PEPPERL+FUCHS

News for Factory Automation

1/2014

A Finger on the Pulse of Automation

Delivering unique development and application expertise, Pepperl+Fuchs has brought ultrasonic sensor technology to another level.

Intelligent Bridge to the Future

Industry 4.0 has until now been more of a concept than a reality. An adapter called SmartBridge shows where the journey could lead.

Salty Surroundings, Powerful Sensor

The F31K2 provides Frisia Zout with reliable feedback on valve positions and optimum plant availability.

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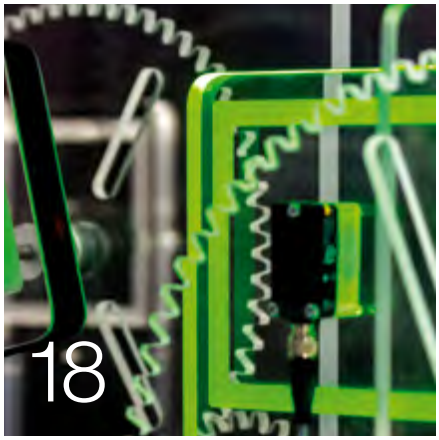

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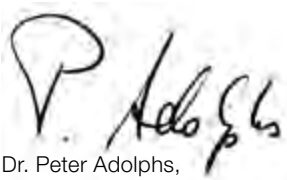
www.youtube.com/PepperlFuchsGmbH

Dear Reader,

Industry 4.0 has until now been more of a concept than a reality. We are only at the beginning of an evolutionary process that is already much more advanced in other sectors. It will probably not be long before networked and GPS-enabled smartphones are controlling entire streams of traffic as cyber physical systems, exchanging data on travel destinations, and ensuring efficient use of road space. But what does this mean for automation technology? In this context, Industry 4.0 means converting large production units and entire companies into networks. This task is far more complex, and more time is required as a result.
In introducing “SmartBridge,” we have taken the first step toward Industry 4.0. What’s behind this term, and the challenges and prospects that Industry 4.0 currently poses for our industry, can be found from page 18 onward.

Take a look behind the scenes at Pepperl+Fuchs’ ultrasonic sensors development center. In our cover story, find out more about our unique vertical integration strategy and how the latest application solutions in ultrasonic technology are developing. After all, ultrasonic sensors have come a long way.

Happy reading,



Dr. Peter Adolphs,
Managing Director of Development & Marketing

We look forward to receiving your feedback on this issue. Please e-mail any comments to: **newsletter@pepperl-fuchs.com**

Focus

A Finger on the Pulse of Automation

Ultrasonic sensors are no longer regarded as special solutions. Today, this technology is commonly used in all kinds of applications. With unique development expertise and vertical integration in ultrasonic sensor technology, Pepperl+Fuchs is working on the application solutions of today and tomorrow.

The men hold their breath, the captain whispers commands, and aside from the quiet hum of the throttled machine, the only sound is the regular “ping” of the sonar. No movie set on a submarine is complete without this scene. The suspense-filled noise comes from a transducer that emits sounds and receives their echoes to locate a dangerous reef or lurking enemy ship. Ultrasonic sensors in automation technology operate according to the same principle. The pings are not perceptible to the human ear in this case. However, these sounds provide a very reliable signal under practically all conditions. As the market and technology leader, Pepperl+Fuchs is developing cutting-edge ultrasonic sensor technology – and that is (almost) as exciting as a submarine-based thriller.

The Core Element

Ultrasonic sensors are based on the principle of runtime measurement: the sensor emits a short acoustic pulse that is reflected by an object or a surface before being detected again. The speed of the sound is known, making it possible to calculate the distance from the time interval between the emitted signal and the received echo.
The sound comes from the core of the sound transducer, a piezoceramic element. The ceramic element is deformed by a current surge and uses this mechanical pulse to create sound waves. When the echo returns, the same sequence of events takes place in reverse order: the sound pressure is applied to the ceramics and this converts the mechanical energy into an electrical signal.

It Is All in the Components

While piezoceramic material is very hard, the sound waves disperse in a very soft medium: the air. “There is a large leap in impedance between ceramic and air, meaning there is a big difference in resistance, as the material resists the sound wave. To allow the sound to disperse as required, an adaptation layer is needed for transfer,” says Karl-Heinz Dausch, who is responsible for the development of the ultrasonic transducer at Pepperl+Fuchs. This layer of hollow glass beads and epoxy resin has a major influence on the operation of the transducer.

Unique Vertical Integration

“In contrast to other providers, we don’t buy ultrasonic transducers, but rather produce them ourselves. We even produce the material for the decoupling layer,” says Franz-Josef Heimerl, Head of Ultrasonic Product Management. The shape and material of the decoupling layer are optimized in such a way that they guarantee the best possible transition of the ultrasonic signal into the surrounding air. An additional metal ring on the back of the decoupling layer can focus and strengthen the emitted sound. The sound cone – the area in which the sensor detects objects – can be made narrower and longer. In addition to the ceramics, decoupling layer, and metal ring, there is synthetic foam, which resides between the actual transducer and the housing. This foam holds the components in place, prevents unwanted noise transmission into the housing, and dampens the transducer movement after an evaluation pulse has been sent. This foam is also developed and manufactured in-house at Pepperl+Fuchs. Electronics and software tuned specifically for the ultrasonic transducer ultimately ensure precise signal evaluation with a minimized blind zone.

Development Close to Production in the Technical Center

“As is often the case in automation technology, quality, function, and lasting reliability depend on the smooth interaction of many different details,” says Karl-Heinz Dausch. The quality and size of the hollow glass beads play an equally important role to the damping properties of the synthetic foam. At the ultrasonic sensors development center at Pepperl+Fuchs, all variants can be manufactured and tested in a highly practical way.

Series production is also prepared during this process; such production has been taking place at Pepperl+Fuchs in Singapore for 20 years. The in-house test facilities mean that virtually all conditions that the sensors are exposed to can be reproduced. These include air conditioning units, a shielded EMC chamber (EMC = electromagnetic compatibility), and a vacuum cabinet that simulates locations up to 2,000 meters above sea level.

A view behind the scenes in the ultrasonic technical center at Pepperl+Fuchs. The core elements of the ultrasonic sensors are developed here.

Suitable for Universal Use

The latest development from the ultrasonic experts in Amberg and Mannheim, Germany, is an ultrasonic transducer covered with a stainless-steel membrane. This device represents the first ever fully sealed sensor for distance measurement that is ideal for particularly critical washdown and food processing applications.
“Ultrasonic sensor technology has come a long way. Previously, ultrasonic sensors were used mostly in dirty and dusty environments. Today, this technology is commonly used in all kinds of applications,” says Franz-Josef Heimerl. Ultrasonic technology has now proven itself in many areas. In manufacturing automation, its indifference to color and material variability opens up new possibilities for solutions. The same applies for intralogistics and warehouse logistics, or the food and beverage industry. Franz-Josef Heimerl emphasizes: “When it comes to measuring distance, it is always worth considering the option of using ultrasonic sensor technology. Very often, the particular strengths of this technology offer unbeatable benefits for the process as a whole.” ■

The Ultrasonic Technology Guide Is Now Available for Download

How does an ultrasonic sensor work? And how can it help to optimize your application? The technology guide provides the answers to these and many other questions on the topic of ultrasonic sensor technology, presented in a clear and attractive way. Get your hands on the compendium as a free download:

www.pepperl-fuchs.com/technology-guide

Small Details for Major Benefits

An interview on ultrasonic sensor technology with Franz-Josef Heimerl, Karl-Heinz Dausch, and Dr. Till Steiner.

Franz-Josef Heimerl,
Head of Product Management
Ultrasonic Sensors

Karl-Heinz Dausch,
Head of Development
Ultrasonic Sensors

Dr. Till Steiner,
Head of Technology & Innovation
Development Ultrasonic Sensors

What are the origins of ultrasonic technology?
Franz-Josef Heimerl: Thirty years ago, ultrasonic technology was used in industries such as wastewater treatment and mining. The sensors used in these settings offer strong resistance to dirt, dust, moisture, and mechanical influences. The devices also need to detect a very wide range of materials. Ultrasonic sensors meet these requirements purely because of their physical design, which makes them extremely robust and virtually maintenance-free. Ultrasonic sensors are therefore an extremely cost-effective solution for most measurement tasks.

What actually makes ultrasonic sensor technology so robust?
Dr. Till Steiner: First, this technology is virtually insensitive to dirt and contamination. Sound is emitted even if dust or other impurities rest on the sensor surface. The vibration of the sound-producing membrane creates a self-cleaning effect and prevents impurities from sticking. Second, the color or material of the object to be detected has no effect on the reflected echo.

Is ultrasound primarily a solution for difficult conditions?
Karl-Heinz Dausch: Ultrasonic sensors are ideal for particularly tough environments and in many cases present the only possible solution for these applications. However, they are just as good for virtually all other areas of industry, such as production engineering and logistics, filling and packaging lines, or warehousing and intralogistics. I am certain the benefits of ultrasonic technology are becoming increasingly well-known and the technology will be used more and more widely. In industrial measuring and control technology, there is virtually no other measuring type that offers more universal use.

What position does Pepperl+Fuchs hold in the field of ultrasonic sensors?
Franz-Josef Heimerl: In the field of industrial application, we are the clear global market leader. We have been heavily involved in developing the technology from the very beginning. In 2010, Pepperl+Fuchs took over the proximity switch division from Siemens, which includes ultrasonic sensors. The two development departments at our headquarters in Mannheim and the former Siemens location in Amberg, Germany, remain fully intact. In other words, today we are building on thirty years of expertise in ultrasonic technology gained by both sides and have a team of experts like no other in the world.

What does that mean for your customers?
Dr. Till Steiner: Customers benefit from our extensive application and development experience. For example, we offer a decoupling layer with a completely smooth exterior. This makes the sensor surface highly resistant to contamination. At first glance this may be a small detail, but in practice it offers major benefits. We are the only industrial ultrasonic manufacturer to develop and produce the transducer element ourselves.

Why is that important?
Karl-Heinz Dausch: The decoupling layer is a key element, which, among other things, determines the quality of the sensor. The epoxy resin and hollow glass bead mixture could be purchased separately, but the material properties have a significant influence on the quality of the ultrasonic signal. For this reason, we develop and produce these raw materials in-house and continually adapt them to new applications and the specific needs of our customers. This allows us to offer high-quality solutions for a wide range of applications. Anyone looking for expertise in ultrasonic sensor technology will find it at Pepperl+Fuchs. ■

Safety for Man and Material

Ultrasonic Sensors **The high-precision VariKont L2 ultrasonic sensor makes the use of forklift trucks, mobile cranes, and lifting platforms safer, more precise, and more efficient. In logistics, construction, and industry, the device has become almost indispensable.**

The small, robust sensor is primarily designed for outdoor use and is immune to rain, fog, temperature fluctuations, and very low temperatures such as you might find in a cold storage freezer. Installed on the front of a forklift truck, the VariKont L2 ultrasonic sensor checks whether a pallet is located on the fork and whether the fork is fully inserted within the pallet. The ultrasonic sensor detects virtually any material, be it metal, paint, wood, or plastic film. The benefit here is that the pallet remains continuously under control. The ultrasonic sensor also regulates the forklift speed, helping increase operational safety. If the mast is extended and carrying a pallet, the ultrasonic sensor limits the forklift movement to a slow speed. If the mast is extended but not carrying anything, the ultrasonic sensor allows a faster speed for more efficient operation.

The compact VariKont L2 can easily be installed on the lifting fork.

To avoid collisions, ultrasonic sensors are installed beneath the work platform.

When used with mobile lifting platforms, the VariKont L2 ensures a greater level of safety. To achieve this, several sensors must be mounted around the machine and below the work platform. The ultrasonic sensors detect obstacles in the operating range; the lifting platform is then switched to slow speed or stopped completely. This eliminates the possibility of collisions with excavators, cranes, walls, and building materials, reliably preventing accidents at work and costly property damage. ■

Magnetic Precision in Robotics

The new ENA58IL magnetic rotary encoder brings robustness and accuracy together in a compact design while ensuring reliability in the production process.

Rotary Encoders **Industrial robots need to operate with a high degree of precision, often under tough conditions. The new magnetic rotary encoders from Pepperl+Fuchs are ideal in this environment: they monitor the position and speed of robot arms at a precision of 0.1° while being extremely robust and compact.**

Industrial robots are a familiar part of everyday life in manufacturing and logistics. They assemble circuit boards, load goods onto pallets, operate lasers, weld and cut metal, and lift parts weighing tons. These applications require a high degree of accuracy.

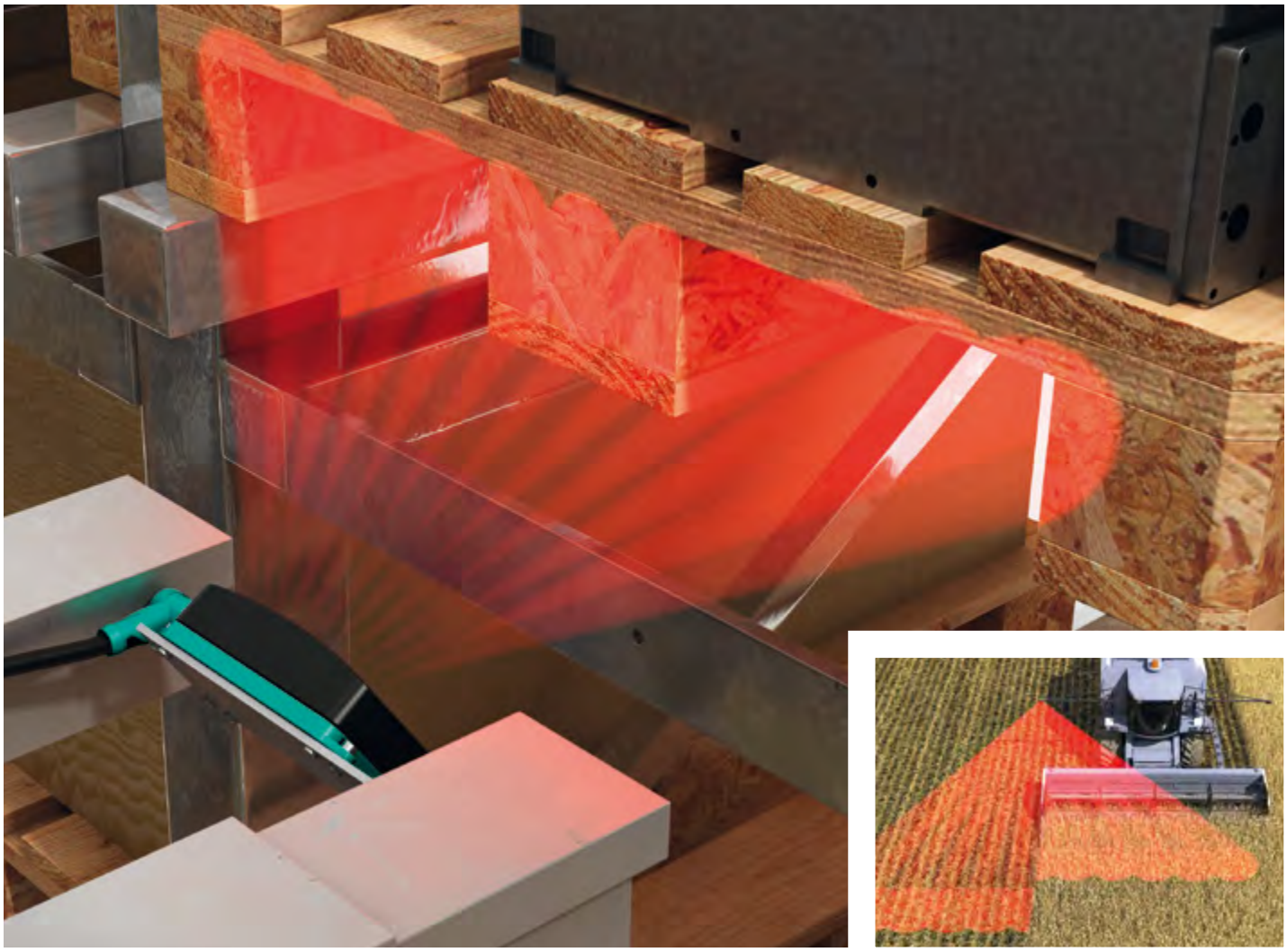
Maximum Precision in the Production Process

Complex processes require the movements of the robot axes to be precisely calibrated with one another. Each axis is driven by its own motor. Rotations are monitored by sensors and the signals from these sensors are evaluated by the controller. “Until now, robot manufacturers had to choose between sensors that were accurate, compact, or robust,” explains Stefan Horvatic, Product Manager for Rotary Encoders at Pepperl+Fuchs. “Resolvers or conventional magnetic sensors are fairly insensitive and compact but are not very accurate, while high-precision optical rotary encoders can react badly to dust, vibrations, or temperature fluctuations. The new magnetic rotary encoders from Pepperl+Fuchs finally solve this dilemma.” They achieve a precision of up to 0.1° and resolutions up to 16 bits while being extremely robust.

The Ultimate Combination

The new magnetic rotary encoders combine two electromagnetic principles – the Hall effect and the Wiegand effect. This wear-free technology ensures a high level of reliability and robustness, even under extreme conditions. The high degree of accuracy and high resolution in single-turn applications is a brand-new innovation. The compact design of the new encoder offers a major benefit. Space is scarce in many production facilities, so the robots are designed to be as compact as possible. Smaller models designed to carry lighter loads are especially lacking in space on the inside. The compact design of the rotary encoder therefore opens up a wide range of application options in industrial manufacturing processes. One additional benefit is the fact that the magnetic rotary encoder offers complete data security in the event of a power failure. The controller obtains the exact position of the axes even after a malfunction and can complete the initiated action with precision. ■

www.pepperl-fuchs.com/magnetic-precision



World's First Multibeam LED Scanner with Pulse Ranging Technology

Photoelectric Sensors **Pulse ranging technology (PRT) is based on direct measurement of single light pulses. In the R2100 multibeam LED scanner, it allows for a unique combination of features. The new, robust sensor can be used in a wide range of operating conditions.**

With multiple LED emitters arranged side by side, the R2100 LED scanner enables two-dimensional distance measurements to be taken. Light pulses emitted from the R2100 reach speeds of nearly 300,000 kilometers per second and are reflected by the target object. A high rate of 20 measurements per second ensures faster process sequences. The R2100 has no moving parts that can wear out over time. And with long-life, low-cost Ultra-IR LEDs as light sources, there is no potential danger to eyesight and they can operate within larger temperature ranges.

Distinct 2-D Measurements

In the R2100, 11 LEDs with offset beam angles emit light pulses in a fan shape. This creates a coverage angle of 88°. These emitters are activated in sequence and the reflected pulses are evaluated by the receiver. This design ensures that the device is suitable for mechanically challenging applications, since there are no moving parts in the sensor. This is an optimal design for operating conditions involving heavy vibrations or shock loads. The large light spots are ideal for measurements on irregular object surfaces. This makes the R2100 particularly flexible in the most diverse applications, including mobile equipment, intra-logistics, and machine and plant engineering.

Maintaining a Constant Edge in Grain Fields

"One of the strengths of the R2100 is that, as a result of the large light spots, it can take reliable measurements on very difficult surfaces," says Product Manager Thorsten Schroeder, who uses the following example in which the edge of the harvested area in a grain field is detected: the sensor is mounted onto the combine harvester and detects the field in front of the cutting unit. Some of the beams are directed at the section of the field that has already been harvested. The others are directed at the remaining crop. "This multichannel measurement can generate

clear information about where the edge of the harvested area is located, in order to automatically guide the combine along this edge. This maximizes productivity and ensures the vehicle is used to its optimum capacity." Unlike many 2-D devices equipped with a fine-point laser source, the R2100's wide beam coverage does not miss measurements when scanning the stalks.

Reliable Distinction

Another field of application is in intralogistics, where the R2100 has several advantages. For example, with two-dimensional measurement, it can detect a forklift truck as it places a pallet on a conveyor system. The conveyor must be stopped so that the pallet can be deposited safely. If other objects enter the detection range or if there are other forklifts driving past, the R2100 can distinguish them and the system will continue to operate. "A photoelectric sensor that works selectively could not make this distinction in a reliable way," emphasizes Thorsten Schroeder. The R2100 is superior to a single laser beam when it comes to collision avoidance, since a single beam can shine through a gap and be unable to detect an object accurately.

Innovative Technology

The development of pulse ranging technology enables maximum performance and durability of the LED scanner. The R2100 is designed for a measuring range between 0.2 and 8 meters. Its LEDs emit infrared light pulses at a wavelength of 850 nm. This unique technology ensures that the sensor takes accurate and reliable measurements.

It is perfectly suited to mechanically challenging applications and its flat design makes it easy to mount on automated guided vehicles or other vehicles in the industrial sector. ■

www.pepperl-fuchs.com/R2100-scanner

Video Interview with Dr. Peter Adolphs about the R2100

Find out on YouTube what makes the R2100 multibeam LED scanner so special. An interview with Dr. Peter Adolphs, Managing Director for Development & Marketing at Pepperl+Fuchs, at the SPS IPC Drives 2013 technology talk in Nuremberg, Germany:

www.youtube.com/PepperlFuchsGmbH

The unique positioning system Position Guided Vision is the first in the world to combine two technologies in one device: optical colored tape/paint tracking for driving and Data Matrix codes for precise position detection of automated guided vehicles.

Always on the Right Track

Positioning Systems **Position Guided Vision, or PGV for short: that is the name of our innovative optical positioning system. This system detects different colored route-tracking tape/paint and uses Data Matrix codes to route automated guided vehicles to their destinations quickly and reliably.**

Car bodies in automotive plants, pallets, picking containers, and shipping cartons within intralogistics, drugs and medical supplies in hospitals and nursing homes: automated guided vehicles can transport a wide variety of goods, depending on the design and application. All the better, then, that the PGV is so compact it fits in or under the smallest of vehicles. The positioning system can be put into operation quickly and easily using plug-and-play technology. Another great feature that the PGV offers is an integrated universal fieldbus interface with an open protocol for transmitting data. This feature allows the positioning system to be easily integrated into any vehicle control system, with a high degree of flexibility.

"Leading the Way" in More Than One Way

"Pioneering in terms of technology and leading the way in function and flexibility – both are statements that apply to the PGV," asserts Product Manager Armin Hornberger. In fact, our 2-D positioning system is a real technological innovation: the product is the first in the world to bring this form of 2-D camera, LED lighting, signal processing, and fieldbus interface together in a single device, contained in a compact and robust housing. Colored tape/paint tracking to facilitate driving, Data Matrix codes for position detection, and control codes for navigation: fully developed from a technical perspective, the reliable PGV positioning solution shows automated guided vehicles the way. With its large reading window, this is also true when the tape, painted strip, or code is damaged. The high level of immunity to extraneous light guarantees optimum detection results, even where the surface is very shiny – as is typically the case on wet roads, in hospital corridors, and in modern vehicle assembly plants.

Giving Planners a Free Ride

One particular benefit for intralogistics planners is that they can change routes or even add new crossovers, branches, and transfer points with a high degree of flexibility: simply route the colored tape/paint and adjust the route in the vehicle's electronic map. With the precise guidance offered by our positioning system, that is all it takes for transport systems to set off for new destinations. ■

www.pepperl-fuchs.com/PGV-system

Multitag Reading around the World

RFID **The new F190 UHF read/write head is taking over the world. Different frequency ranges are available for identification tasks at a distance of up to 1.5 m, depending on the country in which the reader will be used.**

In European countries and in India, the F190 operates at frequencies between 865 MHz and 868 MHz. For Asian and American countries, there is now a product version available with the corresponding frequency range of between 902 MHz and 928 MHz. The read range is adjustable and up to 40 tags can be read simultaneously. This allows substantial reductions in processing times in fields such as factory automation, intralogistics, and the automotive industry.

With its compact housing measuring just 11 cm x 11 cm, the UHF read/write head is easy to install in tight spaces. Its tough metal housing and encapsulated electronics ensure it is robust in harsh ambient conditions. ■

www.pepperl-fuchs.com/UHF-F190

Heavy Duty Solution for Tough Applications

Rotary Encoders **When conditions are tough, the new ENI11HD heavy duty incremental rotary encoder provides reliable speed feedback for large asynchronous motors, and is not affected by the pulsating currents of these motors.**

In the steel industry, shipbuilding, in mines, or on offshore facilities, materials weighing hundreds of tons often need to be moved at once. Large asynchronous motors are used to provide the power. Highly robust rotary encoders control their speed and the sequence of the individual process steps.

Heat, cold, dirt, constant vibration, powerful shocks, and electromagnetic interference are no match for the new heavy duty rotary encoder. The device is unaffected by the electrical currents generated by the constant rotation of the motor shafts. These currents are strong enough to destroy the ball bearings in conventional rotary encoders. The ENI11HD heavy duty rotary encoder is entirely insensitive to such pulsating currents. It combines a long service life with a high level of reliability. Its terminal box can be rotated 360°, enabling greater flexibility during installation and maintenance while reducing costs. ■

Salty Surroundings, Powerful Sensor

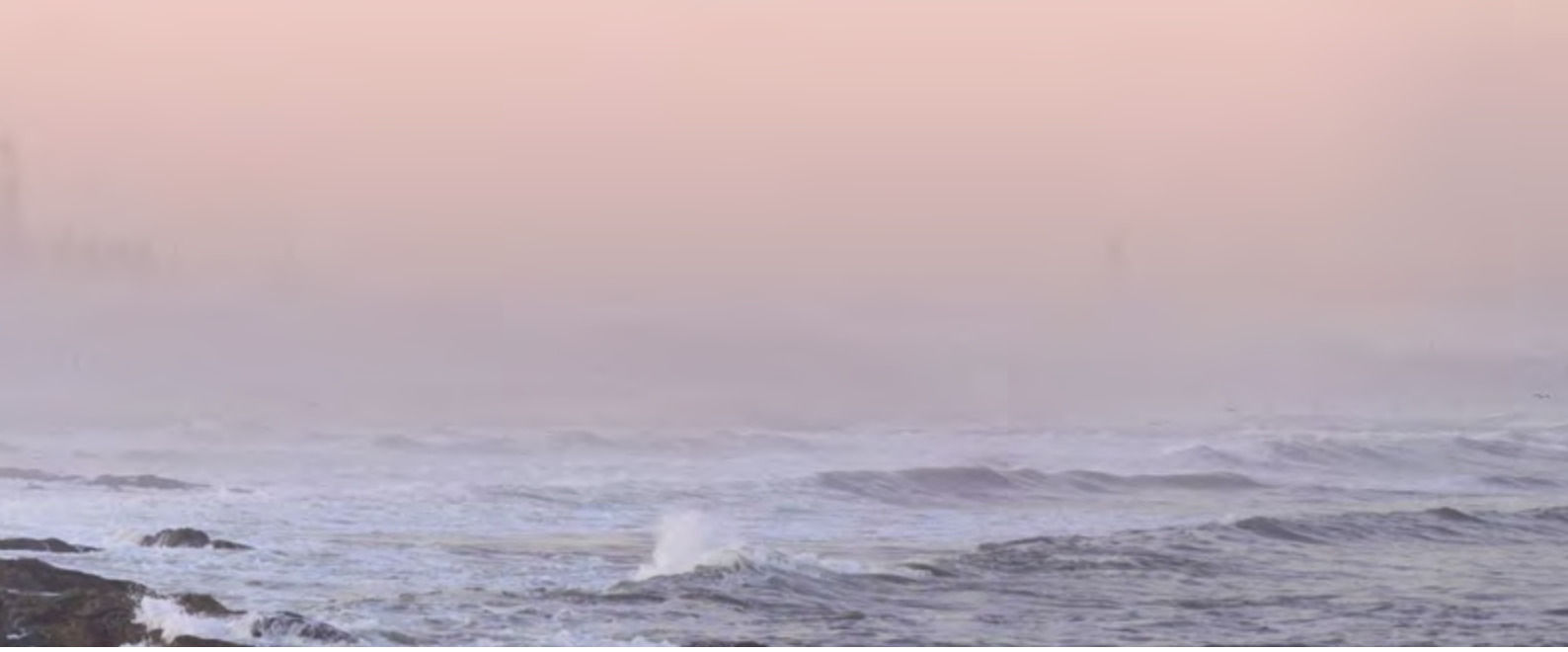
Salt is everywhere at Frisia Zout. “Zout” is Dutch for salt and since that is precisely what Frisia produces, it is hardly surprising that the company’s tanks and pipes are filled with it. However, salt is also in the air, as the company’s plant in the Dutch city of Harlingen is located only a few meters away from the sea.

3,000 meters below Harlingen lies the salt formation where Frisia Zout sources its raw material. Water is forced into the mineral formation at high pressure and salt-saturated brine, is pumped up into the plant’s huge tanks. Here, soda and lime react with the brine, separating the impurities from the brine resulting in lime-like residual matter, which itself is a useful by-product used in the construction industry and in fertilizers.

Corrosive Conditions

The salt at Frisia is not only underneath the ground; the air is also salty, and often wet, as it is close to the sea. Salt causes exposed metal parts to corrode. Together with condensed water, this poses a significant problem for the switch boxes that control the company’s outdoor valves. All too often, the switch boxes have to be replaced due to corroded contacts and electrical parts. To solve this problem, Frisia Zout was eager to try out Pepperl+Fuchs’ new F31K2 dual inductive sensor for valve position feedback.

“We fitted two valve position sensors of the F31K2 Series to the supply pipes about six months ago and two more to the drain pipes shortly afterwards,” recalls Rudolf Bergsma, Head of the Electrotechnical division at Frisia. He had previously read about the new F31K2 in a Pepperl+Fuchs newsletter and immediately recognized the opportunity to solve a recurring problem that he was facing with the switch boxes mounted on the plant’s pneumatic valve actuators. These components are housed in aluminum boxes and use contacts that move mechanically.



However, they are not ideal for use in the harsh climate of the North Sea which, combined with the boxes' susceptibility to internal condensation, means that they constantly corrode inside and must be replaced frequently. The results seen during the six-month test phase were excellent and the company now plans to replace all of its switch boxes with the F31K2 sensors.

Impressively Ruggedized

"A lot of our equipment is made of polyester or stainless steel to ensure that it can withstand salt-induced corrosion," says Rudolf Bergsma. "When I saw the F31K2 valve position sensor's plastic cover and read about its double-housing design, I realized that this could be just what we were looking for." Bergsma then contacted the Dutch valve supplier Bray Controls and Pepperl+Fuchs, which is headquartered in the German city of Mannheim, to organize on-site testing at Frisia Zout.

"The sensor has a number of advantages which impressed us immediately," says Jos De Jong from Bray Controls, a company that enjoys a long-standing working relationship with both Pepperl+Fuchs and Frisia Zout. "This sensor is compact and the beacon in a weatherproof housing gives a very clear indication of the valve's position. With the inductive sensors, there is no need for mechanical contacts – what is not there cannot corrode! The fully encapsulated housing design of the F31K2 guarantees additional protection and high impermeability. At a very reasonable price, the sensor looked like the perfect solution to me," says De Jong.

Did you know that …

… as a result of corrosion damage caused by salty air, major economic losses occur every year to industrial plants, buildings, and offshore installations?

… the average salt content of seawater is approximately 3.5%? The Dead Sea has the highest salt content (28%) of all lakes and oceans.

… "Fleur de Sel" is the world's most expensive sea salt? It is formed only on hot and windless days as a wafer-thin layer on the surface of the water and is siphoned off by hand.

… salt was as valuable as gold in the early advanced civilizations? The Egyptians used the "white gold" not only as a seasoning and preservative, but also for mummification.

Two F31K2 dual inductive sensors mounted on pneumatic valve actuators at Frisia Zout in Harlingen, the Netherlands.

The F31K2 is easy to mount directly onto the pneumatic actuator. The sensor is directly attached to the drive housing, and the puck merely needs to be pushed onto the drive shaft and fixed in place according to the valve's current position.

Touch-Free Valve Position Detection

Traditional switch boxes are based on mechanical feedback systems that depend on rotary or lifting movements, e.g., conventional actuating switching elements that work via switching cams. In contrast, the F31K2 valve position sensor separates mechanical movement and position feedback by using two inductive elements. As soon as a metallic surface (target) enters the inductive sensor's magnetic field, it is detected by the evaluation electronics and the output is triggered. Simple metal targets are sufficient for valve actuators, whose positions can be detected touch-free with the inductive sensors. Since no physical contact is necessary, the sensor can be hermetically sealed from the actuator.

"The electronic solution combines a high degree of switching accuracy and precisely defined hysteresis with intrinsic ruggedness," states sales engineer Wim Kamman at Pepperl+Fuchs Netherlands. "To ensure that the sensor can connect seamlessly with existing control systems, options featuring all common connection types and interfaces are available. The beacon is visible from a long distance and gives on-site operators reliable valve position information at a glance."

The housing materials are optimized for outdoor use. They provide high UV protection and are resistant to extreme temperatures, salt water, and corrosion. The modular housing is made of a ruggedized, translucent plastic, and LEDs that indicate the power supply, sensor, and valve conditions are integrated into the encapsulated sensor module. Thanks to the large terminal compartment and pluggable terminal block, cables that are rigid or have large diameters do not pose any problems in environments where mounting work could prove difficult.

"The sensors have worked perfectly. The on-site operators are extremely satisfied, not least because of the high visibility of the signals given off by the beacon. I am certain that, over time, we shall replace all of our switch boxes with F31K2 sensors," concludes Rudolf Bergsma.

Open Solutions for Easy Direct Mounting

The F31K2 dual inductive sensor is part of Pepperl+Fuchs' open solutions concept for valve position feedback. The concept's basic elements are an actuator (puck) and a sensor. These components can be installed without mounting brackets thanks to both the mechanical standardization of drives pursuant to VDI/VDE 3845, and NAMUR mounting holes. The sensor is directly attached to the drive housing, and the puck merely needs to be pushed onto the drive shaft and fixed in place according to the valve's current position. The sensors cover all drive sizes up to those with drive shaft diameters of 90 mm with just two puck sizes, making brackets or mounting sets unnecessary. To date, no other valve position feedback sensor on the market offers such a product feature. ■

www.pepperl-fuchs.com/F31K2-sensor

Frisia Zout, a company based in Harlingen, the Netherlands, produces and distributes roughly one million tons of high-quality salt per year. Customers include the chemical and food industries. Additionally, the company-produced salt is used for water softening and as road salt. Frisia Zout is a part of K+S AG in Kassel, Germany, which, besides salt, also offers potassium and magnesium products for agriculture and industry.

Bray International, with headquarters in Houston, Texas, USA, is a group of companies that contains the brands Bray Controls, Flow-Tek, RitePro, and Bray Commercial. The corporation develops and produces valve solutions for flow control such as butterfly valves, ball valves, and pneumatic and electric actuators, as well as external devices. With its modular product lines, Bray International is represented in over 40 countries worldwide.

Finding solutions. Cooperating as partners. Sharing passion.

You are the expert in your field. And we'll treat you as one. Working as partners, we share our knowledge and experience with you. This results in solutions that move us jointly towards the future.

www.pepperl-fuchs.com

PEPPERL+FUCHS

See SmartBridge Live

The model of an automated system using SmartBridge technology will be on display from April 7–11, 2014, at the Pepperl+Fuchs booth at the Hanover trade fair. You can connect to the system directly and control the devices yourself using a tablet computer.

Visit Pepperl+Fuchs at the Hanover trade fair 2014 in hall 9, booth D76.

Intelligent Bridge to the Future

Industry 4.0 has until now been more of a concept than a reality – we are only at the beginning of an evolutionary process. For Pepperl+Fuchs sensors, this process is already underway. The first step toward Industry 4.0 has appeared in the form of an adapter called SmartBridge.

It will probably not be long before networked and GPS-enabled smartphones are controlling entire streams of traffic. If thousands of mobile devices exchange data on their owners' destinations, it will be possible to not only take detours around traffic jams, but to prevent them altogether. Route guidance ensures efficient use of road space, so every driver can benefit. In this network, cell phones function as cyber physical systems (CPS): they detect their own location (sensors), calculate potential routes (embedded software), and exchange data with all other devices within a certain radius (communication). While this will soon be a reality on the roads, its introduction into automation technology may take a little longer. After all, it is much easier to network smartphones than it is to convert large production units and entire companies into networks. "Internet technology is not only coming up against stable hierarchical pyramids, but also sophisticated, functioning, and, above all, secure technology," says Dr. Peter Adolphs, Managing Director of Development & Marketing at Pepperl+Fuchs.

Obstacles in Automation Technology

Nevertheless, Ethernet and IP-based communication are rapidly making inroads into automated production processes. Internet technology is already being used for remote monitoring. Some devices feature embedded Web servers and can be accessed via standard browsers. However, there are bigger obstacles to entirely unrestricted, standardized communication in automation technology than there are in the realm of computers. As Dr. Adolphs notes, "The real challenge on the road to Industry 4.0 is the abstract, device-independent way in which information exchange is structured at all levels."

The only way to achieve this goal is by taking a gradual approach based on reaching a consensus. Initiatives such as PROLIST and FDI are working toward this objective. These groups of companies, research institutions, and relevant associations are working on the seamless integration of the work flow for life-cycle management, with machine-readable specifications and information management for intelligent field devices. They have established an important framework that allows the individual cells of Industry 4.0 to be joined together in functioning networks: cyber physical production systems (CPPS).

CPS in Everyday Life, CPPS in Production

"CPS has long been a familiar part of everyday life in the form of smartphones and modern household appliances featuring an Internet connection – but it has not been involved in production," explains Dr. Adolphs. "By working together in an intelligent manner, CPS open up functions that no single device could ever achieve on its own. The same can be said of CPPS, the difference being that an actuator is used in this case to make an independent contribution to a production process within an Industry 4.0 strategy."

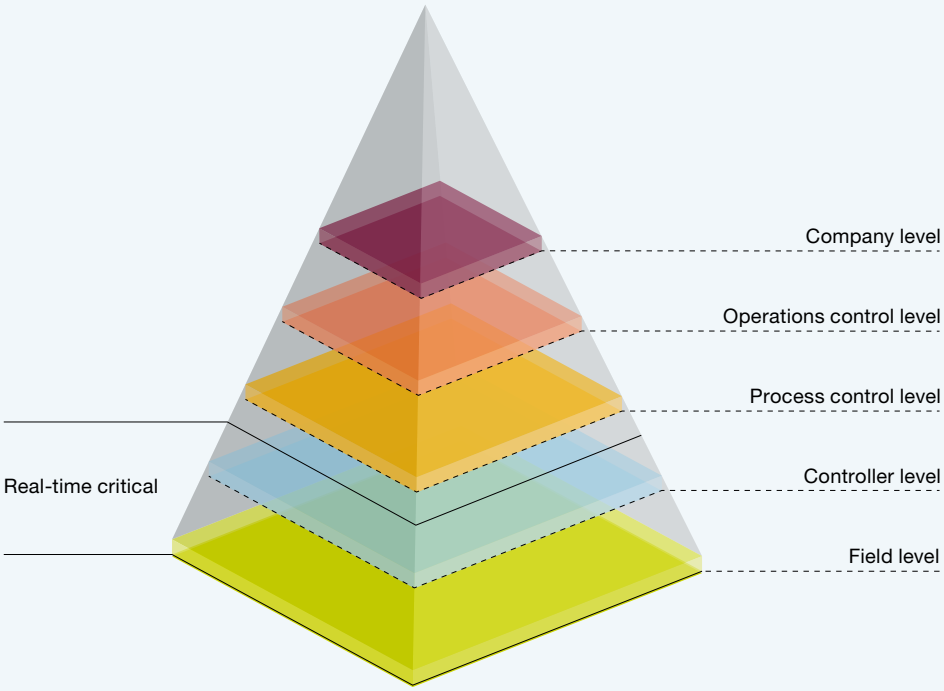
In modern production systems, any changeover to new product versions requires complex interventions and modifications that become economical only when larger unit quantities are involved. One of the central objectives of Industry 4.0 is to manufacture customized goods in small batch sizes, or even for individual customers, under the conditions and prices associated with automated large-scale production. The necessary flexibility would be created through the self-organization of the CPPS. Changeovers would be carried out more or less automatically. They would not interrupt the production process and could be completed at practically zero cost.

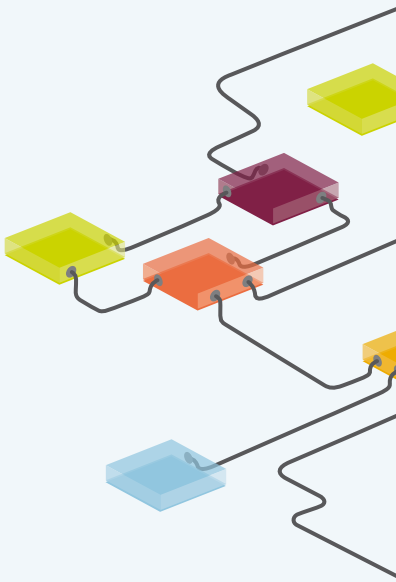
Autonomous Drilling Service

For example, a mechanical component may need to be drilled in very different ways depending on its intended use. "The information about what kinds of holes are required could be contained in the workpiece carrier," explains Dr. Adolphs. "The component would then communicate with the drills on the factory floor and search independently for the 'drill hole' service with the appropriate parameters. Manual interventions would no longer be required. Of course, the practical obstacle in this arrangement is the ability to develop modular

Dr. Peter Adolphs, Managing Director of Development & Marketing

By applying Industry 4.0, the conventional automation pyramid with its hierarchical structure is transformed ...





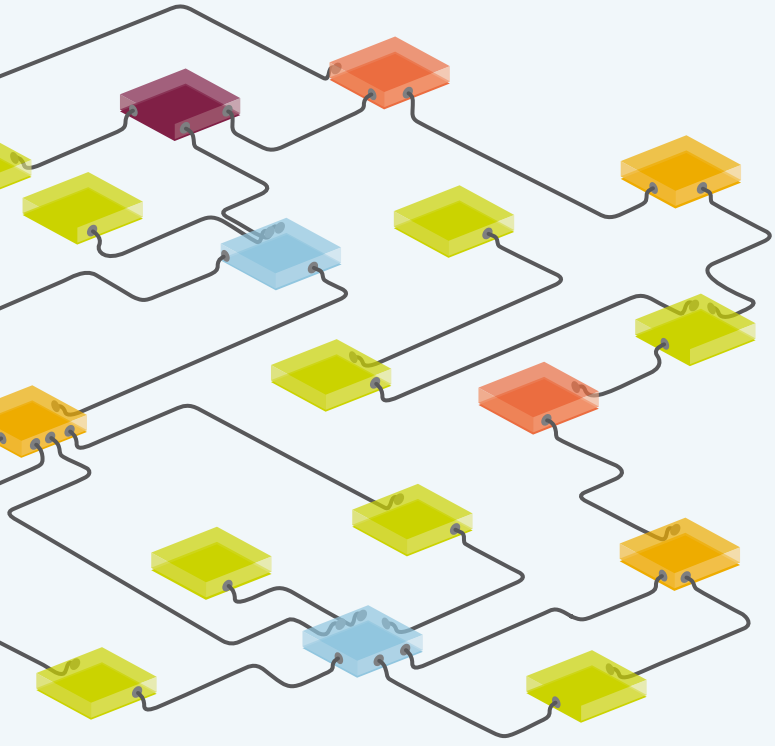
machine components at marketable prices." Furthermore, a rapid transition to Industry 4.0 structures may be prevented by safety requirements in automation, as well as the long service life of the equipment, particularly in the process industry.
In principle, working CPPS are already feasible from a technical standpoint, as the example of the drilling service unit demonstrates. Naturally, Pepperl+Fuchs is tackling this issue from the point of view of sensor systems. "When I imagine a factory or processing plant made up of networked and autonomous CPPS, the first thing I see is a major need for sensors," says Dr. Adolphs. "Many more sensors will be required, and I am sure that many areas will need significantly more detailed information, or, in other words, more accurate measurements than before."

Sensors 4.0

In addition to conventional measuring tasks, it will be necessary to ensure sensor access is compatible with Industry 4.0. Pepperl+Fuchs demonstrated just what this might involve by unveiling an exhibit at the SPS IPC Drives exhibition in Nuremberg, Germany. The exhibit garnered much attention and will soon be on display at the Hanover trade fair 2014. It is a plexiglass model of an automated functional unit that is equipped with multiple sensors based on different measuring principles. At the heart of the unit is a seemingly unremarkable adapter called SmartBridge.
"This small device, which can be integrated into the sensor, taps into the data in the IO-Link interface and sends it to a tablet computer or smartphone via Bluetooth," explains Dr. Adolphs. Parameters can be configured and issues can be analyzed via this connection, without the need for any disassembly and while operations are running. At the same time, the maintenance engineer can access specifications and data sheets online and use them to calibrate the sensor. Commissioning and maintenance processes are greatly simplified, and it is possible to use the data that is read out for higher-level automation tasks.
The fixed point-to-point connection prevents security loopholes. Even a tablet computer infected with a virus would not cause any damage, since transfer between the sensor and controller is not possible.
"SmartBridge represents a very practical step toward Industry 4.0," says Dr. Adolphs. "A step that doesn't need to overcome any obstacles. Since no change is required to the conventional wiring, any system can be easily retrofitted with SmartBridge with minimal work." ■

> "SmartBridge represents a step toward Industry 4.0 that doesn't need to overcome any obstacles. Any system can easily be retrofitted with minimal work."
> *Dr. Peter Adolphs, Managing Director of Development & Marketing*

... into a CPPS-based form of automation with autonomous devices.



Video Interview with Dr. Peter Adolphs

An in-depth video interview with Dr. Peter Adolphs on the topic of Industry 4.0 and SmartBridge can be found on our YouTube channel.

www.youtube.com/PepperlFuchsGmbH

Africa – A Continent with Enormous Growth Potential

With a population of one billion people, Africa is a continent that offers huge growth potential. Pepperl+Fuchs is increasing its presence in Africa and pursuing a long-term strategy, explains Marc Van Pelt, Sales Director for Process Automation in Western Europe & Africa.

Mr. Van Pelt, what is the current status of Pepperl+Fuchs in Africa?
Until now, we have mainly operated in the African market with external sales partners. Only in South Africa have we been involved with the local partner company, which we integrated fully into the Pepperl+Fuchs Group on March 1 this year.

What future prospects do you see for the continent?
Seven of the ten countries in the world with the highest growth rate are in Africa. Following the boom in raw materials, we are seeing increasing demand for our products, especially in process automation, as well as in industrial sensors for factory automation in South Africa. Of course, there are major problems in some countries, but in many others – about which little is reported – we are seeing very positive developments in a stable environment. Africa is a giant that is just waking up, but is already demonstrating its potential.

Marc Van Pelt, Sales Director
for Process Automation in Western Europe & Africa

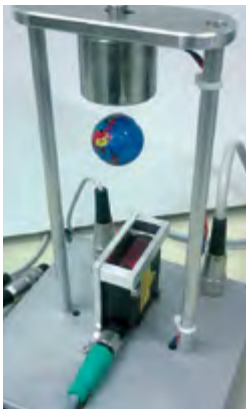
What does your strategy look like?
Our new subsidiary in Johannesburg is responsible for customers in South Africa and in the rest of Africa south of the Sahara. It will work closely with our established offices in Kenya and Nigeria. The francophone countries in North and West Africa will continue to be supported by our branch in France. We will forge closer links within our network in Africa so that we can be closer to our customers and provide them with an even better service. ■

New Branch Office in Johannesburg

The new Pepperl+Fuchs subsidiary in South Africa officially opened on March 1, 2014. This office will take on all the business activities of previous sales partner P&F Products cc based in Edenvale, just outside Johannesburg. All employees will transfer to the new subsidiary, along with the building and warehouse. The new subsidiary in Johannesburg will be responsible for South Africa and most other African countries south of the Sahara. ■

www.pepperl-fuchs.co.za

Expertise and Sensors for Aspiring Engineers



Promoting young talent is extremely important at Pepperl+Fuchs. The company sponsors partnership projects that support training for aspiring engineers by providing product and technology expertise.

The most recent example of such a partnership is the Ostfalia University of Applied Sciences in Wolfenbüttel in the north of Germany. In the university's laboratory for mechatronics, Prof. Dr.-Ing. Rolf Roskam and Dipl.-Ing. (Fh) Nanno Peters have created an unusual test setup, in which a Pepperl+Fuchs laser triangulation sensor is used to determine the position of a metal globe in a magnetic field. Using a sophisticated control technique, the high-resolution sensor enables the globe to be located with an accuracy of up to 20 millimeters. The mechatronics students test their model-based control of the system on a total of 16 magnetic levitation units. By observing the actual interaction between sensors, actuators, hardware, and software, the aspiring engineers are building on the theoretical skills learned in their courses. ■

Trade Shows + Events

April 2014

HANNOVER MESSE
April 7 – 11, 2014 // Hanover, Germany

Elettromondo
April 11 – 13, 2014 // Padua, Italy

FORIND NORDESTE
April 22 – 25, 2014 // Recife, Brazil

May 2014

Elmia Automation (Motek)
May 6 – 9, 2014 // Jönköping, Sweden

Automation & Engineering
May 14 – 15, 2014 // Brussels, Belgium

CeMAT
May 19 – 23, 2014 // Hanover, Germany

SEPEM Industries Est
May 20 – 22, 2014 // Colmar, France

SPS IPC Drives ITALIA
May 20 – 22, 2014 // Parma, Italy

NORRKAMA
May 21 – 22, 2014 // Oulu, Finland

June 2014

Eliaden
June 2 – 5, 2014 // Lillestrøm, Norway

FISPAL TECNOLOGIA
June 3 – 6, 2014 // São Paulo, Brazil

MEORGA Rheinland
June 4, 2014 // Leverkusen, Germany

Manufacturing Expo
June 19 – 22, 2014 // Bangkok, Thailand

Hillhead
June 24 – 26, 2014 // Buxton, UK

August 2014

ONS
August 25 – 28, 2014 // Stavanger, Norway

September 2014

SINDEX
September 2 – 4, 2014 // