

Sensorik 4.0

 PEPPERL+FUCHS

News for Process Automation

1/2015

Sensor Technology 4.0: Ideas beyond Limits

Intelligent sensor technology, networked field devices, and new bridge technologies are the foundations for the Internet of Things.

Human Machine Interfaces for Virtualized Processes

One more step on the journey towards virtualized process automation systems: the RM Shell 4.0 software release.

Industry 4.0 vs. Internet of Things

Three perspectives on the influence of the Internet of Things and Industry 4.0 on the US and Asian markets.



Dear reader,

It is virtually impossible to imagine modern society without digital networking – and the trend towards digitalization has penetrated the field of automation technology, too. Intelligent sensors and field devices already provide the basic data required for the digital networking of plants and production processes. New transmission technologies enable these plants and production processes to be connected to networked communication systems. Read our cover story beginning on page 4 to find out more about the intelligent sensor and bridge technologies currently available and how Pepperl+Fuchs is developing products for Sensor Technology 4.0.

The topic of Industry 4.0 is high on the agenda in Europe. But what is the situation beyond the European continent? Three colleagues from China, Singapore, and the United States take a look at the international importance of this development in the US and Asia. Find out more on page 18.

Production processes and machines are increasing in complexity – so the demands placed on user interfaces are on the rise, too. Virtualization of information from the process control system in the field is a growing trend. Find out how we are helping to pave the way for a virtualized future with new software versions for remote monitors on page 10.

Happy reading,

Dr. Gunther Kegel
CEO

We look forward to receiving your feedback on this issue.

Please e-mail any comments to: newsletter@pepperl-fuchs.com



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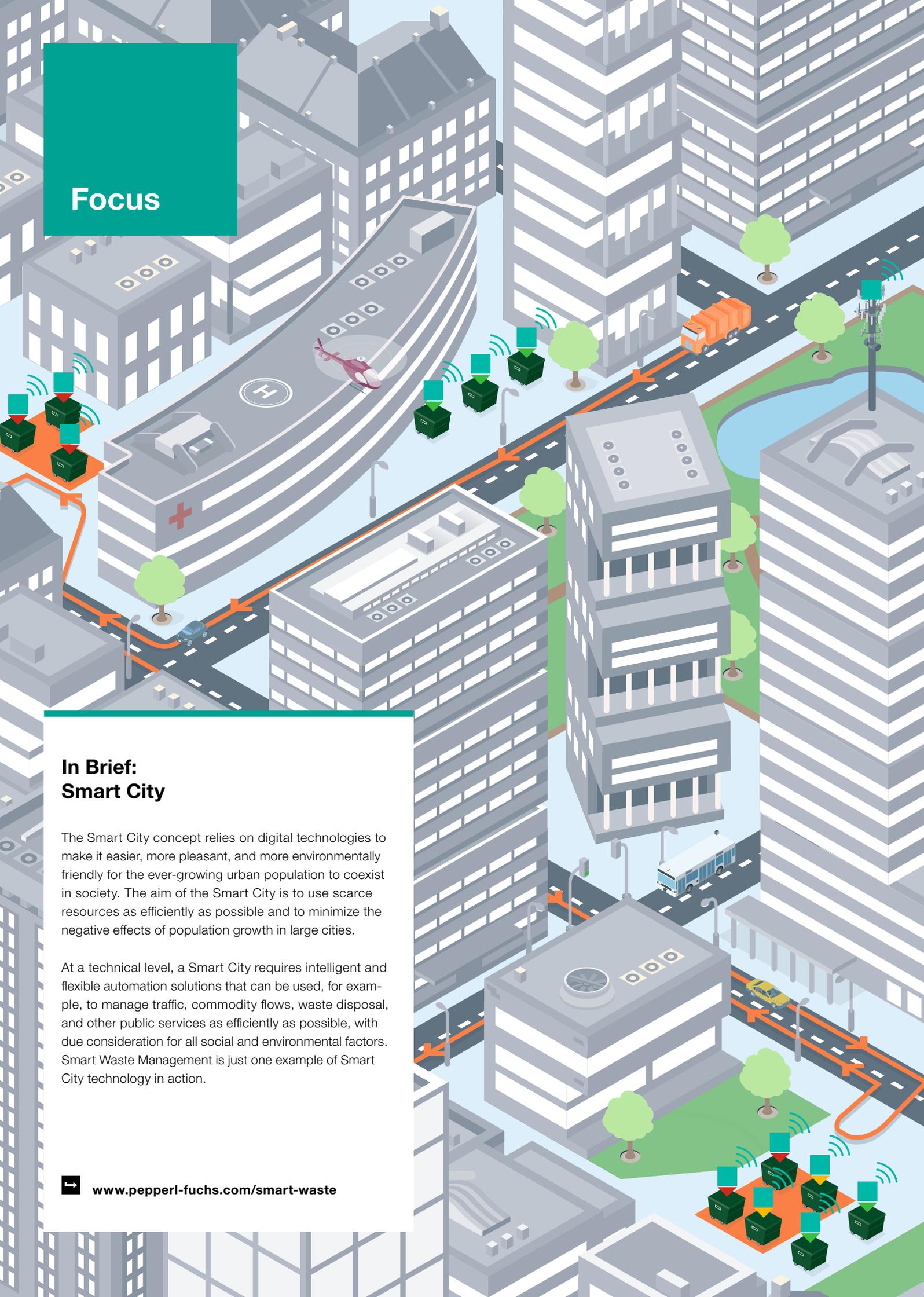
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Focus

In Brief: Smart City

The Smart City concept relies on digital technologies to make it easier, more pleasant, and more environmentally friendly for the ever-growing urban population to coexist in society. The aim of the Smart City is to use scarce resources as efficiently as possible and to minimize the negative effects of population growth in large cities.

At a technical level, a Smart City requires intelligent and flexible automation solutions that can be used, for example, to manage traffic, commodity flows, waste disposal, and other public services as efficiently as possible, with due consideration for all social and environmental factors. Smart Waste Management is just one example of Smart City technology in action.



