Light Guides

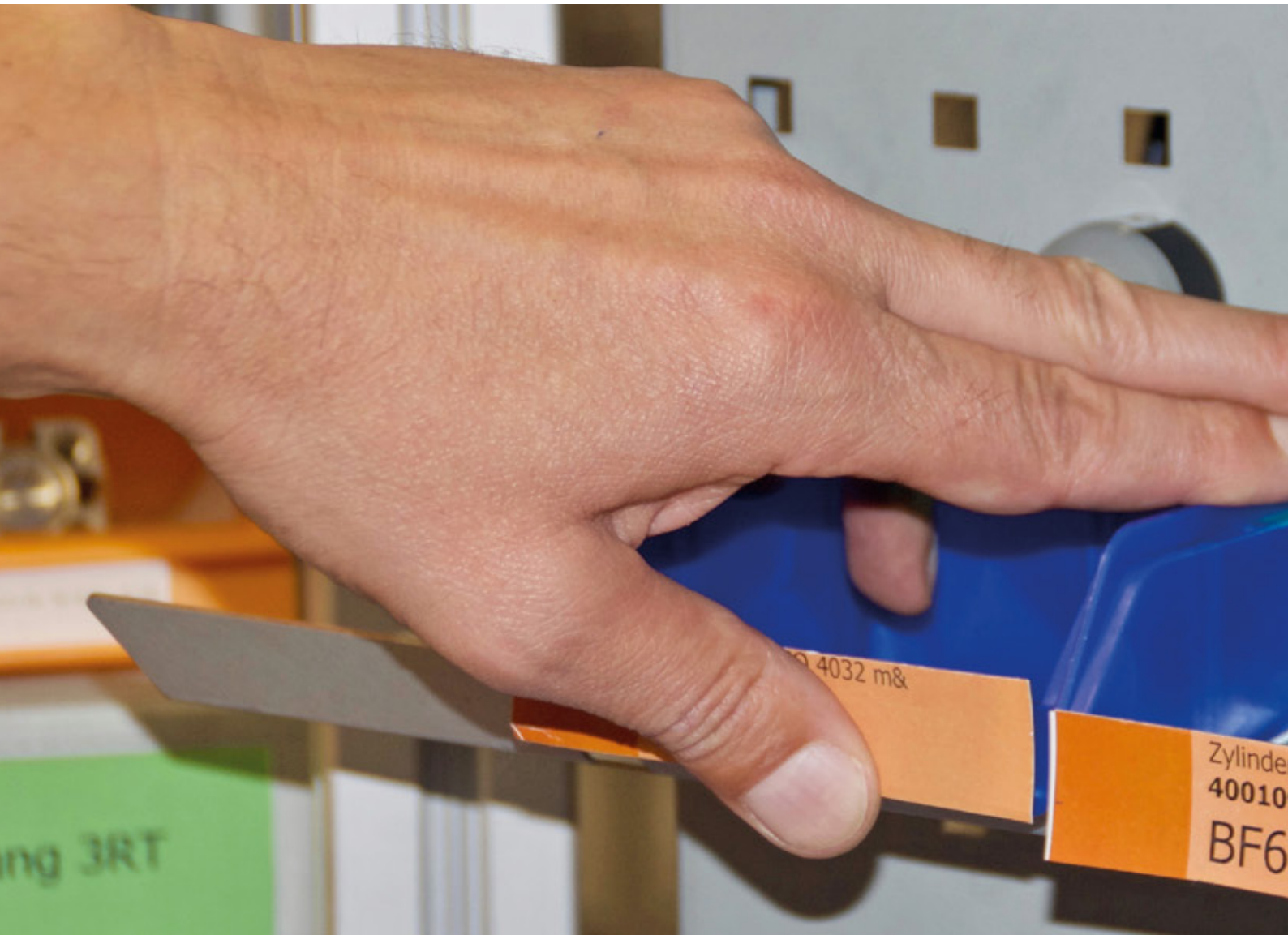
With its extensive pick-to-light system Turck is demonstrating in the SmartFactoryOWL the benefits of light-controlled worker guidance in manual assembly processes

What does "smart" actually mean? The Duden German dictionary now lists "smart" as a German adjective and describes it with the words clever and intelligent. What "smart" really means today can be better found by looking for the common features of the phenomena that are described with this adjective. Whether in Smart Metering, Smart Grids, Smart Home or Smart TV; "smart" always promises a value addition and innovation by the networking of elements, as well as the use of data resulting from this network.

