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News for Factory 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.

Berry Picking at Its Best

The first fully automated strawberry harvesting robot can harvest an entire field of fruit independently.

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.

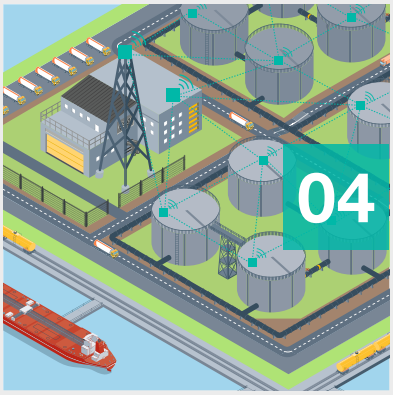
The topic of Industry 4.0 is high on the agenda in Europe. But what is the situation beyond the European continent? Three colleagues from China, Singapore, and the United States take a look at the international importance of this development in the US and Asia. Find out more on page 18.

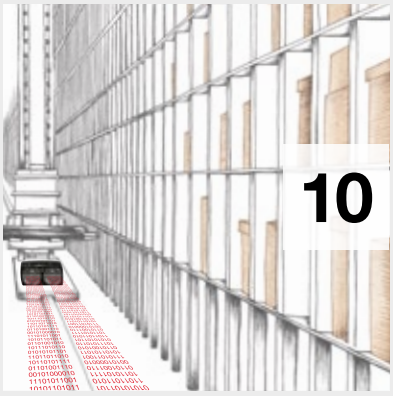
Intelligent sensor solutions are now being used to harvest strawberries. The first fully automated harvest robots are out in the fields – and just one robot can harvest an entire field of fruit. Discover what role sensor technology plays in this process on page 13.

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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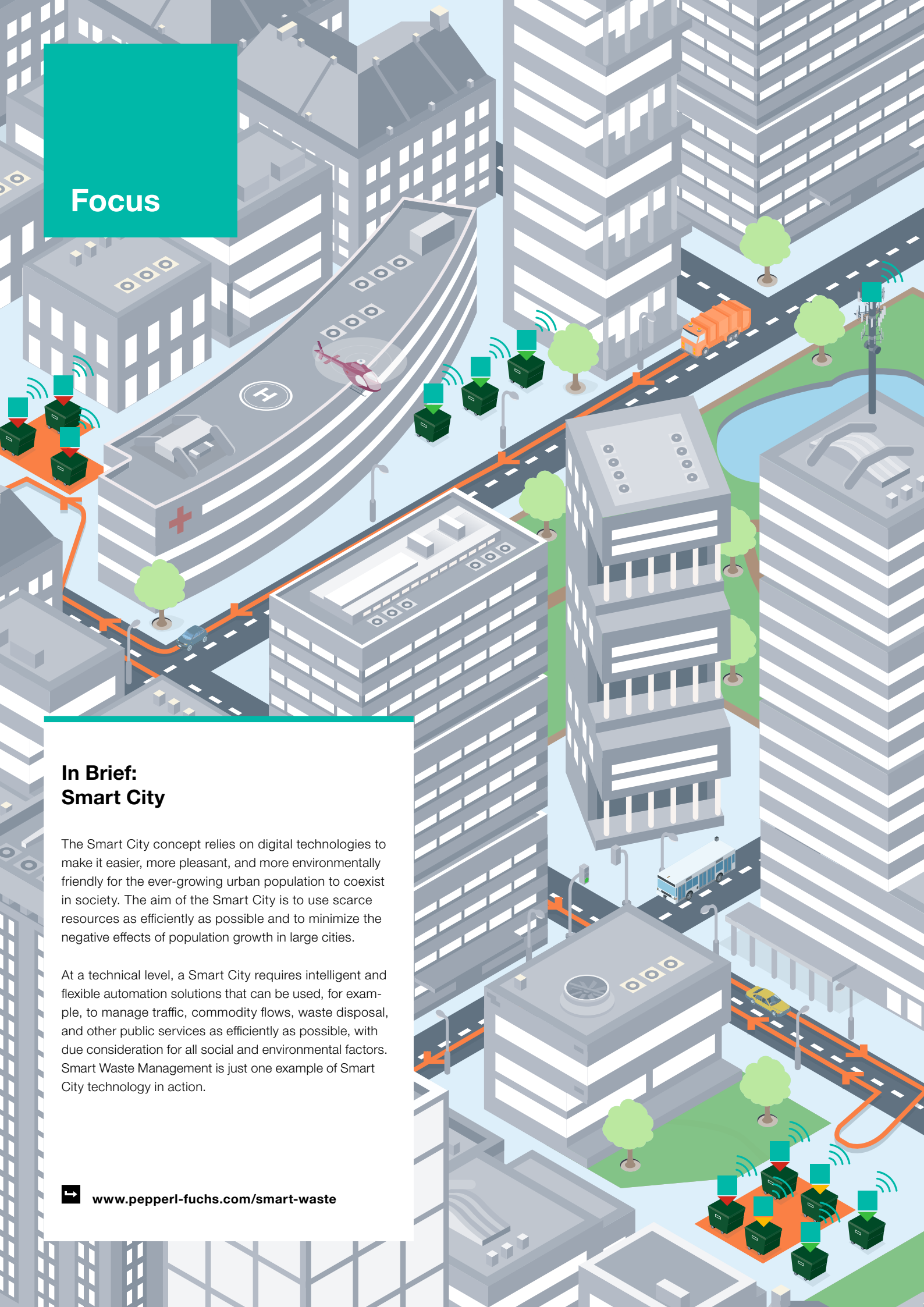
Focus



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.