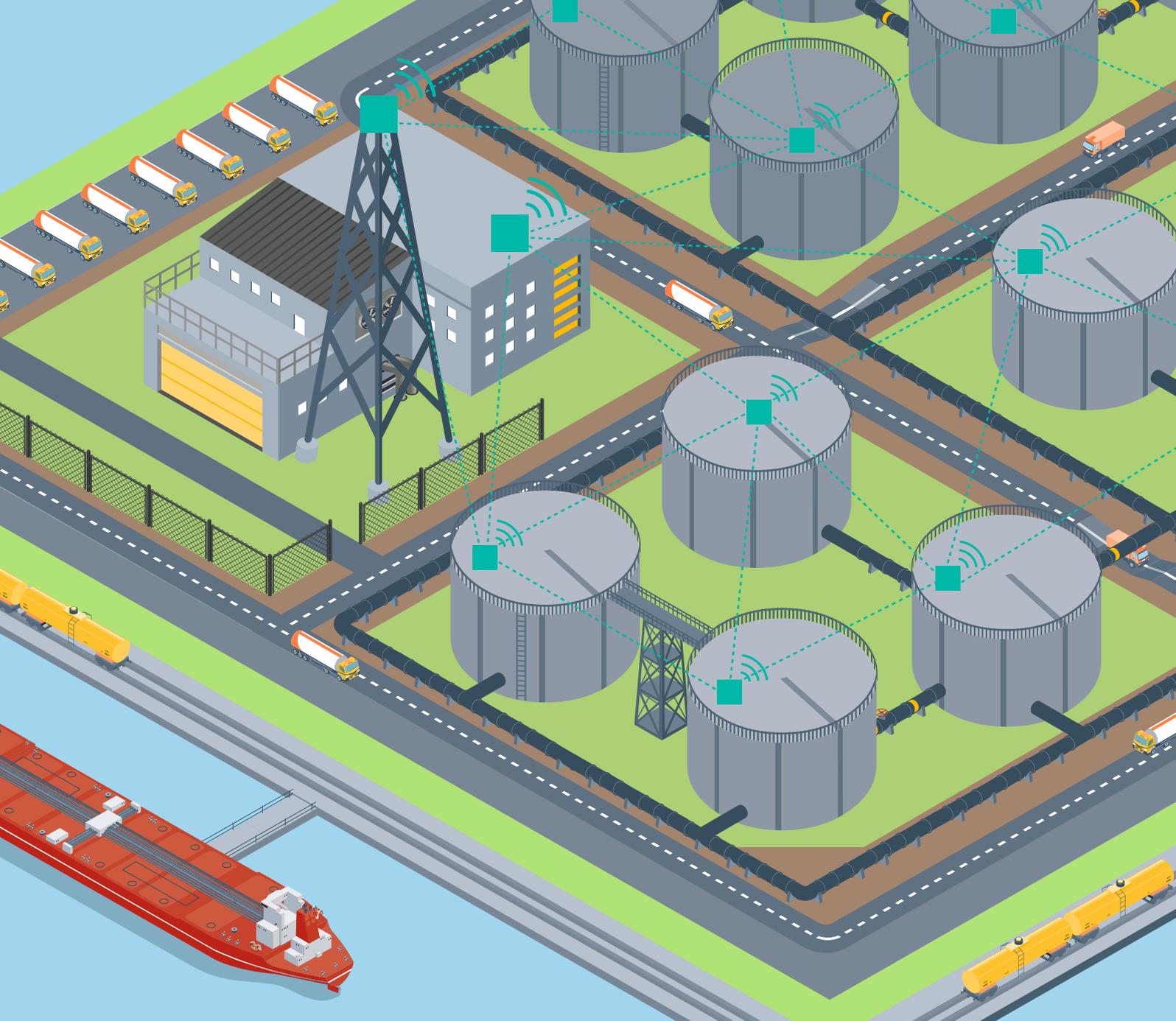
www.pepperl-fuchs.com/smart-waste

Sensor Technology 4.0: Ideas beyond Limits

It is virtually impossible to imagine modern society without digital networking. This megatrend has long been an integral part of all areas of modern life and work. In the field of automation technology, intelligent sensors, actuators, and field devices already provide basic data. Now we need new transmission technologies to drive the autonomy and automation of plants and factories forward.

A garbage container transmits a signal to indicate that it is over 80 percent full. This signal is sent via the mobile communications network to a Web-based software application used by the waste management company. This application visualizes the capacity of the container using a traffic light system. The company then uses this system to plan the best route for waste collection – garbage trucks travel only to the containers that actually need to be emptied. This system of targeted waste collection saves time, money, and fuel; it also reduces exhaust gas emissions and noise levels for local residents. This sounds too good to be true? This technology has been made a reality by MOBA Mobile Automation AG, a company based in Limburg, Germany. The system has already been put to the test as part of the Smart City project underway in Barcelona, and it is now being tested for rollout in some twenty other countries.

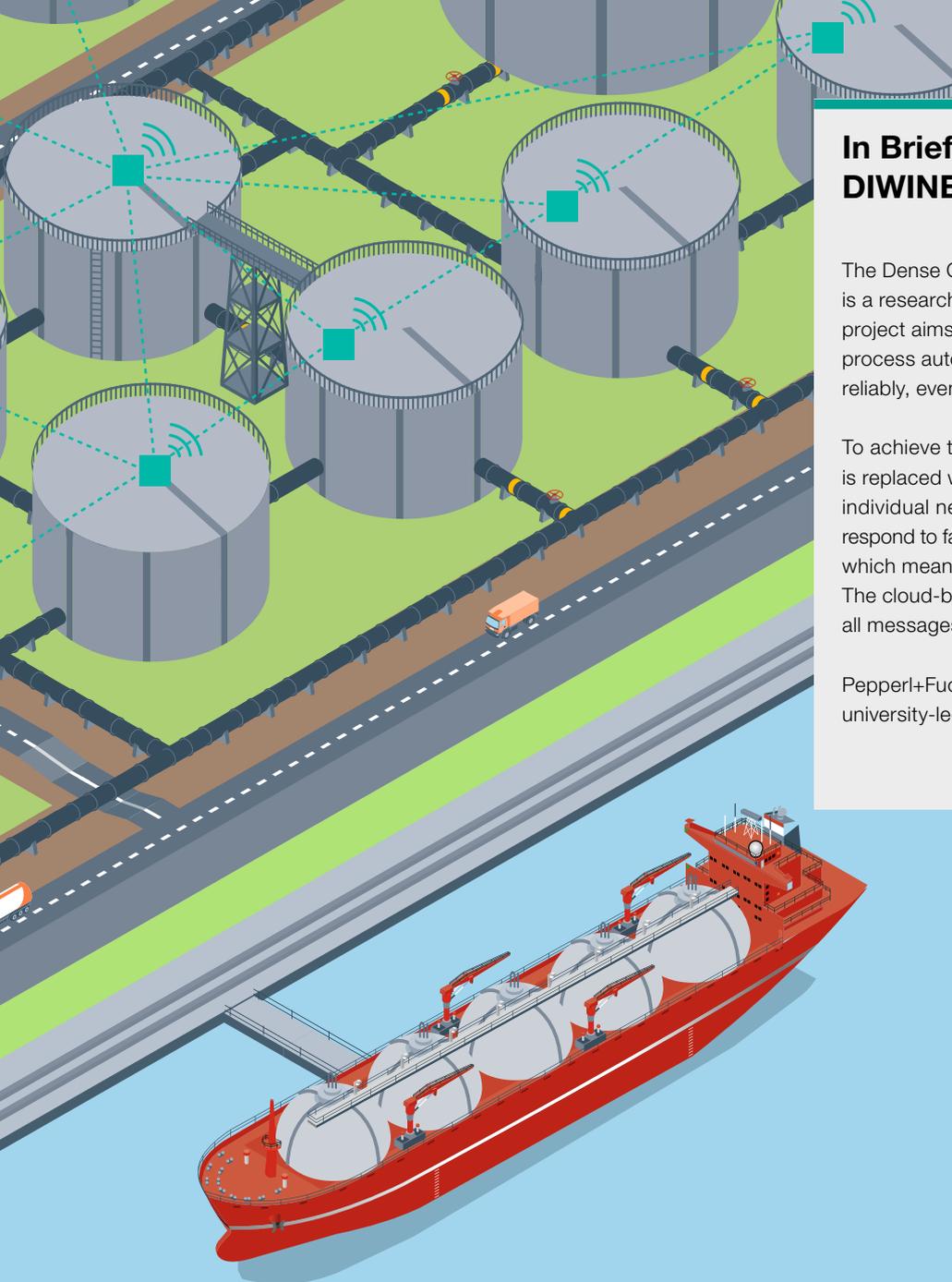
A fill level measurement device is integrated into the lid of every garbage container. This device needs to be extremely robust, and capable of detecting the fill level of the container regardless of what has been deposited inside. It also needs to transmit data on a regular basis. Because absolute reliability is crucial in this application, MOBA opted for ultrasonic technology from Pepperl+Fuchs. The device is equipped with a SIM card and the sensor reports fill level and sensor data at regular intervals. The sensor consumes very little power, so the battery lasts up to ten years. In the future, such type of flexible automation could also be deployed in traffic management or customized parking guidance systems. ☒