SmartFactoryOWL opened in April

A look at the SmartFactoryOWL in Lemgo further increases an understanding of the word "smart". In an area of approx. 2000 square meters, the model factory founded in April 2016 by the University of Applied Sciences East Westphalia-Lippe (OWL) and the Fraunhofer Institute collects different solutions that make production processes smarter. In cooperation with companies, the SmartFactoryOWL exhibits examples of innovative production technologies and assistance systems.

However, the SmartFactoryOWL is designed to be more than just an exhibition area. A team of professors, employees and students in Lemgo aim to promote the networking of industrial challenges and academic know-how in order to optimize production processes through clever planning and technology. This offering is primarily aimed at small and medium-sized companies in the region.

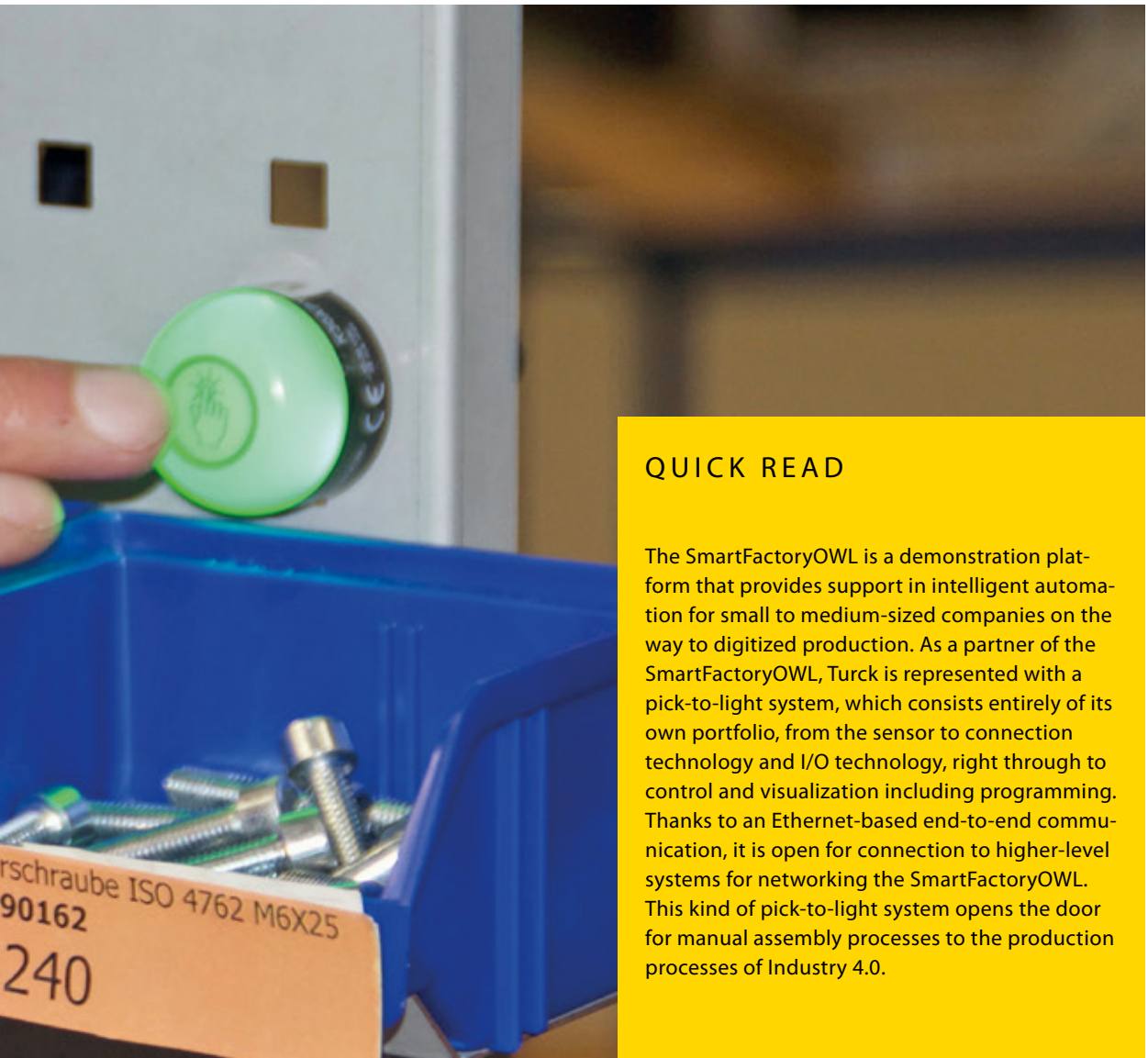


The workers acknowledge the removal of the indicated component by touching the K30 sensor light

Students developing process optimization
"Industrial companies from the region come to us with specific questions. We then develop tailored solutions for these companies by redesigning the work processes and workplaces," Prof. Dr.-Ing. Sven Hinrichsen explains the company's offer. "We also involve students in this development work through final study papers and project work," adds the professor, who is responsible for the areas of industrial engineering and assembly system design at SmartFactoryOWL. One example of this is mechanical engineering company Brandt Kantentechnik from Lemgo, a manufacturer of wood processing machines for gluing edge bands. The company wanted to optimize a manual assembly process that was complex with plenty of variants. It soon became clear that assistance system technologies had to be used as well as work design measures.

The employees at the SmartFactoryOWL: David Brown, Prof. Sven Hinrichsen, Tim Kleineberg, Melissa Paris

Extensive pick-to-light portfolio
