heating, cooling and compressed air supply system. The result: a reduction in primary energy consumption and CO_2 emissions.

The Technical Realization

In detail, the final concept for the energy efficiency project at the WAGO facility in Sondershausen included the use of CHPs for compressed air and heat generation. The amount of heat provided by the newly-installed compressed air-combined heat and power plant, in combination with existing waste heat recovery from conventional compressors, covers the facility's heating needs.

Outside of heating periods, the heat that arises from the compressed air-thermal power plant is used for drive energy in the absorption cooling systems to provide cooling. By linking power, heat, and cooling, the electrical energy needed to provide chilling was minimized. In addition, the integration of speed-regulated compressed air compressors and a higher-level compressed air management system guarantees optimal use of the individual generators. Stated briefly: we use gas to make compressed air and heat – and from these we generate either heat for heating the entire facility, or to drive the cooling systems outside of heating periods.

Another component of the concept is the use of a speed-regulated compression refrigeration machine, which handles peak cooling loads as needed. An increase in the cold water temperatures in the production processes has allowed the use of free cooling. Adiabatic heat exchangers are used for this, which use sprayed water to cool through evaporation, and thus maximizes the efficiency of the system. To further optimize the use and distribution of cold water, high-efficiency, speed-regulated pumps were set up, in addition to an innovative distribution system (Zortström).

The overall concept is rounded out by the integration of the systems into WAGO's internal building management system, including data collection for energy data management. These measures improve the facility's overall efficiency. The newly installed systems are low-maintenance, networked and durable; above all, however, they provide the WAGO Sondershausen facility with energy savings of more than one million kilowatt hours.

Successful Energy Management with WAGO's Own Technology

For the efficiency project in Sondershausen, the project team used WAGO technology – from energy data collection, to plant control, to the wiring of the building and production technology. That seems like an obvious choice, but Achim Zerbst is no less proud for that: "Our own products were the only ones that allowed us to precisely record the energy consumption and all basic conditions for processes, such as temperatures, pressures and operating states." WAGO's own modular I/O System, controllers and corresponding software solutions "were essential for the sector coupling and the complex, harmonious interplay of

the individual controllers for cooling, compressed air and heating." The overall technological solution allows manageable operation of complex plant technology. Yet, the systems themselves remain easy for staff to operate. Zerbst's summary: "We've created the basis for gradually optimizing the systems and implementing successful energy management."

For WAGO, the efficiency project marks an important step towards energy-efficient, climate-friendly production. Achim Zerbst, WAGO Facility Manager and head of the energy management team is sure of one thing: "In this project, we have also identified further potentials for future systematic energy conservation."

The second of WAGO's locations in Germany is located in Sondershausen, Thuringia. This facility is home to WAGO's Logistics Center and a specialized production hall. Products made here are sold across the entire world.

Approach to the Sondershausen Energy Project

1. Tracking Potential Improvements

The path to greater energy efficiency starts with the first step – finding out exactly where the potentials in the system lie. This analysis of the status quo is essential for identifying optimization options. Achim Zerbst, WAGO Energy Manager, comes directly to the point, "Measure it or forget it!" With 80 measuring points, WAGO's Sondershausen plant already had lots of existing measurement data, according to Anne Häring, an energy efficiency project engineer on the Galek & Kowald team from nearby Mühlhausen who oversaw the efficiency project on the consultant side. "We covered the remainder using mobile measurements," she reports. "The next step was to analyze the processes: Where is energy being used, and for what?"

2. Energy Management Means More Than Just Saving Energy

When moving to a concrete optimization concept, "You shouldn't get too obsessed with details at the beginning," advises Zerbst. It's more important that the concept "makes sense in terms of energy consumption and is technically and economically feasible." Falko Kowald, Technical Director of Galek & Kowald, adds, "The premise behind energy management is that making long-term changes is better than just saving as much energy as possible all at once." Therefore, it's important to look both at the energy efficiency of the supply structure, and also at the overall operating costs. These should also include maintenance costs. Achim Zerbst provides an example, "There's no point in having an air compressor that's efficient in itself if the maintenance costs are many times higher."

3. The Path from Consulting to Concept

"First, an energy consultation outlines the current state of energy consumption in the company. Based on that, measures are developed to identify potential energy efficiency improvements," explains Häring. These take the form of specific recommendations

Consumption levels and efficient system circuits at a glance: Energy consultant Anne Häring und CEO Falko Kowald from the Galek & Kowald engineering consulting firm have regular optimization meetings with WAGO's Energy Manager Achim Zerbst (center) at WAGO's facility in Sondershausen.

for action, including an initial technical and economic assessment. For some energy efficiency measures, it may be necessary to involve planning experts (e.g., for cooling technology), as the project progresses. Doing so can provide a firmer footing for the concept while it is still under development.

4. Defining Feasible Implementations

In most cases, it is possible to identify multiple energy conservation measures, which are sometimes associated with very different levels of effort. Replacing existing system technologies with more efficient options is associated with relatively low planning and implementation efforts – for example, changing from conventional lighting to LEDs. By the same token, recommendations that require a switch to a different technology are associated with higher planning and implementation efforts.

5. Considering Subsidy Programs

"Depending on the measures, various incentive programs may be an option for co-financing. In such cases, it's advisable to have an expert partner at your side who's familiar with the various incentive programs on the state and federal level," advises Zerbst.