Existing Technologies for New Opportunities

“Barcelona has taken a key step towards becoming a Smart City by introducing this Smart Waste Management system,” says Dr. Gunther Kegel, CEO of Pepperl+Fuchs. “With the ultrasonic sensor the fill level measurement device can communicate with other devices and is optimized for low energy consumption. This is a good example of the type of intelligent sensors that are becoming more and more popular. These sensors deliver a differentiated image of reality and can transmit this image in real time.” Other examples include 2-D laser scanners and laser measurement systems with time-of-flight technology, Pulse Ranging Technology (PRT), or laser triangulation. In the future, a combination of these methods could also open up the doors to spatial 3-D detection – and therefore to applications such as fully automated guidance. RFID sensors and components also play a significant role in enabling ever-finer differentiation between production processes, since they are capable of reading and writing tags. This enables them to identify individual parts, so that industrial production processes can be implemented from batch sizes of just one unit and upward.

“Combining these kinds of sensors with networked communication technology is the basis for Sensor Technology 4.0,” explains Dr. Kegel. “Sensor Technology 4.0, in turn, is the technical prerequisite for the increasing autonomy and automation of plants and factories – in other words, Industry 4.0 and the Internet of Things.” New bridge technologies are a crucial link in making this a reality. For the smart waste collection system in Barcelona, mobile communication technology and the Internet fulfill this function. Factory automation often relies on the Ethernet. However, these technologies reach their physical limits in field-level process automation. Even today, mostly analog signals are used. Plant operators prefer networks with two wires per line for their power and data transmission, instead of the four or eight used by Ethernet technology. For use in hazardous areas, power consumption must be significantly reduced, while the range of a segment must be much larger.



In Brief: DIWINE

The Dense Cooperative Wireless Cloud Network (DIWINE) is a research project funded by the European Union. The project aims to develop a flexible and wireless network for process automation that functions securely, quickly, and reliably, even in challenging wireless conditions.

To achieve this, the central network management system is replaced with a decentralized form of intelligence in the individual network nodes. Each individual participant can respond to faults or unplanned requirements autonomously, which means that a response is initiated extremely rapidly. The cloud-based network securely and reliably transmits all messages.

Pepperl+Fuchs is an industry partner of this fundamental university-led research project.

Ethernet for Process Automation

"Together with other well-known manufacturers of automation technology in the process industry, we are conducting a feasibility study on Ethernet application right down to field level," explains Dr. Kegel. "In these applications, it is necessary to define a 'physical layer' that meets the requirements for process automation. This process has resulted in two technological concepts for a physical layer, which are now being tested in terms of their economic feasibility and evaluated by users, and may end up being merged into one concept. This technology could replace fieldbuses and open up a new level of flexibility in process automation."

However, some plants are so large that the operators are eager to remove the need for cables, and operate on wireless data transfer. For continuous systems, GSM-based solutions, such as that used for intelligent waste management in Barcelona, are out of the question. A familiar technology used in process automation is *WirelessHART*, an intelligent and robust data transmission technology that enables all connected devices to act as both transmitters and receivers. The meshed network structure makes it easy to construct extensive networks.

However, data transfer in this kind of system is subject to some limitations: If one network participant fails and an alternative route must be found, data transmission can be delayed by the central network management system, and the fact that it is necessary to acknowledge a signal packet transfer. Pepperl+Fuchs is involved in another research project that aims to improve wireless communication. The Dense Cooperative Wireless Cloud Network (DIWINE) project aims to bring about a network that delivers a significantly higher level of flexibility; one that functions securely, quickly, and reliably even in challenging wireless conditions to transfer data to the cloud.

The system sends messages to different participants, which no longer need to acknowledge them. Instead, the messages are processed autonomously. As the message is forwarded in parallel using this multi-cast approach, the data is transferred securely and reliably, even if a path is faulty, with no significant increase to the signal runtime. "In this concept, the central network management system is replaced with a decentralized form of intelligence in the individual network nodes," explains Dr. Kegel. ☒



“Combining sensors with networked communication technology is the basis for Sensor Technology 4.0. In turn, Sensor Technology 4.0 is the technical prerequisite for the increasing autonomy and automation of plants and factories – in other words, Industry 4.0 and the Internet of Things.”

Dr. Gunther Kegel, CEO Pepperl+Fuchs Group

In Brief: SmartBridge

SmartBridge technology functions using an adapter for IO-Link sensors and a SmartBridge app, which is compatible with mobile devices such as tablets and smartphones. The adapter takes data and parameters from the sensor and transmits these to the mobile device wirelessly via Bluetooth. The app visualizes this data and allows parameter-level access to the sensor, functioning as an “intelligent multimeter” to simplify the commissioning and maintenance of field devices.

As a universal bridging technology, it can also be used to enable interaction between cyber-physical systems at field level and to connect these systems to higher-level networks. Devices with an Ethernet or WLAN interface can also be called up directly via the SmartBridge app without the need to use an adapter.



www.pepperl-fuchs.com/smartbridge-technology

» Bridging Technology SmartBridge

Although research on DIWINE is still ongoing and process Ethernet is yet to make the transition to field level, there is already a technology in existence that, in principle, could be used to add extensive communication features to any sensor. The technology, known as SmartBridge, enables any sensor with an IO-Link interface to be connected to IP structures, providing the sensor with full communication capability.

“Currently, sensor data is generally stuck at field level and cannot be made available at a higher level, for example to the Management Execution System. With SmartBridge technology, fill levels from a filling plant, for example, can be fed directly into the performance calculations of the company, without needing to make any changes at the control level to hardware and software,” explains Dr. Kegel. “The technology also opens up a host of new options when setting up new plants; if you integrate a machine or plant completely transparently into the network, but don’t want to take IP communication right down to the lowest level, or if the sensor is physically inaccessible. SmartBridge technology enables devices to communicate wirelessly with systems in inaccessible locations or encapsulated in the plant or machine. It really is a practical bridging technology that offers great potential for the future.” ■



Human Machine Interfaces for Virtualized Processes

Human Machine Interfaces As the complexity of production processes and machines grows, so do the requirements for user interfaces. Pepperl+Fuchs launched the first VisuNet Remote Monitors in 2007, and these devices are now used worldwide in the process industry. With RM Shell 4.0, a new software version for the Remote Monitors, Pepperl+Fuchs is taking another step to achieve virtualized process automation systems.

In this interview, Product Portfolio Manager Dr. Marc Seissler and Business Development Manager Louis Szabo talk about the new software and the associated opportunities for virtualization.

What opportunities and benefits do you see in the development of virtualization in the process automation industry?

Dr. Marc Seissler: Running process automation applications centrally on a server is useful for simplifying maintenance or for updating hardware, operating systems, and software. However, conflicts occurred previously if applications tried to access the same libraries at the same time. Today, virtual machines (VM) that are completely encapsulated

run on a virtual intermediate layer known as the “hypervisor.” The hypervisor allocates computer resources to the VMs, prevents conflicts, and ensures a more efficient use of hardware resources. This resource allocation enables different operating systems to be run side-by-side on a computer without any problems. If implemented consistently, across all areas of process automation, virtualization can significantly reduce hardware costs.