Researcher David Brown therefore suggested optimizing the process with a pick-to-light solution. "The system we wanted to use had to be as flexible as possible and allow a large selection of different sensor lights. Precisely with the small C part containers, we thought that the light-controlled guidance of workers was important, since these parts are very similar to each other. We also looked for a system that we could adapt without any major programming effort required," Brown states some key criteria for selecting the pick-to-light system. The system also had to be networkable, i.e. have an Ethernet interface in order to connect it to SAP or other higher-level systems.



QUICK READ

The SmartFactoryOWL is a demonstration platform that provides support in intelligent automation for small to medium-sized companies on the way to digitized production. As a partner of the SmartFactoryOWL, Turck is represented with a pick-to-light system, which consists entirely of its own portfolio, from the sensor to connection technology and I/O technology, right through to control and visualization including programming. Thanks to an Ethernet-based end-to-end communication, it is open for connection to higher-level systems for networking the SmartFactoryOWL. This kind of pick-to-light system opens the door for manual assembly processes to the production processes of Industry 4.0.

Turck's pick-to-light system boasted an impressive range of sensor lights in Lemgo

Complete solution from the sensor to the controller

After considering these criteria and comparing different vendor solutions, the pick-to-light system from Turck and its optical sensor partner Banner Engineering was chosen. Besides the pick-to-light components used, the system approach of the solution was also impressive. Turck could not only supply different sensor lights for process control but also offer a comprehensive solution directly, which also consisted of connection and I/O technology including the controller, as well as the visual support for the worker via the HMI. "The small K30 sensor lights in particular, which we require for the integration of C parts such as screws and nuts, could not be supplied by other vendors," adds Brown.