6. The Process Remains the Goal

In the course of the optimization process, it's important to verify the effectiveness of the energy conservation efforts. Zerbst is convinced that this is impossible without performance indicators, since metrics are the only way to demonstrate and maintain energy efficiency improvements. "For that, we need to relate energy consumption to the influencing variables and environmental factors. That way, we can determine the crucial metrics and monitor them." These performance indicators are calculated using a statistical method, a so-called regression analysis. These analyses yield potentials for long-term energy savings.

BUILDING SYSTEMS
IN GREEN BUILDINGS

SUSTAINABILITY CAN BE CALCULATED FOR DURING CONSTRUCTION

Buildings must become more energy efficient and, in the future, significantly more sustainable – experts, politicians, environmental activists and professional associations all agree on this point. Yet, what precisely does sustainability in buildings mean? For some, it means using the most well-established and sustainable raw materials and resources. Others initially consider the building's long-term energy consumption, and primarily connect the term 'green building' with energy efficiency. Potential recyclability or social and health related aspects, like the ability to work in ergonomic postures, can also play a role in the evaluation of a building as 'sustainable'.

Determining a building's sustainability on the basis of only one aspect is, therefore, too simplistic and unrealistic. "Sustainability in construction or of a building should always be viewed holistically. That is, across the entire life cycle of the building," according to Ann-Christin Rachuba, Head of Building Installation at WAGO. Therefore, thoughts about sustainability should already be included in the design, and each life cycle phase should be proactively planned. "Due to digitization, this already functions well," says Rachuba. "By using BIM, we have the possibility to construct a model, starting at the beginning, which can be successively supplemented and enriched with information across building disciplines. Not only is more information stored in this way, it is also easier to access. The facilitates the determination of, for example, the inputs related to energy flows needed to generate ecological balances."

Sustainable Construction Aligned with the Building Life Cycle

A building's life cycle can be roughly divided into four phases: planning, construction, operation including maintenance, and reconstruction or modernization. Dismantling or tearing down a building has become far less common due to growing concerns about sustainability, from both ecological and economical viewpoints. This is because the goal of green buildings is to cover as many needs as possible with the fewest resources and for the longest time. When constructing

LEARN MORE ABOUT THE TOPIC OF PLUGGABLE BUILDING INSTALLATIONS.

BIM (Building Information Modeling)

BIM is a software-based method for cooperatively and digitally modeling buildings across all systems, so that planned building projects can be virtually implemented before the actual construction. This makes it possible to model a complete digital simulation of the building, in line with a digital twin (see p. 24), as early as the planning phase. Errors and clashes in the timing of work on the various different building systems can be detected early on, allowing adjustments to be made at significantly lower cost than would be possible if the planning phase ran concurrent with construction. This means that BIM provides new approaches to solutions for planning and implementing construction projects, as well as building operations.

SUSTAINABILITY CAN BE CALCULATED FOR DURING CONSTRUCTION.

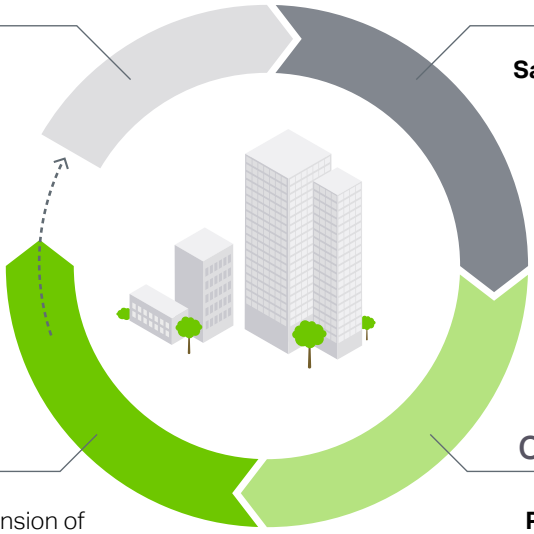
Building Life Cycle with Pluggable Electrical Installations

Planning

Targeted planning: ideal for buildings planned using a BIM, due to detailed preplanning, error reduction

Construction

Save time and money: easy installation using plug & play, ready to use on site due to good pre-assembly, increased safety on the construction site.



Reusability, Migration and Expansion

Flexible conversion: fast, simple expansion of the pluggable connection system, good accessibility, reusability of cables and plugs, can be combined at any time with automation technology through pluggably connected system distribution boxes – even during retrofitting.

Operation and Maintenance:

Prevent disruptions: fast exchange of defective consumers in the case of a fault, easy overview due to color-coded markings.

a building, it is therefore important to consider reutilization, already in the planning stage, and to create the conditions needed for this. This also applies to the equipment in the technical building services (TBS), in particular for electrical wiring installations, that do not yet exist.

"Construction of buildings in a sustainable way means that the capability for conversion must be a given from the outset. This means that the technology has to be able to be changed quickly, sometimes while the building is still in use," states Rachuba. "Therefore, the electrical wiring installations must also have the potential to be quickly modified – in the future even more than now. This can be provided by using pluggable installations."

Wiring Installations that are Predictable

Pluggable installations are a variant of the 'plug and play' electrical installation. They consist of a large number of different components and cables that are planned into be tailored for the specific application in advance of the installation phase, subsequently pre-assembled and then simply plugged together on the construction site. Typical applications include, for example, lighting installations in suspended ceilings, electrical installations of switches and outlets in cable ducts and cavity walls, and installations in floor boxes and system distribution boxes in raised floors.