Louis Szabo: Virtualization was primarily a business domain function until about 2010. Only in the past few years has the technology migrated to the process automation industry to be used even for online process control. There is definitely still room for growth. Many of the control



Business Development Manager Louis Szabo

system manufacturers expect that 85 percent of their business will be made up of virtualized client/server architectures in 2018. The opportunities and enormous potential of this technology was recognized by Pepperl+Fuchs early on. We developed the first network-based Thin Client solution for hazardous areas back in 2007, meaning we have the most experience in this area. Today, our remote monitors are used around the world in the process industry, and with the next version of our software, RM Shell 4.0, we are taking another step towards a virtualized future.

What was the main focus when developing VisuNet RM Shell 4.0?

Louis Szabo: With RM Shell 4.0, we support the latest versions of all common remote protocol systems, such as RDP, VNC, and Emerson DRDC. New protocols ensure that the systems can be used with full functionality. The integration process could not be simpler: All you need to quickly establish a direct connection to the distributed control system processor is the IP address of the existing system.

Dr. Marc Seissler: The most important factor during development was the level of user-friendliness offered by the software. We wanted to offer process engineers maximum ease of use and a high level of support when setting up the system. That's why Remote Monitors from Pepperl+Fuchs do not use operating systems with standard dialogs, which are actually misleading in the field. They have their own user interface, known as the "shell," which only displays what is really important and makes the integration process simpler than ever before. To further increase usability, the specially developed user

interface offers a consistent design for all protocols. What's more, we optimize the software for data input via touch screen.

And what about security?

Louis Szabo: Security played a crucial role in developing the software. We integrate an optional, limited Web browser that restricts user rights depending on corporate user specifications. When utilizing the Web client mode, access to the "outside world" is not available, but only to predefined Web applications such as SCADA or MES. This ensures reliable protection against cyber attacks and unauthorized access.

Dr. Marc Seissler: On top of that there is the matter of process reliability. To achieve this, a stable connection to the process control system computers and an error-free display of the process image are crucial. With this in mind, RM Shell 4.0 offers a variety of important additional functions. The auto-connect function can be used to configure the remote monitors in such a way that they establish a connection to a designated host system – without any further intervention from the user. From this point, the connection is monitored constantly and events such as network faults or host server failures can be easily handled. While temporarily interrupted connections are automatically reestablished, backup hosts to which a remote monitor should connect can further be defined. You could say that, whatever happens, RM Shell 4.0 will deliver a secure and reliable representation of process control system information in the field. ■



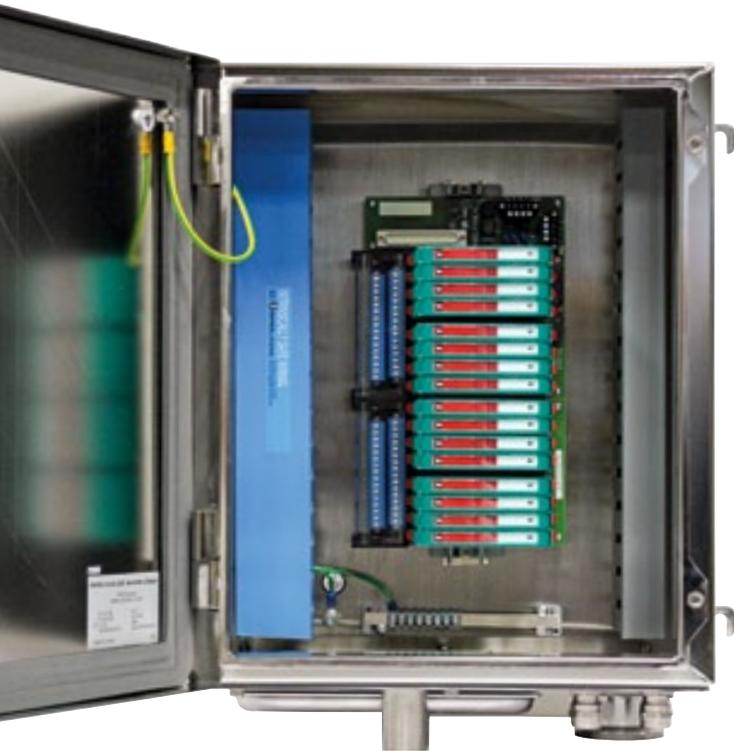
Product Portfolio Manager Dr. Marc Seissler



www.pepperl-fuchs.com/RM-Shell

Process Infrastructure – Simple and Flexible

Interface Technology The universal barrier from Pepperl+Fuchs is setting new performance standards in large-scale process equipment projects. The device is the first isolated barrier to automatically adapt to the signal type.



The HiC2441 universal barrier can be used with any signal type and without the need to configure hardware settings. As a single I/O module, the universal barrier can replace conventional modules. This means that you can prewire the termination boards of the H-System without having to take the signal type into account. The standardized switch cabinets significantly reduce costs for planning, engineering, and configuration. The switch cabinet layouts can be easily reproduced, so it is no longer necessary to constantly create new wiring plans, power supply calculations, or heating calculations.

The simple infrastructure guarantees fast project implementation and execution. Using a flexible input card, you can make last-minute changes via remote access rather than in the field. Configuration changes that previously took days now take only a few minutes. ■



www.pepperl-fuchs.com/universal-barrier

New Modules, Greater Flexibility



Interface Technology High-quality galvanic isolation, an extended temperature range of up to 70 °C, and flexible modules – these impressive features are what make the compact SC-System stand out. The signal conditioners for nonhazardous areas now feature two additional modules.

The millivolt signal converter is ideally suited to applications with small sensor voltages. It galvanically isolates and converts bipolar and unipolar millivolt voltages, which often occur when measuring voltages using shunt resistors.

A new universal splitter provides greater flexibility for the galvanic isolation, conversion, and distribution of standard signals. You can now process several types of field signals, which means that many more field devices are compatible with the module. The transmitter power supply can also be used to switch on the supply voltage for the operation of 2-wire signal converters. ■



www.pepperl-fuchs.com/scsystem

Wireless Monitoring and Control



WirelessHART In applications where cable connections are too complex or impossible to implement, *WirelessHART* technology has been successfully used for years to monitor plants. A new generation of *WirelessHART* field devices now enables processes to be controlled wirelessly, too.

To prevent tanks from being overfilled or running dry, fill levels must be reliably monitored and controlled. Field devices are often installed at great heights or in locations that are difficult to access. Communication between the controller and field devices can often only be achieved with wireless networks. Until now, these networks allowed only process monitoring. Since *WirelessHART* devices capable of switching outputs were not previously available, it was not possible to control processes. Now, for the first time, the innovative *WirelessHART* Discrete I/O field devices enable the entire process chain to be controlled using wireless technology.

Reliability throughout the Entire Process Chain

As soon as a minimum or maximum value is reached in the tank, the Discrete I/O field device transmits this measured value wirelessly to the control system via the *WirelessHART* gateway. When a limit value is reached, the control system sets the digital output to activate the pump and to open or close valves. While communication takes place with the control system wirelessly via the gateway, the Discrete I/O field device is hardwired to the sensors and actuators. To perform a simple installation independently of the power supply, the connected sensors and actuators can be supplied with power via the long-life battery for the Discrete I/O field device.