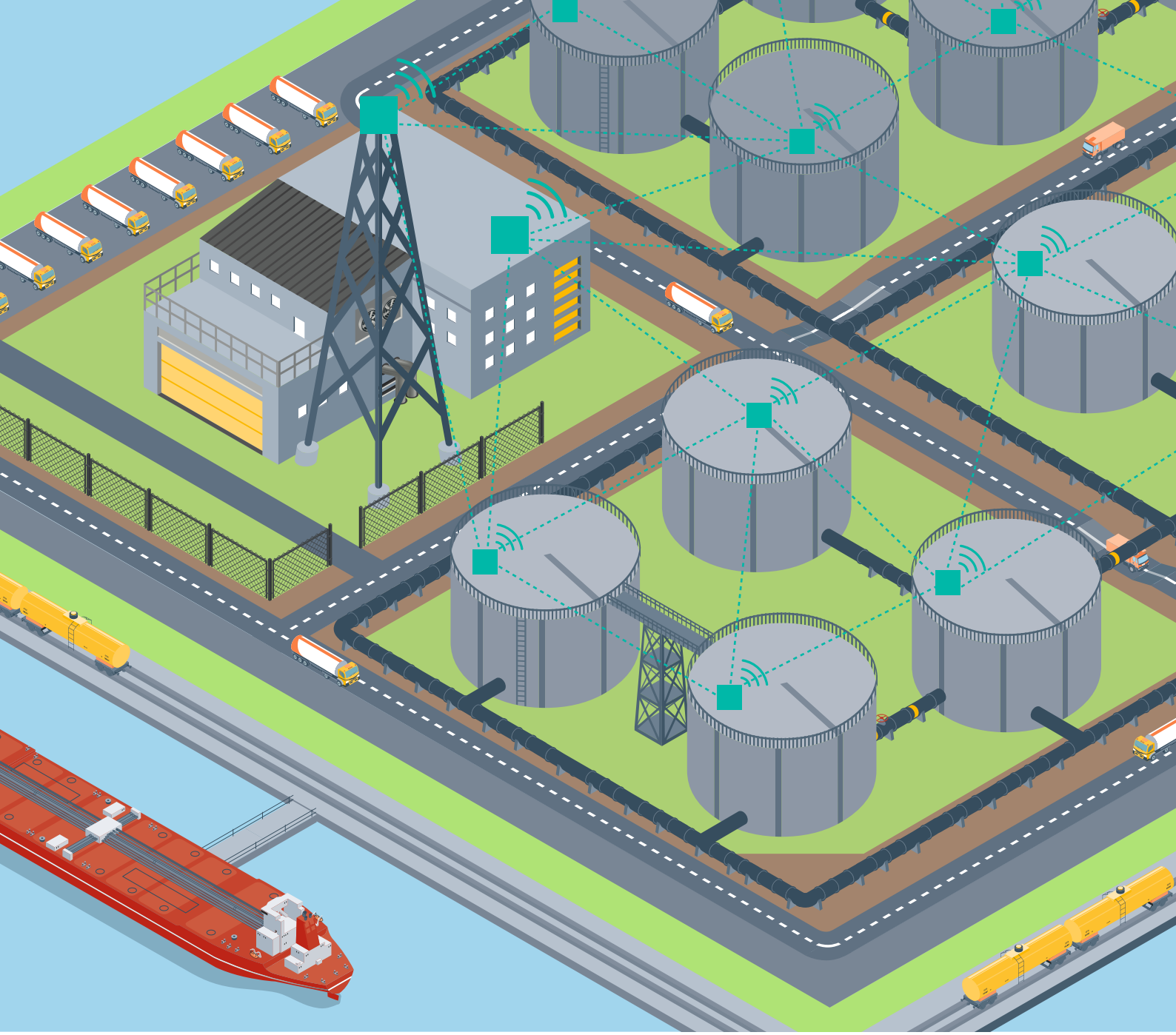
www.pepperl-fuchs.com/smart-waste

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.