In contrast to conventional approaches, pluggable electrical installations must be considered and precisely designed early in the initial pre-planning phase. This greater expense at the outset is the unavoidable shifting of costs from the construction phase into the planning phase, and arises in the consistent adaptation to contemporary construction methods. This both saves time during the construction phase and prevents planning errors, and also dovetails with approaches related to green buildings. "If I want more sustainability in construction, then the electrical installations must also be calculable, and for this, it must be predictable. This is one aspect of pluggable electrical installations," says Rachuba. Complete data sets are needed, for example, to generate a digital twin, which is already the standard for sustainably designed buildings.

Flexible Conversion with Pluggable Installations

Good predictability and the possibility for pre-assembly are not the only factors that demonstrate that pluggable connection systems are sustainable in the sense of an efficient building life cycle. This is due to the fact that, even in a conventional approach for constructing new buildings, the entirety of the technology can also be planned in advance and as a completely harmonized system. "Problems appear, at the latest, when the building has transitioned to the utilization phase, or following that in the conversion phase. This is when the difficulty arises, that things are no longer easily accessible, i.e., a wall must be

SUSTAINABILITY CAN BE CALCULATED FOR DURING CONSTRUCTION.

opened up or entire cable bundles need to be replaced," according to Rachuba.

When planning follows conventional approaches, renovations commonly require new additions to be crammed in at available junctions – as a supplement to what already exists in the building. "This means that materials used in the renovation increases, which can then generally worsen other factors, such as fire load," one of Rachuba's concerns. "By using pluggable installations, I have significantly more flexibility and can also see exactly where things are – especially when was planned as a BIM project. This allows me to consider from the outset, the points where one can ideally start, which parts can be retained and which components can be reused at another location. The effects can be observed in advance by recalculating the parameters and applying them to the models, which also allows them to be simultaneously optimized."

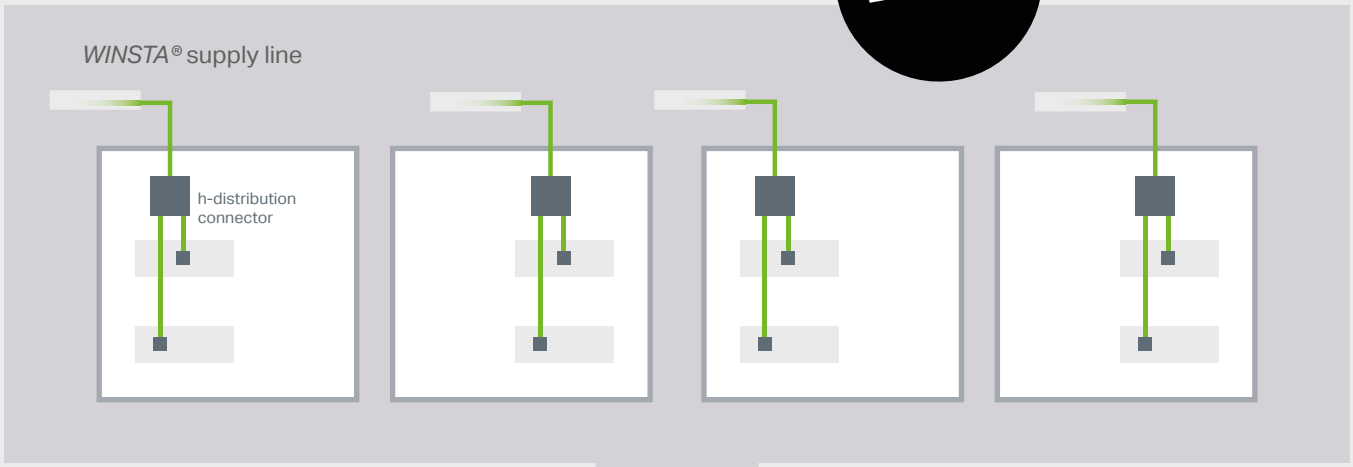
As an example: a medical practice was to be converted to a daycare. The office space included four treatment rooms with two lights in each case. These areas were to be converted into two large play group rooms, each with four lights. If the electrician only changes

Practical Example – Pluggable Installations in Use

This practical example demonstrates how flexible pluggable installations can be. The plug & play principle enables a fast and easy exchange of components. Existing lines can be reused, as long as they are suitable, or set aside for later applications – which ultimately conserves resources.

Medical practice with 4 treatment rooms

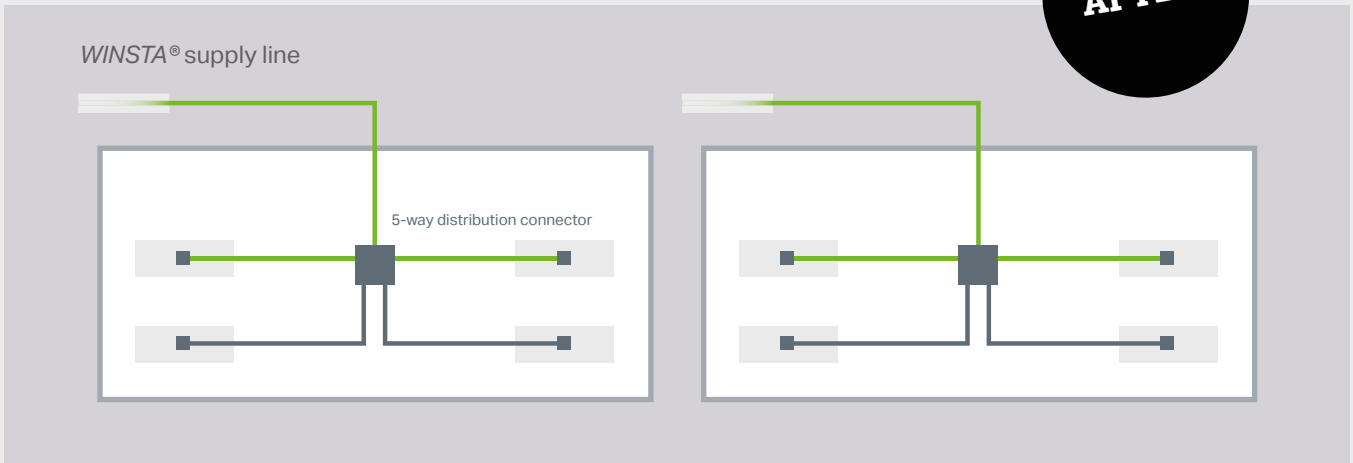
BEFORE



old line
new line

Kindergarten with 2 play group rooms

AFTER



the switching groups, other components, like the distribution boxes, can be replaced, at least in part, by suitable variants, or the same conductors can be reused at other points. Even if it is impossible to reuse everything at a 1:1 level, it is quite rare that a completely new design will be required.
In addition, components from the restructuring that can't be reused at that point, distribution boxes for example, can be used at other wiring locations at the construction site.

Sustainability Means Easy Expansion

The example also shows another challenge: the current installation must be able to be easily expandable with new approaches – this is already true, and will become more so in the future as the levels of technology and automation in buildings increases. Therefore, a system is required that can establish an interface between existing electrical installations and new automation technologies.

"If the electrical installations are conventionally designed, the effort required to adapt new technologies or to link in new technical applications is very high. This is simply because it is less flexible," says Rachuba. At the same time, this means that all components used in constructing a building have to be able to flexibly adjust to these changes in technology. "The electrical installations must also be able to adapt. It is simple: the electrical installations can't require more effort. They must be able to be carried out quickly, safely and error-free, and function exceptionally well with the automation technology." In the case of pluggable installations, the automation technology is already integrated into pre-assembled system distributors, that can be pluggably connected, prior to the construction phase. On site, these function using plug & play technology, and are already functional once they are plugged in.

Added Value through Certifications

Certifications also demonstrate that pluggable installations fit into an efficient building cycle and the construction of sustainable buildings: even if the electrical installations in themselves don't attract any attention from the popular approval agencies, like DGNB, breeam and LEED, there are many factors that are evaluated and which can be positively influenced by the use of pluggable electrical installations. "Let's take the DGNB as an example: in this case, *WINSTA®* can positively influence around 50% of the criteria. The mere fact that one is already designing with pluggable installations is, in itself, the best prerequisite for an evaluation," according to Rachuba. "This shows that the demands posed by sustainable buildings are optimally satisfied by pluggable connection systems."

Conclusion

Green buildings must be entirely sustainably planned, and not just in individual aspects. A holistic consideration of the building life cycle is necessary. A consistently planned building requires predictable data, and thus calculable, adaptable electrical wiring installations. By using pluggable installations, a concept results that ideally supports the efficient configuration or conversion of the individual phases and provides added value through all life cycle stages.

PLUGGABLE INSTALLATIONS ARE THE ANSWER HERE.

***WINSTA®* – the Pluggable Connection System from WAGO**

20 years ago, WAGO developed *WINSTA®*, a pluggable connection system optimally tailored to the high demands placed on building installations, and the company has continued to refine it in the decades since then. It allows simple pluggable connections, making electrical installation fast, safe and error-free – with a 100% protection against mismating. WAGO has added to the solution through *WINSTA®* System Partners. Products from well-known companies have already been equipped with suitable *WINSTA®* connectors – for an integrated system solution.

Your benefits:

- A holistic approach to sustainable construction is used to increase long-term value over the entire building life cycle
- Greater efficiency along the value-added chain thanks to digitalization
- React to the growing market dynamics with increased flexibility

IN DEMAND

Ms Rachuba, what should you consider when using pluggable electrical installations in construction?

»Anyone, who has not planned out a pluggable electrical installation in advance can't just spontaneously set one up. I recommend that you structure its basic applications first, and lay out the parts of a kit in order to minimize the complexity. You can almost always reuse these parts with minor adjustments, like changing the length of the conductors. This depends, naturally, on the project and the types of buildings: equipping or constructing a kindergarten is something quite different, than if I am designing an enormous office complex. Taking a look at our *WINSTA*® network of system partners before you start is also absolutely to be recommended.«

Ann-Christin Rachuba,
Head of Building Installation, Strategy & Digitalization

INTERVIEW

THE LIGHTING SECTOR IS ON THE PATH TO GREATER SUSTAINABILITY

Sustainability is an ever expanding topic. This affects many areas in a building: it is important to work in a resource efficient way during design, construction, installation, maintenance and removal. This also includes lighting, because lighting is ultimately responsible for a large portion of the energy consumed by buildings, which should be as low as possible in sustainable constructions. In this interview, Markus Düker, Global Industry Manager Lighting at WAGO, discusses sustainability in lighting technology and the effects of correct lighting management on our health.