More Flexibility and Efficiency

The *WirelessHART* Discrete I/O will be launched on the market at the end of the year. It is capable of activating NAMUR sensors. With its four inputs/outputs, up to four field devices can be connected. This saves hardware costs and increases the range of *WirelessHART* applications. By enabling monitoring and control, the device allows predictive maintenance for valves. Instead of replacing valves based on the suspicion that they need replacement, or when the plant is already in downtime, you can replace them when they actually reach their operating limit. As a result, Discrete I/O field devices increase levels of efficiency and flexibility when planning plants and performing maintenance tasks. ■



Ballast Water Ahoy!

Across the world, oil tankers, floating oil production platforms, and cargo ships are in transit in international waters. Physical methods are used to clean organisms and germs from ships' ballast water. Explosion protection plays a pivotal role on board, whether it be to protect the ships' pumps from the proximity of the cleaning systems, or due to a potentially hazardous environment the ships' cargo creates. Pepperl+Fuchs has developed customized solutions for this purpose, delivering the perfect combination of purge and pressurization along with a ballast water treatment system.



On their journey across the world's oceans, tankers and cargo ships use ballast water to stabilize. As the ballast water is changed at regular intervals at loading and unloading, it washes up at coastal regions all over the world. Organisms that do not naturally occur at the destination ports are carried along with the ballast water. These "stowaways" can upset the balance of the local ecosystem. Environmental damage can occur as a result of threats to native species or health risks from bacteria.

The International Maritime Organization (IMO) defined the rules for ballast water management in a convention adopted in February 2004. Each ship must document its ballast water exchanges in accordance with the full requirements of the convention. In principle, there are two methods, one of which is to change the water at high sea. However, this technique is usually restricted due to weather influences, ship routes, or the design of the ship itself. Another method is to perform ballast water treatment processes on board using mechanical, physical, or chemical methods. »



In its Solution Engineering Centers Pepperl+Fuchs develops individual system solutions for all hazardous area applications.

Combined Solution

Filtering the ballast water and treating it with high concentrations of UV light to kill organisms and germs is an environmentally friendly method. An appropriate system with a UV reactor is installed, usually in the central pump room. This room is classified as a hazardous area in oil tankers, floating oil production platforms, and ships carrying combustible materials. High voltages are needed to operate the UV reactor. Pepperl+Fuchs has developed a certified solution that combines a purge and pressurization system with other explosion protection equipment. This certified solution creates safe environments to operate high-voltage electrical equipment.

The central component of the solution is a purge and pressurization system. The system from the Bebcu EPS® 6000 series product range protects the electronic components in the reactor and the UV lights.

To do this, the system automatically establishes the necessary overpressure and monitors it continuously. By purging with an inert gas, any ignitable gases and vapors are reduced to a concentration that is no longer explosive.

The purge and pressurization system is supplemented by an explosion-protected junction box and control components. Pepperl+Fuchs offers pressure measuring sensors, fill level sensors, temperature measuring sensors, and K-System junction boxes for intrinsically safe signal transmission. This customized, internationally certified solution is ready for connection and comes in explosion-protected housing.

Specially Designed for Use Around the World

The combined solution – made up of a purge and pressurization system and an explosion-protected package solution – meets safety requirements and is certified for worldwide use. This is a major advantage, as the ships do not simply travel the globe – they also need to call at ports all around the world, where they will undergo repair or maintenance work. The self-contained, automatic Ex system makes this the optimum solution for this specific application.

In its Solution Engineering Centers in the USA, Europe, and Asia, Pepperl+Fuchs develops customized system solutions for special applications in potentially explosive areas – solutions that are ready to use and come with certification. This offers many advantages, particularly for international projects. Every phase of the project, such as engineering, procurement, or design, can be managed around the world at the networked Solution Engineering Centers. ■





Building on Existing Infrastructure

Save time and money at the push of a button: The Fieldbus Diagnostic Handheld allows operators and planners to check whether an existing installation is suitable for fieldbus operation before a plant upgrade.

When updating a plant with fieldbus technology, operators and planners soon face a crucial question: Can the existing infrastructure still be used or is a full rewire necessary? The choice between these two options is an important one, because time and money are at stake. Until now, it was not possible to reliably test in advance whether physical core properties such as impedance or surge impedance were within ranges suitable for fieldbus operation. As a result, before the development of this new device, expensive new installations were the norm.

Mobile Infrastructure Test

This all changed with the introduction of the FDH-1 Fieldbus Diagnostic Handheld from the FieldConnex® product line. The mobile device now offers the option to check the installed cables to ensure they can be used for fieldbus operation. To do this, one FDH-1 is connected to the cable close to the power supply and another is connected to the other end of the cable. When you push a button, the two devices measure the quality at which the emitted signals arrive. Using a portable fieldbus battery, you can also test parts that are not regularly supplied with power. The result shows where you can use existing infrastructure, so that you update only what is necessary.

In addition to this feasibility testing feature, the FDH-1 offers a wide variety of diagnostic and monitoring options: Before a segment is commissioned, the device suggests how to eliminate possible wiring faults. A target/actual comparison can easily be made using values from the plant, guaranteeing the accuracy of the final result.

Another notable advantage of the mobile device is its user-friendliness. The integrated display guides the user through each task in the language of their choice. Tasks include full troubleshooting, commissioning, checkout, and documentation processes. The Fieldbus Diagnostic Handheld is ideal for both beginners and experienced users as a tool for detailed infrastructure testing – ensuring trouble-free operation and maximum availability of process equipment. ■



www.pepperl-fuchs.com/fieldbus-handheld



Industry 4.0 vs. Internet of Things – Three Perspectives



As a result of the Internet, the real world and the virtual world are growing together – the economy is on the brink of the fourth industrial revolution. Concepts such as the “Internet of Things” and “Industry 4.0” are being discussed extensively across Europe. But what is the situation in other regions of the world?

In this interview, Dr. Helge Hornis, Product Marketing Manager for Intelligent Systems in the USA, Shane Parr, Managing Director in Singapore, and John Saw, Product Marketing Director in Shanghai, provide their assessments and views of the Asian and US markets.

Is the term Industry 4.0, as coined by German industrial associations, as well known and widely discussed in America and Asia as it is in Germany?

Helge Hornis: In America, the term is only really known among experts, but even then people do not know a lot about what it means. Here, everyone in the consumer market is talking about the Internet of Things. There is considerable hype surrounding the field of building automation and there are already products that you can buy from home-improvement stores, such as a heating regulator, which raises the temperature when the GPS data from the user’s smartphone signals that they are on their way home.

John Saw: Many experts in the field of factory automation are familiar with the term Industry 4.0, and customers want to learn more about this concept. The Internet of Things is developing quickly in Asia, as is the case in the USA, where these impulses come from the consumer market.

What is the situation like in the field of process automation?

Shane Parr: In process automation industries, the terms Industry 4.0 and Internet of Things are known, with the latter used more commonly throughout Asia. However, while the industry press is attempting to build up some substance around the Internet of Things, the reality is that there are no real, let’s say killer applications, to drive this technological step.

Specific terms aside, how far has the idea of increasingly networked automation spread?

Helge Hornis: The automation industry in the US is typically more cautious towards fundamental innovations. For example, even in recent times, new baggage systems in airports have been fitted with AC switches – so in some cases 24 VDC switches haven’t even been introduced yet, let alone bus systems.