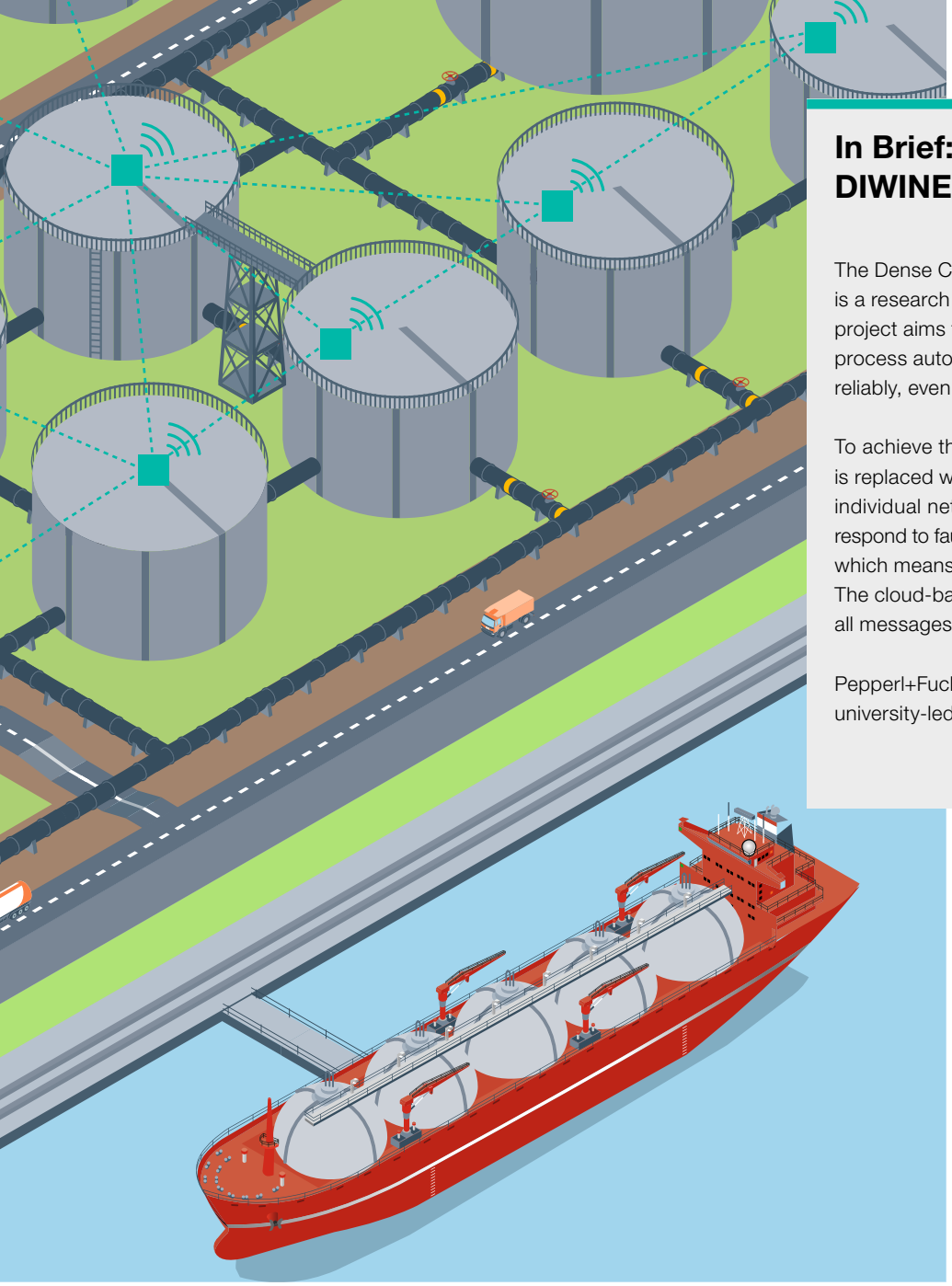
A fill level measurement device is integrated into the lid of every garbage container. This device needs to be extremely robust, and capable of detecting the fill level of the container regardless of what has been deposited inside. It also needs to transmit data on a regular basis. Because absolute reliability 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 *Wireless*HART, 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 multicast 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." ■

Faster, Higher, Farther

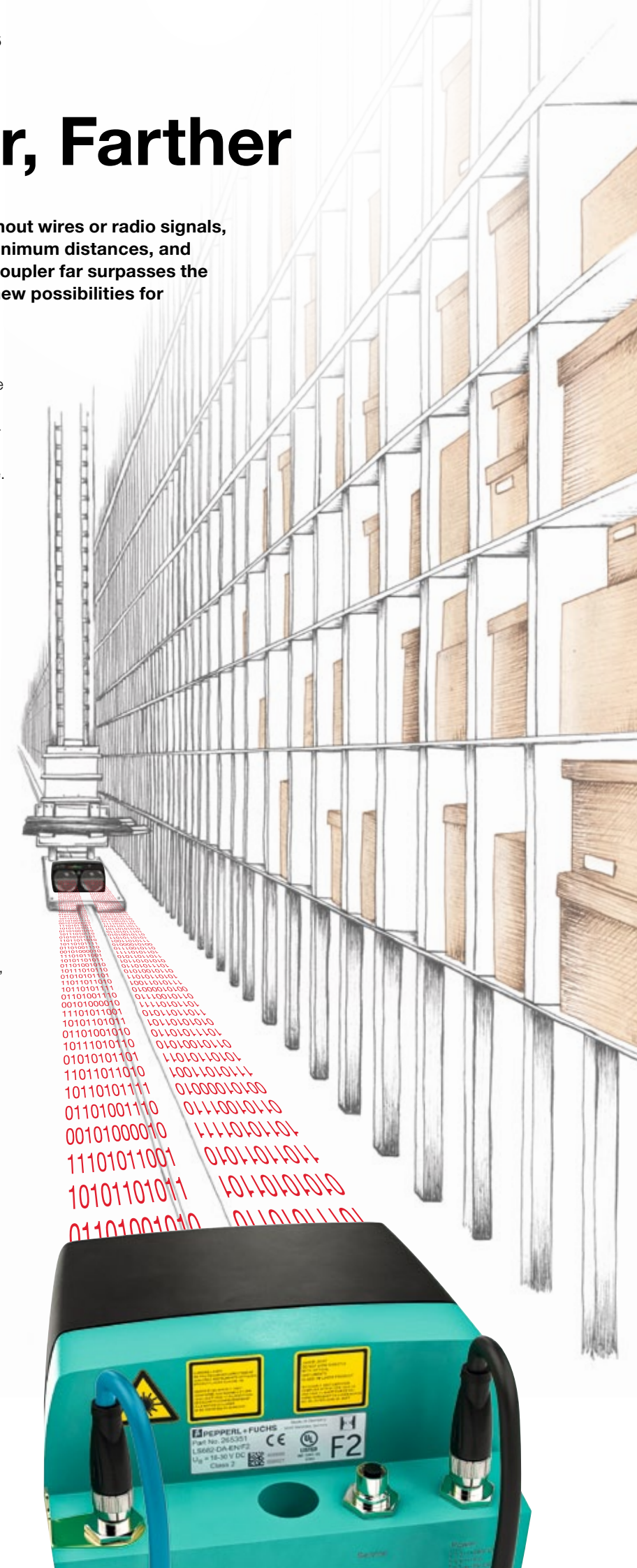
Photoelectric Sensors **Able to transfer data without wires or radio signals, across distances of up to 300 meters, without minimum distances, and at speeds of 100 Mbit/s: The LS682 optical data coupler far surpasses the performance of its competitors – and opens up new possibilities for high-bay warehouses.**

With its large detection range of up to 300 meters, the device gives planners and operators in high-bay warehouses unprecedented levels of freedom. The LED display on the transmitter indicates the received signal strength – an important feature given the distances at which this device can operate. This design allows the user to quickly and optimally align the optical data coupler. Since configuration is not necessary, commissioning is simpler.