How common are sustainability and green buildings as topics in lighting technology?

Markus Düker: »Sustainability is a very important subject in lighting technology. Primarily because lighting is a significant part of energy consumption. The focus has long been on LED technology, because it's highly energy efficient, and can replace old fluorescent lights in renovations. Movement and light sensors ensure that lighting matches the brightness in a room, and they only switch on if someone is there. By using an intelligent lighting management system, lights can be individually and flexibly adapted to user demands, and can further improve a carbon footprint.«

What recent developments have there been in the area of lighting and buildings? What advances are worth mentioning?

Düker: »In recent years, LED lights have developed even farther in the direction of energy efficiency. A new EU ecodesign directive has specified a timeframe for phasing out conventional luminaires, like T8 fluorescent bulbs, by September 1, 2023. This directive will further encourage renovations or the replacement of existing lights with LED technology. New additions include approaches related to the circular economy, and thus conservation of resources through promotion of interchangeability in lighting sources and their separate drivers.«

Where are these developments headed?

Düker: »LED technology is the most energy-efficient lighting technology that we have at this time. The use of splicing connectors in lighting and components when replacing existing lighting is unavoidable. Lighting manufacturers are researching the future use of renewable raw materials and bioplastics. There will also be more 3D printed lights in the future.«

What should a company consider if they rely on sustainable lighting?

Düker: »Checking whether existing lighting systems can be replaced by LED technology is recommended. Legislators often support this type of lighting replacement with subsidies. As already mentioned, no more T8 fluorescent lights can be sold after September 1, 2023, because they aren't energy efficient.«

What does a sustainable lighting concept look like in a building?

Düker: »Lighting management systems support and improve three essential areas: the efficiency of the building, general economic viability, and, not least, the comfort and thus the productivity of the people who work there. The light

Markus Düker has spent 25 years in lighting technology and is more than familiar with developments and trends in the sector. Eight years ago, he brought his expertise to WAGO.

is therefore precisely supplied – where it is needed, at the correct levels, at the right time. This saves energy, resources, and ultimately money. If there are changes in how spaces are used, this can be quickly and efficiently mapped in the WAGO lighting management system.«

Light can illuminate more than just buildings or external areas. What can light do for our health?

Düker: »This is where 'Human Centric Lighting' – HCL for short – is the appropriate catch phrase. In this scenario, artificial light is aligned with daylight and thus follows our circadian rhythm. In the morning, our performance curve rises steeply, until it levels off at midday, and drops to a low point at night. The driver behind this is light, whether natural or artificial. While daylight illumination of more than 5,300 Kelvin activates human beings, a warm white illumination below 3,000 Kelvins has a relaxing effect. To implement this in a lighting program, an intelligent controller is needed, in addition to dynamically controlled lighting intensities and sensors for needs-based color temperature profiles from warm to daylight white. Different lighting scenarios corresponding to the circadian rhythm can be programmed using WAGO lighting management.«

Where does this make sense?

Düker: »Human Centric Lighting makes sense everywhere in a building that people are going to spend a lot of time without access to natural sunlight, and wherever value is placed on people's well-being, performance and the ability to concentrate. The majority of these applications will, therefore, take place in office buildings, healthcare, industry and in educational institutions.«

CLICK & PLAY:
CLICK HERE TO VIEW THE VIDEO RELATED TO THE TEXT.