John Saw: In Asia, adoption of most modern solutions and technology is usually favored. In the automotive industry, for example, there is discussion and consideration on how Industry 4.0 concepts can be implemented in practice. We are being asked what Pepperl+Fuchs as a sensor manufacturer can contribute in this area. 🗨️



“I see a cascade effect happening, starting in the consumer market, carrying forward into the field of factory automation and after that into the field of process automation.”

*Shane Parr, Managing Director,
Pepper+Fuchs Singapore*

» **What topics are the highest priority for users?**

Shane Parr: In process automation, the main focus is on reliable and efficient plant operations. Users would welcome industry-wide standards to enable platform-independent communication across systems and devices. However, as we have seen recently in wireless technologies, there are already two competing standards available: *WirelessHART* and *ISA100*. What’s more, providers of process control systems have no overriding interest in opening up their proprietary systems for broad communication. Reliability and safety are crucial factors – in any case, plants with potentially explosive materials and atmospheres would only be able to implement tried-and-tested technologies that offer high protection classes.

John Saw: In the field of factory automation, Ethernet-based devices are gaining popularity and are already widely used in some industries. In the automotive industry, cloud-based solutions are also being discussed. Remote access to devices for maintenance and diagnostics is basically accepted and will likely spread quickly. To enable this capability, manufacturing processes and also the flexibility to quickly match consumer demands would then be guided by data. In order to implement this concept, a reliable means of achieving data security would, of course, be an important requirement, and solutions still need to be found in this area.

In what areas do you see or expect to see a strong impetus for change?

Helge Hornis: I expect to see the real breakthrough when a large Internet-oriented company comes up with an overall solution that then spills over into the automation market. Once the idea of network-based automation is accepted in the USA, it will definitely be implemented quickly.

John Saw: Business models that rely predominantly on low wages will not work forever in China. As such, companies are thinking hard on how to create more value to achieve its competitive and comparative advantage. Increasing efficiency, achieving increased flexibility and reliability, better matching consumer demands to supply through connectivity is a growing trend. Customers want comprehensive, coordinated initiatives that provide a reliable and binding framework, which is as standardized as possible. Many experts in Asia are following the extensive discussion about the Internet of Things and Industry 4.0 in Germany with a great deal of interest.

Shane Parr: I see a cascade effect happening, starting in the consumer market, carrying forward into the field of factory automation and after that into the field of process automation.



“I expect to see the real breakthrough when a large Internet-oriented company comes up with an overall solution that then spills over into the automation market.”

Dr. Helge Hornis, Product Marketing Manager for Intelligent Systems, Pepperl+Fuchs Twinsburg, Ohio, USA

What specific actions are planned at present?

Shane Parr: Advanced diagnostics and predictive maintenance are two keywords used in process automation, and with fieldbus our devices already provide both. However, these capabilities have yet to be integrated into each individual system with its specific standards and protocols. It is often the case that the potential of available data is not fully utilized. We are already able to implement a wealth of additional networked intelligence at plant level.

Helge Hornis: With SmartBridge, we are able to offer technology that enables users to take a significant step in this direction, without needing to change the plant and process control system. As is the case for

the heating regulator controlled via smartphone, SmartBridge can be taken off the shelf and put to immediate use. It requires a minimal investment, is easy to understand, and offers a direct benefit. This is not yet Industry 4.0, but it is a real piece of Sensor Technology 4.0.

John Saw: Our intelligent sensors and devices already offer features of detailed diagnosis, online monitoring, fault detection for predictive maintenance, and remote parameterization. We are sharing more and more with our customers to better enable them to integrate these features into their applications to achieve remote access and data transparency. The SmartBridge concept is generating interest in Asia as it further bridges field sensors and devices to the Industry 4.0 concept. ■

“Remote access to devices for maintenance and diagnostics is basically accepted and will likely spread quickly.”

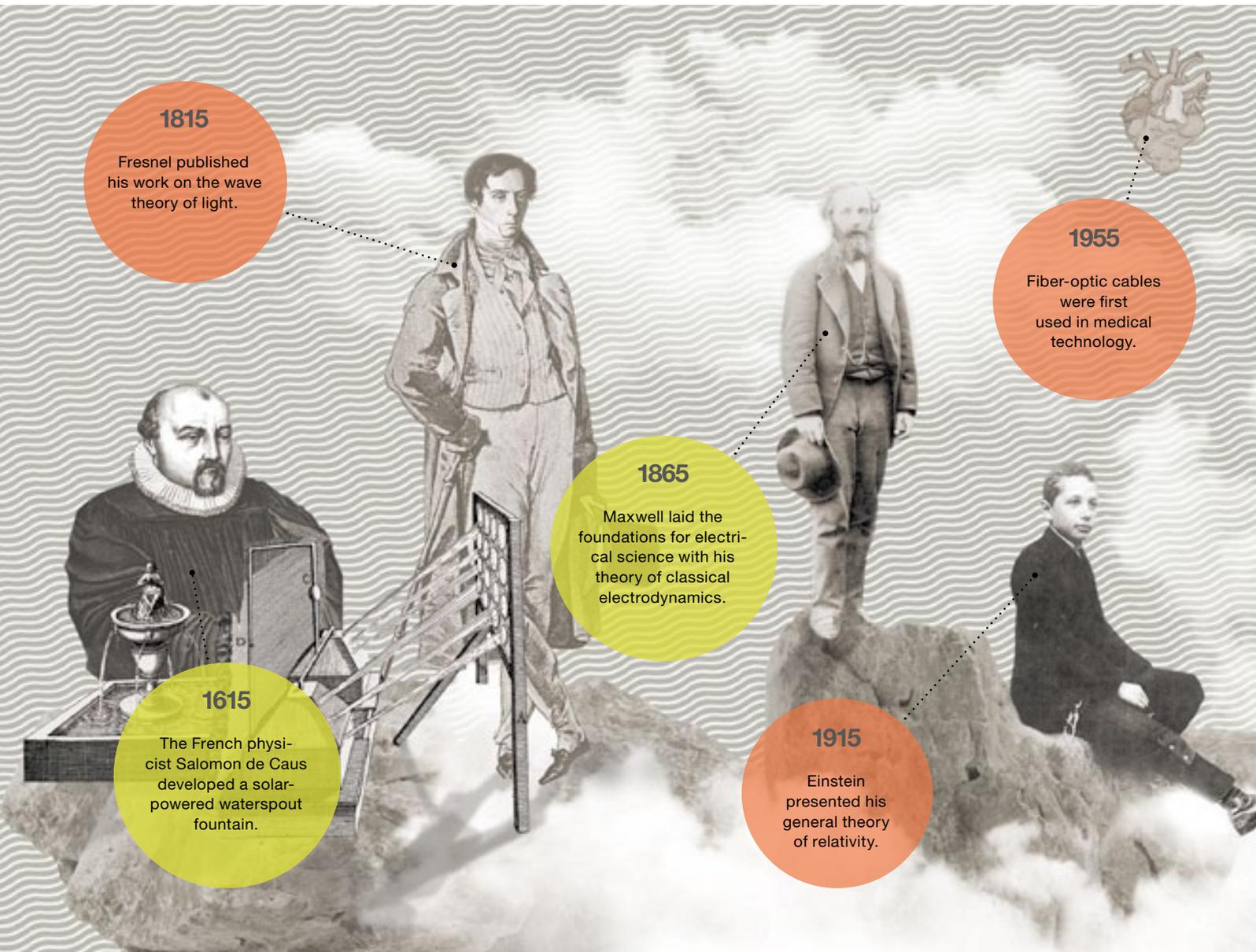
John Saw, Product Marketing Director, Pepperl+Fuchs Shanghai, China



The Key to the Future Lies in the Past

We have long moved past using the natural rhythm of day and night to organize our lives. Over time, artificial light sources have changed the day-to-day life of human beings. However, light can do much more than simply brighten up our lives – as we can see in the field of automation technology.