Transfer without Restrictions

This product family has always been synonymous with innovation. The predecessor model, the LS680, was the first optical data coupler to achieve a transfer rate of 100 Mbit/s, earning the device several international awards. The LS682 works at the same fast transfer rate. Telegrams are not saved, so transfers take place without delay and the LS682 can send and receive large amounts of data over long distances in real time. The data transfer rate remains constant at any distance, which means that video data from cameras on the control panel can be used directly – for example for remote maintenance and diagnostics with visual support, or for system documentation. The bidirectional communication works independently of any protocol and can be integrated into any application, including industrial Ethernet topologies such as PROFINET, EtherNet/IP, EtherCAT, or Powerlink. The LS682 optical data coupler provides the ideal data transfer technology for high-bay warehouses, moving carriages, lifting stations, and gantry cranes. ■

www.pepperl-fuchs.com/data-coupler



Linear Diversity

Rotary Encoders **The new cable pull rotary encoders from Pepperl+Fuchs are available in different variants with a range of electrical interfaces. Robust magnetic rotary encoders ensure reliable measurement results.**

www.pepperl-fuchs.com/cable-pull

Cable pull rotary encoders are ideal for measuring the lift height of scissor lift tables and elevators, or telescopic length for crane vehicles. In most cases, optical measurement systems are not considered for such applications due to dust, vibration, or other interference factors. By combining a cable pull and rotary encoder, linear movements are recorded both dynamically and accurately.

The new cable pulls from Pepperl+Fuchs are based on a modular product architecture and offer a wide variety of equipment and application options. Brushes or compressed air attachments remove dirt easily. Guide pulleys can be used to move around obstacles and measure objects that change direction. The length range of the measuring cable spans 1 m to 60 m, making the devices suitable for a wide range of applications. Versions are available with various surface coatings and in a range of models – from space-saving designs and lightweight plastic variants through to robust heavy-duty versions.

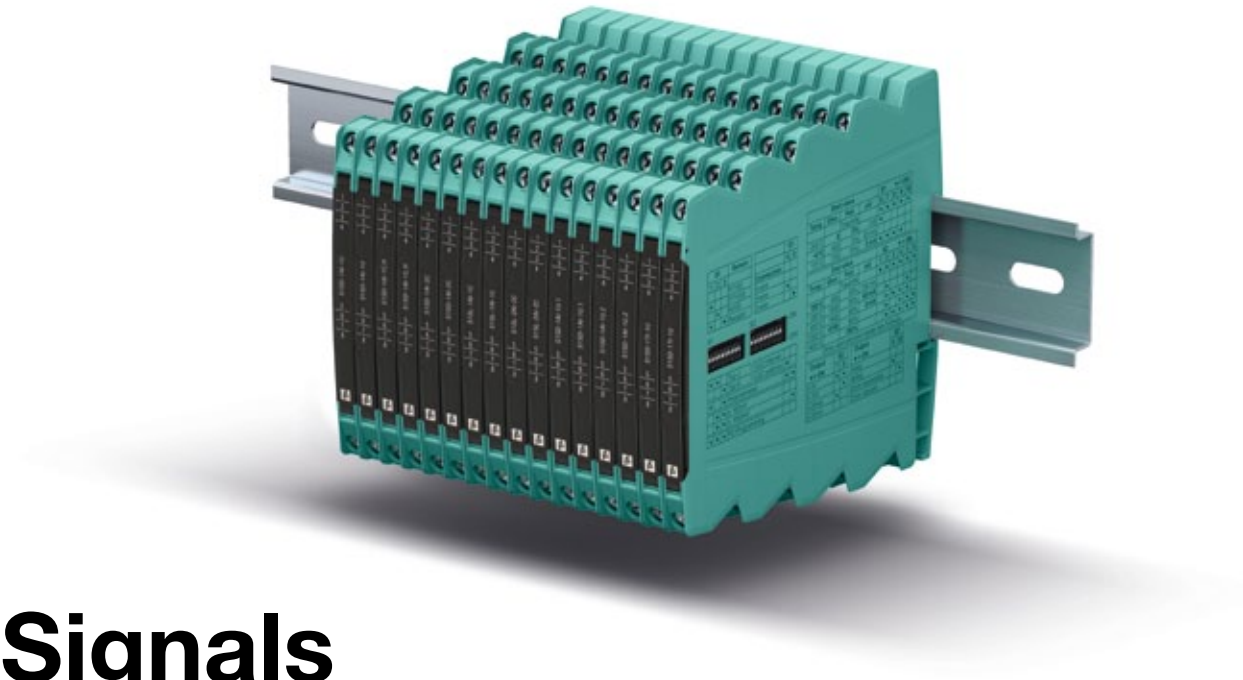
This is yet another application of the new magnetic rotary encoders: Mounted on the cable pull, the compact rotary encoders deliver reliable measurement results, even in difficult conditions involving dirt, shock, or vibration. ■

Integrative Housing Design

The ENA58IL series magnetic rotary encoders are now also available with PROFINET, EtherCAT, and PROFIBUS interfaces, and can be used flexibly in machine and plant engineering. The unique new compact housing design integrates all base and interface electronics – no connection or bus cover needed. Three M12 connectors attached to the housing axially are used for connection purposes.

The Ethernet versions can be connected to the control system via plug-and-play. The rotary encoders configure themselves automatically via the control system – no manual adjustment is required. For rotary encoders with a PROFIBUS interface, the bus address and baud rate can be easily adjusted using two rotary switches, also located on the rear of the housing. Diagnostic LEDs further simplify bus installation: In the event of any bus connection faults, the cause of the fault can be traced quickly. ■

www.pepperl-fuchs.com/magnetic



Clear Signals Are Crucial

Interface Technology **Interference in the signal path between the field device and control system can distort signals and cause processes to be controlled incorrectly. This can cause a risk to personnel and system components. SC-System signal conditioners ensure that the signal transmission between the field and control level is reliable and provide effective protection for personnel and controllers.**

Dangerous interference can interrupt a signal path if there is an isolation problem in mains-connected devices, such as pumps, motors, or fans. High voltages in the signal circuit can endanger operating personnel and the controller if no suitable protective devices are present. Signal conditioners provide protection against contact and prevent systems from being damaged. They offer a suitable solution for ensuring that processes run at an optimal level and for eliminating faults caused by measurement errors. Using galvanic isolation, they enable seamless communication between the field devices and control system in any area where the measurement and control signal transmission process is at risk of interference. In automation systems, signal conditioning should always be a key consideration. This applies across all sectors – from power generation and the paper and pulp industry, to the steel industry, water and wastewater treatment plants, the food industry, or the cement industry.

Reliable and Compact

The new SC-System signal conditioners use high-quality galvanic isolation to prevent transmission and control errors between the field and control level. High working voltages and test voltages (300 V and 3 kV) protect systems from damage caused by dangerous overvoltages. At just 6 mm wide and 97 mm high, their compact design reduces the space required for the modules in the switch cabinet to a minimum and allows them to fit between narrow-seated cable ducts. The single- and dual-channel signal conditioners are available in several versions with different functions, ranging from transmitter power supplies to repeaters and signal converters. They offer excellent flexibility with their extended temperature range of -25 °C to +70 °C. ■

www.pepperl-fuchs.com/scsystem

In Brief: Signal Conditioners

Signal conditioners are interface components between the field and control level. They provide galvanic isolation between the two signal circuits. Unlike isolated barriers, signal conditioners are used only in areas without an explosive atmosphere. Signal conditioners protect the control side against interference, such as that caused by equalizing currents in ground loops, permitting seamless communication between the field level and the process control system.

Berry Picking at Its Best

With their sweet taste, strawberries stand out as one of the world's most popular fruits. Around five million metric tons are harvested every year, and this figure continues to rise. With the automatic harvesting robot AGROBOT, a single harvest worker can pick the fruits of an entire strawberry field, all while sitting comfortably. A set of Pepperl+Fuchs sensors helps steer the machine through crop rows, control the robotic arms that pick the berries, and convey the berries to the packaging area.

A Delicate Fruit

This little red fruit is delicate in more ways than one. Unlike apples and bananas, there is no after-ripening with strawberries, meaning they can only be picked once they are already red and soft. At this point, however, even the smallest amount of squeezing will induce a decaying process that destroys the berry before it arrives on the supermarket shelf.

Until very recently, it seemed impossible to automate the painstaking work of picking, so strawberry harvesting remained exclusively manual. Then along came AGROBOT S.L., a manufacturer of innovative agricultural robots based in the Andalusian town of Huelva. Since southern Spain is a hub of large-scale strawberry farming, AGROBOT's engineers had the problem right in front of them, and they devised the solution to it by developing the automatic harvester AGROBOT SW 6010.

Single-handed Operation

In order to protect berries from squeezing or falls, they are cut from their stems by two thin, razor-sharp blades and immediately caught in a tiny basket lined with rubber rolls. The basket then places the fruit on a conveyor belt leading to the packaging area. "Sitting at two ergonomic workstations, operators can immediately select and pack the fruit into trays – the only manual operations necessary," explains AGROBOT's Managing Director Juan Bravo.

There is space for two farm workers on the machine, though it can also be run by one person alone, since everything apart from the selecting and packing is done automatically. Robotic arms whose movements are directed by sensor technology from Pepperl+Fuchs control the interactions of blades and baskets with the berries. A camera-based vision system analyses each fruit individually, checking form and color, and then orders the precise cutting movements when a ripe berry is found.

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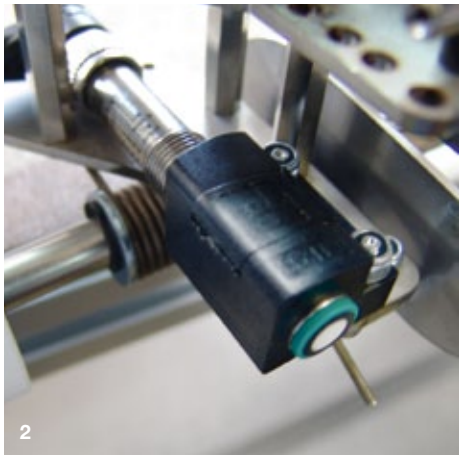
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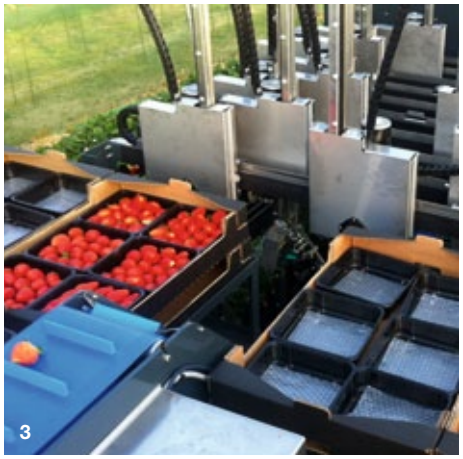
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Sensors for All Working Conditions