LIGHTING MANAGEMENT FOR GREATER COMFORT AND EFFICIENCY

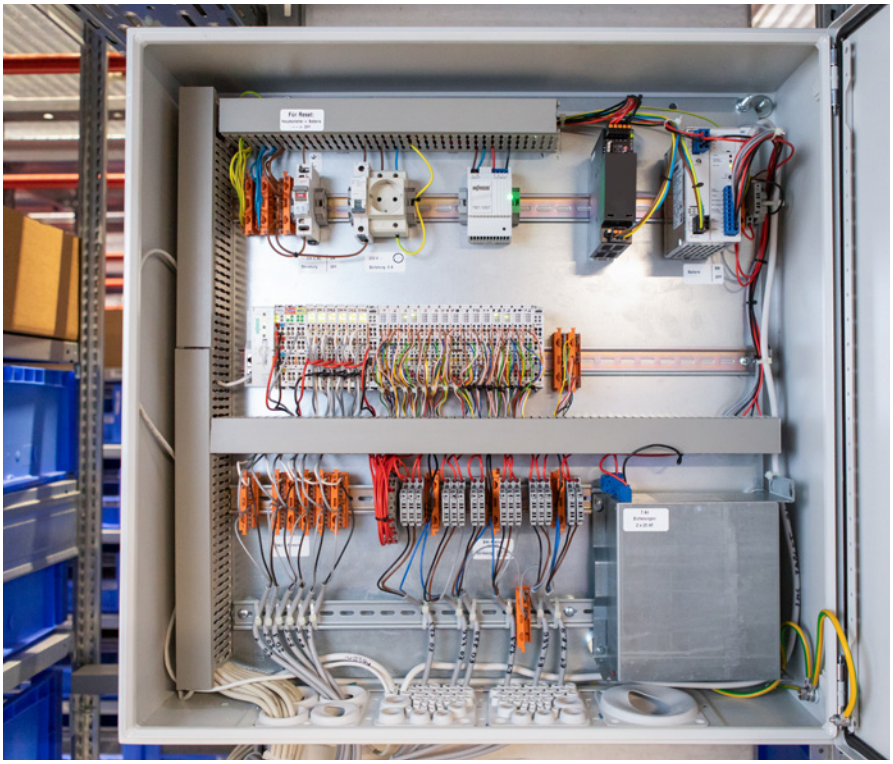
TRULY ILLUMINATING

Goods in the distribution centers of large online retailers must be perfectly sorted and stored in the smallest possible space. In order for orders to be processed quickly and without errors, optimal illumination is also important for these warehouse systems. Because lighting accounts for one of the largest energy consumers in these buildings, an intelligent, professionally-designed lighting management system is essential. It all comes down to energy-efficient concepts, thoroughly developed automation programs and reliable hardware.

Fashion and lifestyle products, vehicle and machine replacement parts, electrical components: mail-order companies use large distribution centers with so-called pick towers in order to provide a variety of items in different shapes and sizes at the highest level of spatial utilization. These multi-story rack systems are traversable, enable a safe and flexible separation of goods and offer up to 3,500 shelves on multiple levels in a compact structure. These pick towers can have more than 90 km of corridors, along which employees work in shifts to handle the order picking. That optimal lighting would be necessary for these tasks is understood as a given. It is likewise obvious, for ecological and economic reasons, that these rack systems can't be fully illuminated around the clock. Even with LED lighting, the energy consumption levels would be enormous and irresponsible with respect to energy costs and the environmental footprint. Therefore, good and efficient lighting as well as intelligent lighting management are necessary in order to simultaneously provide an optimal working environment and highly efficient energy use.

Energy Pioneer with Inventive Spirit

Dipl.-Phys. Roland Kretschmer, CEO of KEC - Kretschmer Energie-Consulting GmbH has spent more than 30 years working on these and other energy-related topics. KEC is one of the leading German companies that provide lighting for shelving racks. "The primary goal of our projects is easily explained: whenever and wherever light is used, it must be available with sufficient brightness, a good color palette, and minimal glare. Otherwise, lights should be off or strongly dimmed so that I conserve the most electricity – quite obvious, really," he states in summary.



KEC - Kretschmer Energie Consulting GmbH relies on the comprehensive, fieldbus independent WAGO I/O System 750 for the necessary flexibility in connecting and controlling their lights and LED modules.

However, in order that this actually functions, a lot of experience, innovative spirit and reliable technology are all quite necessary. "The most electricity used by far in these shelving systems is used for lighting – followed by conveyor systems," explains Kretschmer. "Even before we started using LED technology, we were already working on how to most efficiently use light. This is why we developed specialized lenses many years ago, in order to achieve optimum efficiency and to aid our customers in reducing their electrical costs."

Optimum Light Yields Are the Sum of Many Details

Proprietary lenses, tailored to specific applications, remain an important component in KEC's business plans; however, they are only one aspect among many that help to achieve maximum comfort during work hours at minimal energy use. "Pick towers present special challenges to lighting, as they create aisles that are 1.2 m wide and run at 4-5 levels in height, creating umpteen km of transport paths. To optimally illuminate large projects like this, we use 20-30,000 light points, and all of them must be controlled in a needs-based manner," explains Kretschmer.

We use detectors to ascertain human presence and to control the corresponding light points. The efficiency chain begins with the presence sensors, explains the physicist, "As soon as an employee enters an aisle, it must be safely lit. However, this shouldn't occur when someone merely passes by that aisle. Therefore, we developed detectors with specialized infrared lenses, that detect a precisely defined area with high levels of sensitivity." KEC has a comprehensive library of lenses: every presence sensor can be equipped with one of around one dozen specialized lenses. By individually adjusting the infrared lenses, two sensors, one at each end of an aisle, can precisely detect up to 25 m of rack corridors.

The detector signals are supplied to a controller, where they are processed and output to the lighting operating devices as DALI signals. The "digital addressable lighting interface" (DALI), is an international standard protocol in building automation, which is used to control operating devices for lights. Based on a unique, DALI short address, each DALI device is identifiable and can be individually controlled. The protocol, defined according to IEC Standard 62386, allows for bidirectional data flow, so that the operating device can also return status messages to the DALI controller.

Flexible System – Intelligently Controlled

"We design our projects individually, based on our own lights and LED modules. We rely on the WAGO I/O System 750 for the necessary flexibility in connecting and controlling our lights," explains Kretschmer. Nils Roth, technical sales consultant at WAGO, adds, "Our WAGO controller components are part of our comprehensive, fieldbus-independent system. This allows KEC

Working together to design good and efficient lighting in the new distribution center belonging to Häfele GmbH & Co. KG, (from left to right): Jan Hertel, manager of the distribution center, Häfele GmbH & Co. KG; Roland Kretschmer, CEO of KEC; and Nils Roth, technical sales consultant at WAGO

to focus on their actual project and the on site solution for the customer – regardless of which controllers and connections are already available in the building control technology at the end customer's building." Each of these peripheral devices can accommodate multiple DALI Multi Master Modules, which in turn can be connected to up to 64 DALI actuators. Kretschmer is highly satisfied with the component reliability and their compact design, "By using suitable WAGO power supplies, we can house the entire hardware for controlling more than 700 operating devices for up to 2000 light points in a standard control cabinet – robust, up to industry standards, and without additional cooling required."
Kretschmer wrote the automation programs needed for lighting management based on the CODESYS automation software that WAGO supports. It includes the intelligence necessary to ensure that optimal lighting conditions prevail in pick towers at the lowest possible consumption of energy. "
During the development of the program, the Sales and Application Support at WAGO provided excellent assistance," states the CEO of KEC. "In addition to reliable hardware, that is another reason that we rely on WAGO: a directly-acces-

sible contact person is always there for us. Regardless of whether we are working through a tricky challenge or whether there's a high level of time pressure – we always receive professional support." The sophisticated lighting controls are completely oriented toward optimizing employee comfort when working in pick towers: each level is independently controlled and has its own dimming values. As soon as the presence sensors signal a worker's presence, the area is fully illuminated. Following a certain length of time without movement – and before switching off – the illumination level fades to half for several seconds. This allows workers who are still in the aisle to reactivate the presence sensor by moving.

"Regardless of whether we are working through a tricky challenge or whether there's a high level of time pressure – we always receive professional support."

In addition to monitoring individual rack corridors, an additional algorithm ensures further savings by analyzing cluster activity in the movement sensors across larger areas. If, for example, items that are seldom ordered are stored in the upper levels, or certain areas are not used, that is, no one is present here at all for longer time periods, the illumination levels can be correspondingly dropped, even along transport routes, and then returned to normal levels upon renewed activity in that location.

"We let all of the experience we had accumulated over the years flow into the programming," reports Kretschmer, "even if these are just standard program blocks, like 'night' or 'everything on', used for inventory or cleaning, for example, our customers use the automated mode almost exclusively. By using the controller programs, we ensure that employees have optimal lighting conditions precisely as long as needed." In some projects, the WAGO I/O System 750 is linked to a higher-level building control system. This allows the entire lighting control system to be centrally visualized and operated – in parallel with the WAGO Touch Panels 600 on site.

The Winners: Employees, Operators and the Environment

In contrast to earlier lighting designs with T5 fluorescent tubes, modern LED technology provides a significant advantage in topics of efficiency. The use of a well adapted and thought-through lighting control system is likewise effective, as the CEO of KEC explains, "This results in 60 … 70% savings over continuous lighting. In installations with 25,000 light points, that is quite a lot of energy saved, and, consequently, a lot of CO_2 as well. However, regardless of whether the project is large or small, it is, for me, an affair of the heart to exploit these potential savings – for the sake of our world."

The earlier that lighting management is taken into consideration in building design, the better the results, which mean: greater comfort, more workplace efficiency and safety due to optimal

(from left to right): Nils Roth, Roland Kretschmer and Jan Hertel in front of a distribution and control unit box in the distribution center for Häfele GmbH & Co. KG

Roland Kretschmer, CEO of KEC, at one of the WAGO Touch Panels 600, that allows on site visualization and operation of the lighting control system.

light quality, and the greatest levels of energy efficiency, and thus lower costs and greater environmental impacts, due to intelligent lighting controllers. "At the end, everyone wins: employees, operators and the environment," summarizes Kretschmer, "and WAGO's control technology at the device level forms the reliable connection between quality lighting and energy efficiency."

Project Partner

KEC - Kretschmer Energy Consulting GmbH
KEC - Kretschmer Energy Consulting GmbH, founded at the end of 2004, develops and sells efficient lighting technology for industry, hospitals, offices and administrative buildings: their current area of focus is lighting multi-story rack systems in distribution centers for large online retailers.

www.k-e-c.de

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NEW LIGHT AND MEDIA TECHNOLOGY FOR THE MERCEDES-BENZ MUSEUM IN STUTTGART

PRECISE CONTROL FOR BUILDING TECHNOLOGY

The Mercedes-Benz Museum in Stuttgart uses futuristic architecture with multimedia and lighting technology to showcase 135 years of automotive and corporate history. About ten years after the museum opened, the automation was in need of updates and modernization. The contract was awarded to SYS.TEC, a system integrator for building automation, and a system partner of B-CON and WAGO.

Automotive history comes to life directly in front of the factory gates in the Untertürkheim district of Stuttgart: the museum building, which opened in 2006, houses 160 automobiles and more than 1,500 exhibits in 16,500 m² of display space. These are elaborately presented in rotating exhibitions and special shows – a challenge for the lighting and media control system. In order to modernize and update the aging LON® lighting control system, SYS.TEC developed a custom solution based on the B-CON building management software in connection with our WAGO I/O System.

Custom Automation for a Unique Building

"With its numerous exhibitions and special shows, the Mercedes-Benz Museum requires specially tailored solutions that go far beyond the standard," explains Alexander Großmann,

Project Partner

SYS.TEC Gebäudeautomation GmbH
SYS.TEC Gebäudeautomation GmbH & Co. KG, founded in 2001, specializes in intelligent building technology and develops solutions for building automation and visualization – from individual room solutions up to major projects. SYS.TEC is also a WAGO Solution Provider.

www.sys-tec.info

one of the two managing directors of SYS.TEC and head of the project. SYS.TEC developed B-CON, a decentralized control unit, in order to completely reprogram the lighting and media control system.

Lighting Technology: Individual Control for Complex Scenarios

Scenario management, including visualization, was a core goal and technical challenge for the team. It allows optimal illumination and staging for all the exhibits – with a decentralized approach – even during ongoing presentations and events. Using Windows tablets, the elements of the lighting and presentation technology are controlled on site via the decentralized control unit, and stored as a scenario in the WAGO controller. In this way, the presentation organizers can control all of the 12,400 lights separately, as well as the screens, projectors, media players, etc. as needed, and integrate them into presentation scenarios.

Challenges around the Clock

The coordination and execution of this large-scale project during ongoing museum operations required a high level of reliability and organizational skills from everyone involved. For example, one organizational challenge consisted in replacing and installing all of the controls, interfaces and control cabinets – without the museum visitors noticing anything. "The museum is closed one day a week, which helped. Otherwise, we worked in the background – and even at night if necessary," explains Alexander Großmann.

Mercedes-Benz Brand Space

In the "Brand Space," which opened in 2019, Mercedes-Benz takes its employees on a journey into the future – and presents its various corporate brands. To help this work perfectly, an LED wall with complete media technology, such as film and sound elements, can now be included in the mobile scenario management, in addition to color and lighting scenarios. In order to ensure stable scenario control, all the old controllers had to be replaced with new WAGO controllers. Furthermore, the numerous new interfaces had to be integrated into the WAGO system.

Text source: SYS.TEC Gebäudeautomation GmbH. & Co. KG

IN THE BEGINNING IS THE MEASUREMENT

"Knowledge is power" – a statement that is also highly applicable to energy consumption. Rising costs and potential CO_2 savings are making the prospect of greater energy efficiency increasingly attractive. However, you need precise knowledge about your consumption to optimize it. We have summarized how to set up energy measurements in just 4 easy steps by using our energy meters (MID).

Finding the right device
WAGO's energy meter (MID) is available in three versions: two direct meters and one transformer meter. The direct meters have a width of 4 horizontal pitches (72 mm), and are available in two connection variants. The universal connection variants (4PU) have input and output terminals on the bottom of the device; in contrast, the devices marked 4PS have their input terminal on the bottom and output terminals on the top. This also allows the devices to fit perfectly into existing systems, and the selection can be based on the cable routing. The type 2CT transformer meters are only 2 horizontal pitches (35 mm) wide, which already saves space on the DIN-rail in the control cabinet planning stage.

STEP 1

STEP 2

Connect installations quickly and safely – with proven connection technology from WAGO
The lever connection technology with push-in technology allows fast tool-free device connection. Solid conductors and conductors with ferrules can be plugged in directly; fine-stranded conductors are connected without tools by opening the lever. Another benefit of the CAGE CLAMP® connection technology is safe operation during the service life. While screw connections can loosen over time, this technology ensures a permanent contact, and keeps the contact points from overheating, for example. This can be particularly relevant in a high-vibration environment.

STEP 3

Commission the device in a straightforward way
The free WAGO Energy Meter Configurator app (available in German and English) supports commissioning. All the required parameters can be intuitively set via a *Bluetooth*® connection using a smartphone or tablet.

STEP 4

Read values
There are several ways to read values during operation: via the display, the app or connected energy management systems. The energy meters' large illuminated displays show you all of the important values at a glance; touch-sensitive operating elements allow you to operate the device directly on site as well. In addition, all energy meters have three integrated communication interfaces: M-Bus and Modbus® interfaces as well as two S0 pulse outputs. This allows the energy meters to be monitored remotely and integrated into an energy management system.

Because WAGO's 4-quadrant energy meters (MID) comply with the MID Directive 2014/32/EU, they are additionally certified for billing-related energy measurements throughout Europe.

GET TO KNOW … JANA BÖKE

What drives us at WAGO, and what does our work look like – we introduce one of our colleagues from Building Technology in each issue of WAGO DIRECTBUILDING. This time it's Jana Böke, Global Industry Manager Building Installation at WAGO.

Ms Böke, what exactly do you do at WAGO? And how long have you worked here?

»I'm a member of the Industry Management Building Technology Department, and work on topics related to pluggable installations using *WINSTA*®. In the meantime, I've been at WAGO for more than 5 years – at the time I started, I was a dual student majoring in industrial engineering with business studies. Two years ago, I officially joined the Industry Management Department.«

What are you working on now?

»At the moment, I'm currently responsible for quite a few things. Together with one of my colleagues, I'm involved with planning a few activities with our *WINSTA*® system partners. In addition, cooperation with our international colleagues is currently quite important.«

What fascinates you about building technology?

»Everything eventually connects to building technology somehow – whether in your own home, as a career, or simply during the work day in an office. What's really exciting is when you take a good look at the totality of technical possibilities that are currently available and the technical depth to which buildings can be equipped.«

What do you find particularly fun about your work?

»The best part is that we never deal with the same projects every day. There are always new responsibilities and problems that we need to solve. In addition, interacting with many other departments is very important, and you learn so many new things and meet new people.«

Is there anything that you are looking forward to in 2022?

»I hope that we get the opportunity in 2022 to take up direct contacts with customers again. I'm also really looking forward to participating in different trade shows and other events.«

Thank you!

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