Transferring data at high speed, introducing new uses for lasers in the medical field, and gaining a better understanding of the cosmos are just some of the areas where light plays an important role. To remind us all of the importance of light, the UN General Assembly has proclaimed 2015 to be the “International Year of Light and Light-Based Technologies.” After all, this year marks the anniversary of a number of key insights from the scientific field of optics – from the invention of the first solar-powered machine 400 years ago, to the theory of general relativity introduced by Albert Einstein 100 years ago, right up to the proof for the big bang theory that Penzias and Wilson provided in 1965 with the concept of cosmic microwave background radiation.



1815

Fresnel published his work on the wave theory of light.

1955

Fiber-optic cables were first used in medical technology.

1865

Maxwell laid the foundations for electrical science with his theory of classical electrodynamics.

1615

The French physicist Salomon de Caus developed a solar-powered waterspout fountain.

1915

Einstein presented his general theory of relativity.

The Science of Light Affects Many Areas

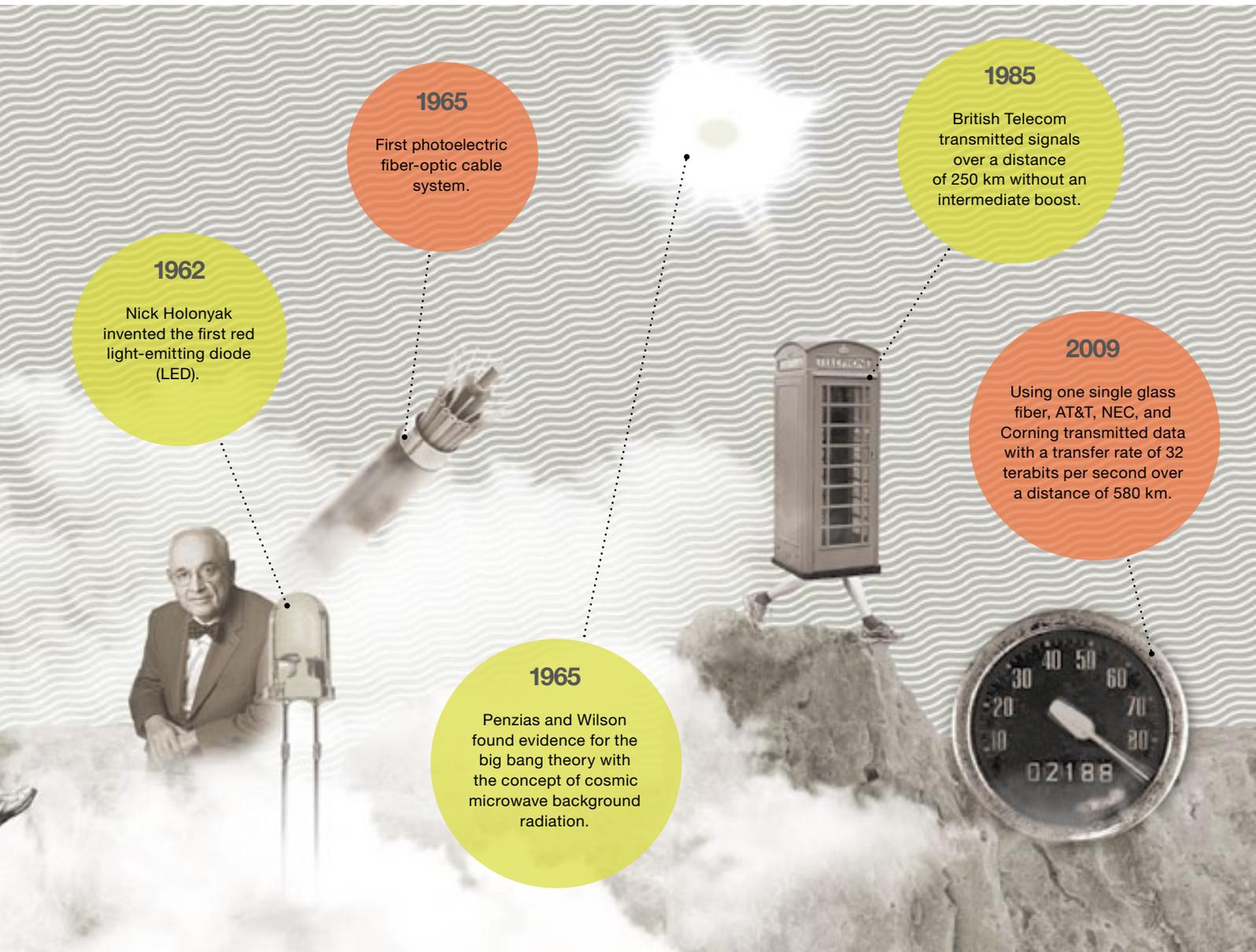
The question concerning the “nature of light” is one that goes back through the history of humanity – from the attempt to understand the movements of the stars and planets to a physical description of vision. The science of light has had an impact on practically every other discipline of science. And all this time – until the modern age at least – it was not clear what light actually was. The various attempts to explain light in physical terms brought inventions such as eyeglasses, the telescope, and the microscope. Fundamental discoveries and new scientific limits are opening up the possibility for highly sophisticated research in areas such as photonics, quantum optics, and high-speed physics.

Industrial and business sectors alike benefit from the high speed, resolution down to the nanometer range, and level of precision possible with data captured by light. Photoelectric sensors, laser technology, and sophisticated camera systems are now an integral part of automation technology. Even simple photoelectric sensors use the speed of light to detect objects. Energy-efficient forms of illumination, such

as the semiconductor, light emitting diodes (LEDs), and organic LEDs (OLEDs) have long been used in industry for illumination or signal detection – and offer another advantage: like photovoltaic devices, they minimize the emission of greenhouse gases.

Light Pulses as the “Backbone” of the Internet

The field of photonics applies the science of light and is particularly concerned with optical methods and technologies for storing, transferring, and processing information. Using light to transmit messages is not new. In the field of seafaring, using light to send Morse code is an old technique that is still used by boats and ships today. The telephone and the Internet are mostly based on the principle of optical data transfer. Here, light pulses are sent through glass fiber cables to transmit information. Messages and information also reach the most remote areas of our planet via satellites and wireless technology. Light forms the foundation that enables people and machines to establish global networks – and is therefore a key component of the Internet of Things. ■



1962

Nick Holonyak
invented the first red
light-emitting diode
(LED).

1965

First photoelectric
fiber-optic cable
system.

1985

British Telecom
transmitted signals
over a distance
of 250 km without an
intermediate boost.

2009

Using one single glass
fiber, AT&T, NEC, and
Corning transmitted data
with a transfer rate of 32
terabits per second over
a distance of 580 km.

1965

Penzias and Wilson
found evidence for the
big bang theory with
the concept of cosmic
microwave background
radiation.



Crucial Modules

Without a protective sleeve and a reliable connection, even the best electronic devices will deliver no real benefit. In the city of Veszprém in western Hungary, Pepperl+Fuchs manufactures standard housings and connection technology that is perfectly adapted to the devices. Depending on the application, they can handle a wide range of often very tough demands.



Facts + Figures

Capital	Budapest	Head of government	Prime Minister Viktor Orbán
Area	93,036 km ²	GDP	132.26 billion US\$ (2013)
Population	9.91 million (2014)	National anthem	God bless the Hungarians
Form of government	Parliamentary republic	Internet TLD	.hu
Head of State	President János Áder	Country calling code	+36

Hungary is a country in the east of Central Europe known for its relaxed lifestyle, hearty cuisine, and bubbling thermal springs. Pepperl+Fuchs has been active in Veszprém, one of the oldest cities in Hungary, for 18 years. The city is located between Lake Balaton and Bakony, a low mountain range filled with dense forests. Even from afar, visitors to this region cannot fail to notice the mountain and its baroque castle of Veszprém, which provides evidence of times gone by.

Thanks to good road and rail connections, Budapest and the Austrian capital Vienna are no more than two hours apart. In addition to the 70,000 inhabitants, the city has more than 10,000 students. The local university plays an important role in academic life in the country. With its computer science, economics, and engineering faculties, it is a constant source of qualified young professionals.

Good Conditions for Qualified Employees

“We have had a very good experience throughout our time in Hungary,” says Jürgen Chrobak, Managing Director of Pepperl+Fuchs Hungary. “The surrounding conditions in Veszprém are excellent. The main thing is that we can rely on a very committed and loyal workforce.” Employees can help to shape their working environment and have the opportunity to provide suggestions for improvements. “One or two good suggestions are made almost every week,” says Chrobak. The labor turnover rate is at one percent, which could hardly be any lower, although the labor market in the western part of Hungary is almost empty. “We do a great deal to create good conditions for our 500 employees. We have clear and common objectives and offer a range of training and career development opportunities supported by the in-house Pepperl+Fuchs Academy.” ☒



Did you know that ...

... the small population of Hungary has produced a large number of inventions that are now used in everyday life around the world?

Here is a small selection:

In 1826, **Ányos Jedlik** invented soda water by artificially adding carbon dioxide.

In 1836, **János Irinyi** invented the safety match.

In 1938, **László József Bíró** patented the ballpoint pen, which in some languages, including English and Italian, is known as the "biro" after its inventor.

In 1947, **Dénes Gábor** developed the principle of holography. In 1971, he won the Nobel Prize for Physics for this discovery.

In 1976, **Ernő Rubik** invented the toy puzzle known as "Rubik's cube."

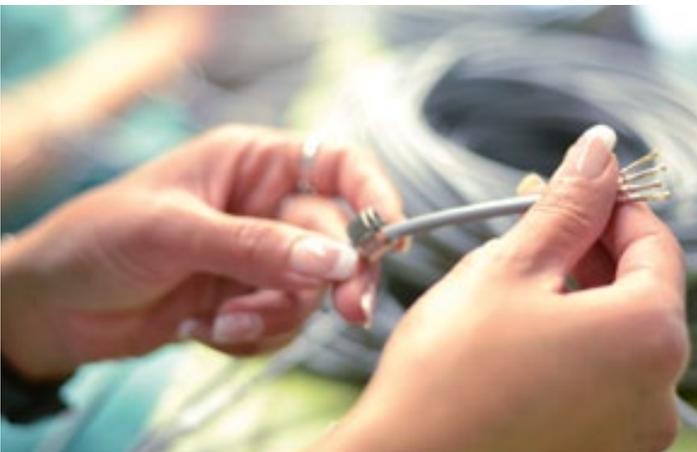
» Production began in Veszprém in 1997 manufacturing housings for the entire Pepperl+Fuchs Group. "You could say that we make the clothes for the sensors, as well as the wetsuits when needed," explains Jürgen Chrobak. A small percentage of the housings are made of metal and turned on CNC machines. However, the majority are made from plastic, which is how the site quickly became the center of injection molding technology within the company.

More Than Just Connectors and Cables

Connection technology was developed as the second pillar of the site in Veszprém and came from expertise in plastic processing. Although it sounds like a simple accessory, connection technology is actually a vital component of automation technology – after all, a single connection error can lead to the failure of an entire plant. "High-performance sensor technology requires equally high-performance connection technology," explains Chrobak. "That's why we have adapted both components to one another perfectly." Depending on the application, the connecting elements must fulfill widely varying and often very tough demands, including NAMUR certification, explosion protection, stability for mechanical loads, and resistance to aggressive substances or large fluctuations in temperature.

"We can meet all the requirements as we use only high-quality materials from certified European production and have zero-defect tolerance in the area of quality assurance," emphasizes Jürgen Chrobak. The gas-tight crimps provide robustness and tool-friendly knurled nuts enable the connection sockets to be mounted quickly and securely.

The warehouse in Veszprém is well stocked with raw materials, which allows matching cables and connectors to be delivered quickly. Around 360 deliveries are made each year to the Pepperl+Fuchs sites in Mannheim, the USA, and Singapore – many thousands of kilometers of raw cables are used each year. For most applications, standard cabling can be used. However, Pepperl+Fuchs offers customized solutions designed to meet special requirements. An in-house development department in Veszprém is working on new products, explains the managing director. "As a competence center for connectors and cable connectors, we want to be pioneers in our field when it comes to developing the most promising solutions for the future." ■



Fairs + Events



HANNOVER MESSE

April 13–17, 2015 // Hall 9, Booth D76 // Hanover, Germany

INTERPHEX

April 21–22, 2015 // Booth 3471 // New York City, New York, USA



Offshore Technology Conference

May 4–7, 2015 // Booth 8844 // Houston, Texas, USA

Africa Automation

May 5–7, 2015 // Booth e41-e45 // North Riding, Johannesburg, South Africa



O&M OFFSHORE EXPO 2015

June 2–3, 2015 // Fair C // Fredericia, Denmark

SEPEM Industries Sud-Est

June 2–4, 2015 // Avignon, France

Nor-shipping Oslo

June 2–5, 2015 // Hall B01, Booth 21 // Oslo, Norway

ACHEMA

June 15–19, 2015 // Hall 11.1, Booth A41 // Frankfurt/Main, Germany

Honeywell Users Group

June 21–26, 2015 // San Antonio, Texas, USA

The PROFIBUS & PROFINET Conference & Exhibition

June 23–24, 2015 // Stratford-upon-Avon, United Kingdom



Automaatio 15

October 6–8, 2015 // Helsinki, Finland

Emerson Exchange

October 12–16, 2015 // Denver, Colorado, USA



Offshore Europe

September 8–11, 2015 // Booth 3A.221 // Aberdeen, United Kingdom

Rockwell Automation Fair
November 18–19, 2015 // Chicago, Illinois, USA

SPS IPC Drives
November 24–26, 2015 // Hall 7A, Booth 330 // Nuremberg, Germany





Sensorik 4.0

Imprint

Publisher

Pepperl+Fuchs GmbH
Lilienthalstrasse 200
68307 Mannheim · Germany
Phone: +49-621-776-2222
E-mail: pa-info@pepperl-fuchs.com

Edition: 24,100

Year of publication: 2015

Part No.: EN 200214

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Design

ultrabold GmbH, www.ultrabold.com

Pictures

shutterstock.com

Printed by

ColorDruck Solutions GmbH
Gutenbergstrasse 4
69181 Leimen · Germany

www.pepperl-fuchs.com

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