BL67 with Codesys 3 controls the process

Turck dug deep into its box of systems to provide the complete control of the assembly process. The worker first of all reads in a 2D code via the iVu vision sensor from Banner Engineering. The connected TX513 HMI then shows the assembly process on the start screen. A programmable gateway for the IP67-rated BL67 I/O system acts here as the controller. Turck programmed the pick-to-light application on the gateway with Codesys 3, which contains the TargetVisu tool for the visualization of the individual assembly steps. The system was implemented so that users can enter new product configurations themselves without any programming required.

The BL67 system includes IO-Link master modules which each contain four IO-Link master ports. Each of these ports communicates with a compact TBIL I/O hub which can connect the inputs and outputs of eight sensor lights each. Each sensor light has an input and output signal, since workers acknowledge the removal of the required part by triggering the integrated sensor when their hand is placed in the indicated compartment. The ability of the universal TBIL DXP ports to be used as an input and output is both a unique and practical feature. The assignment of input and output functions via the controller is unnecessary, and likewise the use of Y splitters to route the input and output signal to different ports. Thanks to IO-Link, the cabling effort involved is reasonable anyway.

Flat PVD lights save space

Three different types of sensor lights are used at the workplace in the SmartFactoryOWL. The conventional K50 lights with photoelectric sensors for acknowledging, the small K30 lights with capacitive sensors for the C part containers and the flat PVD lights on the high containers, which offer little space for the shelf above it. "The possibility to also use flat lights was important since we have to stay within the maximum grip height of shorter employees to ensure ergonomic design," Brown explains.

Outlook

The pick-to-light rack in the SmartFactoryOWL also has some expansion options: One idea is to connect the material shelf to the workplace via Turck's inductive IO-Link couplers. The devices handle the contactless transfer of up to 16 digital signals and up to 7 Watts of

The small K30 lights are ideally suited to incorporating the C parts containers

How pick-to-light works

Pick-to-light systems control and monitor the work steps for manual order picking, fitting, or assembly processes. To do this, the system uses light signals to indicate precisely the storage box from which the next component has to be taken. The system then detects the successful removal of the part, either automatically via optical sensors which detect the hand of the worker, or through the acknowledgement at the sensor lights. The system then visually indicates the next box from which the operator has to take the part for the next work step. Pick-to-light sensors from the Turck program are available in a number of different designs, also for direct mounting at the compartments.

power. This enables the shelf with the components to be quickly disconnected from the assembly space. If the number of variants exceeds the capacity of a shelf, additional shelves can be docked on for different products or variant groups. The application specific tag that comes with every IO-Link product, enables the controller to check whether the correct rack is connected for the particular product group.

Another project is already being implemented: It is possible, for example, to analyze the data that the system makes available. "We are currently developing a key indicator cockpit that workers and lead personnel in production can set up as required to obtain information in real time," explains Tim Kleineberg, who also works as a researcher in the industrial engineering team. If, for example, the control of the execution time for individual assembly steps exceeds a critical value, this event indicates a problem in the installation of the components. The relevant employee is then notified of the possible problem. The automatic ordering of used components is just as possible as custom product variants, which the system represents "on the fly" as an assembly sequence and job directly after the order process.

Partnership

For Turck the Laboratory for Industrial Engineering of the OWL University of Applied Science and the SmartFactoryOWL, the project is the start of a permanent partnership. Turck can try out joint solutions together with the students and employees, test them under realistic conditions and forge contacts with students and visitors. The SmartFactoryOWL and the Laboratory for Industrial Engineering have in Turck a partner that can not only offer individual components but also automation solutions from a single source and has at its disposal extensive know-how for all levels of the automation pyramid. Professor Hinrichsen is hopeful about the future: "We already have a number of other development projects in mind and are looking forward to the further collaboration with Turck."

If you look once more at what the word "smart" means in this context, it is clear that the "smart" in SmartFactoryOWL not only means the networking of production systems and data suppliers but also the creation of smart results through the networking of partners from industry and other areas.

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