Movements of the robotic arms and the machine itself are controlled by a set of Pepperl+Fuchs devices. Each arm is equipped with two inductive sensors to stop at end positions. An ultrasonic sensor prevents the arm from touching the ground. “Before that, mechanical end-position switches were tested, but failed due to a lot of switching operations which leads to wear,” explains Managing Director Juan Bravo. “Contact-free inductive sensors were therefore the ideal solution, since they suffer no mechanical attrition at all,” he adds. Also, the collision control system has to cope with dirt and dust, changing temperatures, vibration, and shock. It needs to keep the robotic arms from touching the ground and being damaged. “Reliable ultrasonic technology proved to be the best solution here, using a robust ultrasonic sensor series UB400-12GM,” says José Antonio Amil, Sales Engineer at Pepperl+Fuchs Spain.

Additional ultrasonic sensors are exposed to the same external impacts while helping steer the harvesting machine automatically. Each wheel is equipped with the ultrasonic sensor which continually detects the distance between the wheel and the strawberry field row, keeping the vehicle on track and avoiding damage to the fruits. Signals are sent to the automatic steering system from the sensors to regulate the steering position of the wheels continuously and exactly. The steering shaft position is controlled by the inductive angular measuring system PMI360DV-F130 series. This enables perfect end-of-row maneuvers, whether the ride is bumpy or smooth. ■

1) The harvesting robot drives through the strawberry bed rows and collects the berries, checking their form and degree of ripeness.
2) Ultrasonic sensors protect the robotic arm from damage by maintaining a safe distance from the bumpy ground.
3) The conveyor belt brings the automatically picked fruits down from the robotic arm up to the packaging area, where a farm worker places the fruit into the trays.
4) The inductive angular measuring system measures the absolute angular position and corrects the steering angle of the wheels.

AGROBOT SW 6010

www.youtube.com

The AGROBOT SW 6010 is the first fully automated strawberry harvester. Its navigation system integrates guidance and automatic operation capabilities, providing fully independent control of the machine’s main functions. Ultrasonic and inductive sensors from Pepperl+Fuchs provide the signals for navigation and maneuvering as well as for articulation of the robotic arms doing the actual harvesting.

Watch the AGROBOT SW 6010 working its way through rows of strawberry beds:

Collision Protection at Tropical Temperatures

Humid, warm air helps plants to thrive – so greenhouses play a major role in cooler cultivation regions. Dutch company De Vette CV specializes in aluminum and steel construction and machinery for horticulture applications, as well as producing custom greenhouse solutions.

Tropical temperatures and humid air: For most plants, greenhouses are an ideal environment for rapid growth. But the plants are not the only living things that feel at home in this environment – heat and moisture also attract pests. In the fight against greenhouse pests, many companies are now increasingly deploying natural enemies of their unwanted guests, and opting for biological pest control provided by parasitic wasps, predatory mites, or nematodes.

Automated Spreader

While small businesses or private growers can apply pest controllers manually, large companies require machinery to apply the natural enemies to the plants correctly and in a structured, systematic way. For this purpose, De Vette CV developed an automated spreader specifically for greenhouses. Growers can install this suspended, space-saving solution under the greenhouse roof.
The ingenious spreader ensures that the pest controllers are applied in the required quantities and at the correct distance from the plants for maximum effect. The control agents are fed into the system via a metal pipe and spread over the plants through fans attached to a movable arm. In the Netherlands, this automated solution is used in horticultural applications such as chrysanthemum cultivation.

Reliable Collision Protection

The suspended system moves along the heating pipes under the greenhouse roof. “Our challenge was to produce a system that would stop automatically – both at a sufficient distance from the glass facade at the end of the greenhouse and far enough away from a metal reflector plate when the spreader changes direction,” said Marco Groot, Sales Advisor at De Vette CV.

The solution: ultrasonic sensors from Pepperl+Fuchs, fitted on both sides of the hanging arm of the system. The ultrasonic sensors work reliably even in the humid, dirty, and dusty environment of the greenhouse because they are insensitive to external environmental influences. They have no problems detecting the glass facade of the greenhouse or the metal of the reflector plate, and offer reliable collision protection.

Ultrasonic sensors mounted on either side of the arm ensure reliable collision protection in the greenhouse.

“We are very pleased with this solution and are currently investigating other ways we could integrate ultrasonic sensors from Pepperl+Fuchs into our products to generate added value for our customers,” says Marco Groot.
In contrast to a mechanical solution, the compact ultrasonic sensors have the advantage that their switching points can be reproduced consistently. The protection class IP67 ensures reliable operation in this humid environment and allows the sensors to be mounted in close vicinity of the greenhouse’s irrigation system. Another plus point: Because of the compact design of the sensors, you can mount it in a space-saving flat position – ideal for applications where installation real estate is tight. ■

Did you know that ...

... biological pest control processes rely purely on natural substances and natural enemies of damaging organisms to control pests? The advantage of this method lies in controlled, selective intervention: Usually, only the damaging pests are reduced in number, while useful organisms remain unaffected. The pest controllers released into the environment parasitize the target organisms and survive only while their hosts are still present – so careful biological pest control presents very little risk to humans or nature.

www.pepperl-fuchs.com/ultrasonic-sensors

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, Pepperl+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: *Wireless*HART 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. ■

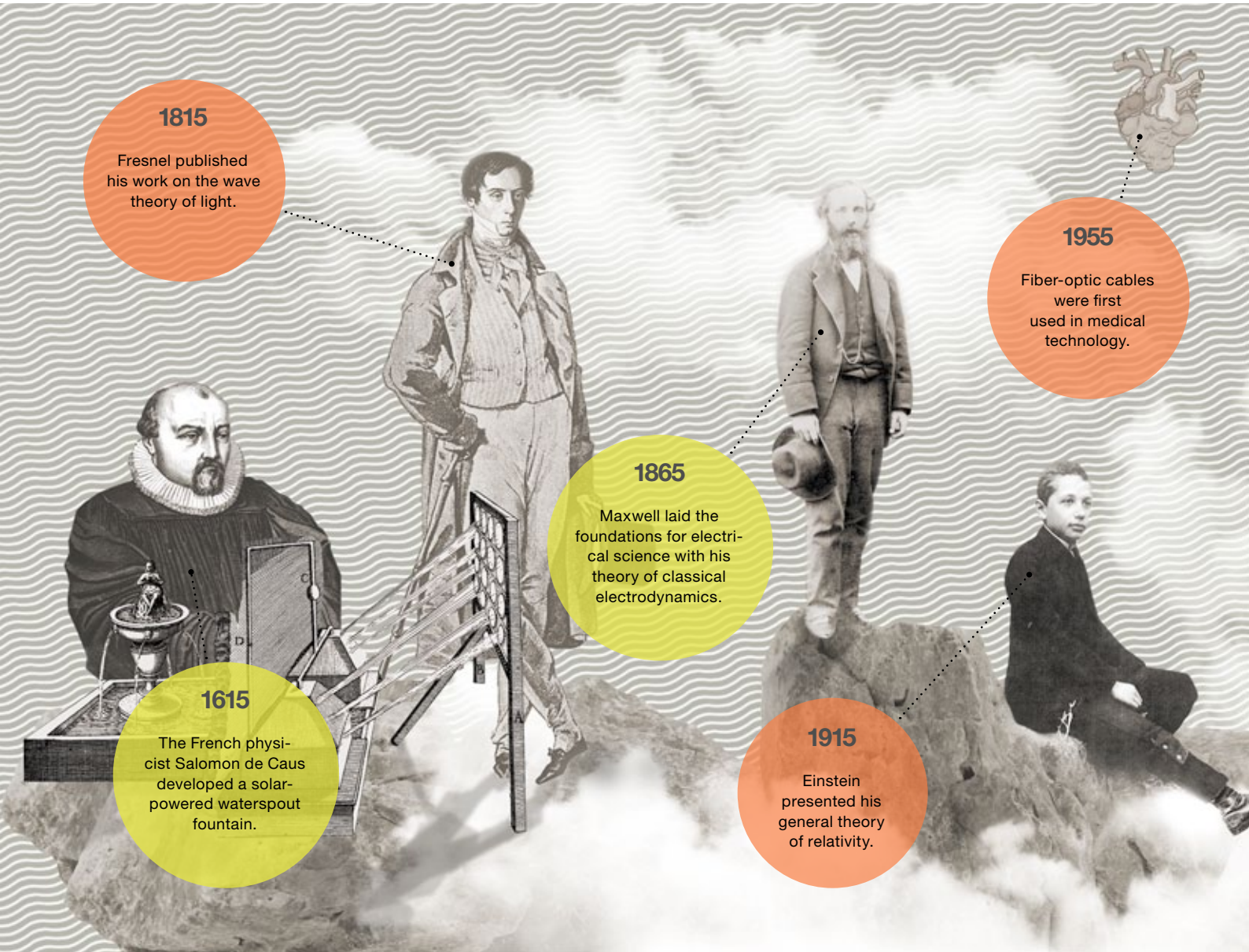
"Remote access to devices for maintenance and diagnostics is basically accepted and will likely spread quickly."

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.



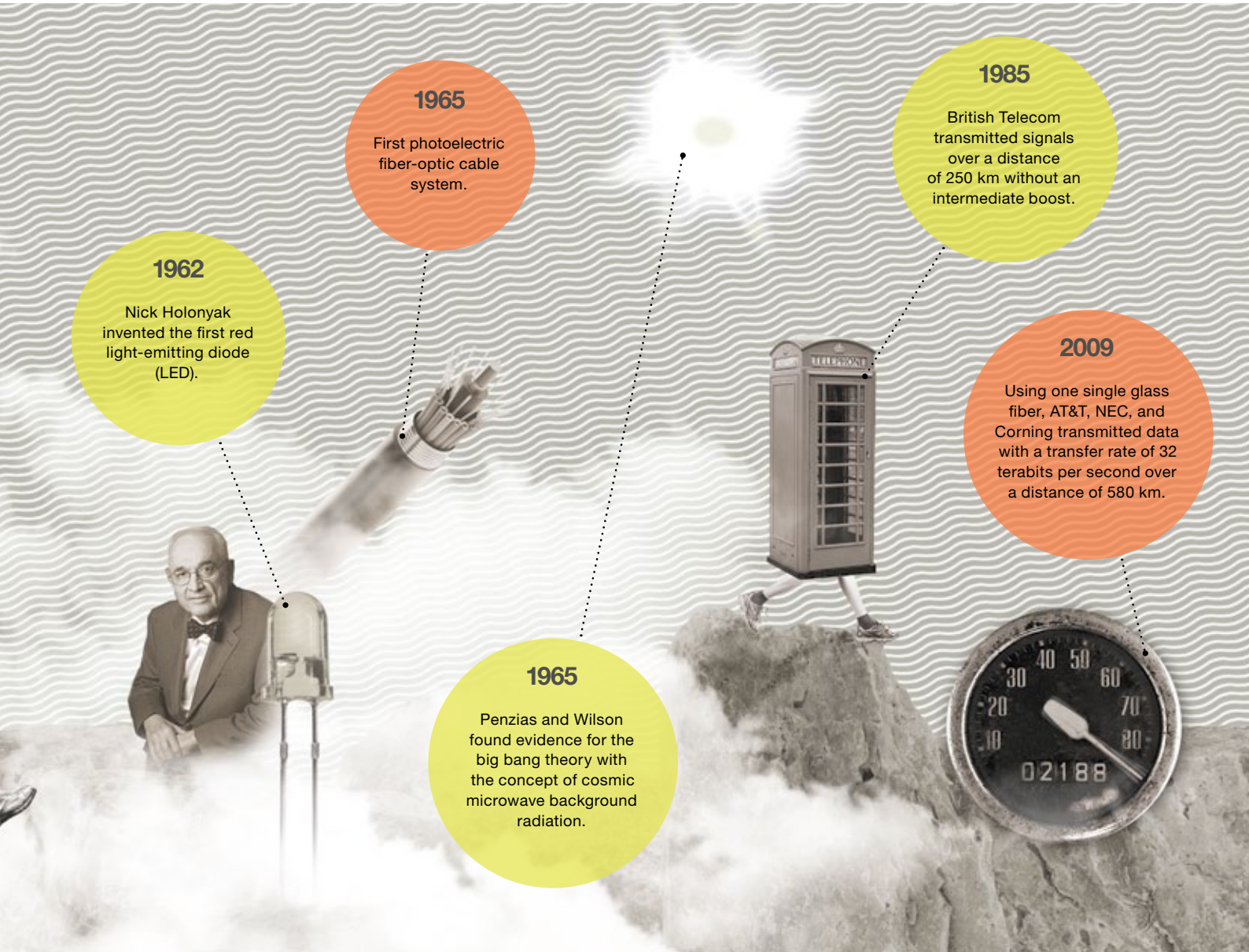
The Science of Light Affects Many Areas

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. ■



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

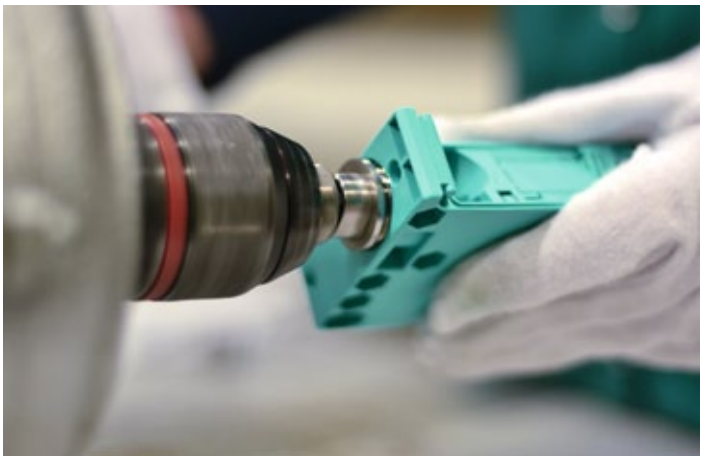
Capital	Budapest	***Head of government***	Prime Minister Viktor Orbán
Area	93,036 km²	***GDP***	132.26 billion US$ (2013)
Population	9.91 million (2014)	***National anthem***	God bless the Hungarians
Form of government	Parliamentary republic	***Internet TLD***	.hu
Head of State	President János Áder	***Country 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:

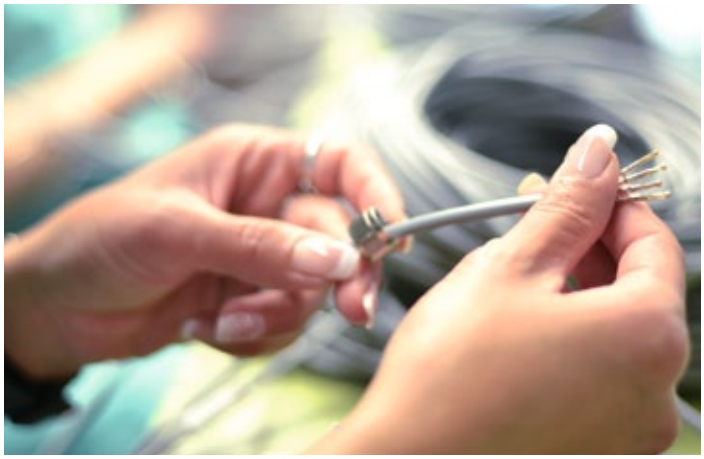
In 1826, ***Ányos Jedlik*** invented soda water by artificially adding carbon dioxide.

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

04 April

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

05 May

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

Indumation.be
May 6–8, 2015
Hall 1-A15-4 // Kortrijk, Belgium

SPS IPC Drives ITALIA
May 12–14, 2015
Parma, Italy

SMART Automation Austria
May 19–21, 2015
Booth 224 // Linz, Austria

06 June

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

09 September

IEAS Bucharest
September 8–11, 2015
Bucharest, Romania

10 October

Teknologia 2015
October 6–8, 2015
Helsinki, Finland

11 November

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

www.pepperl-fuchs.com/events

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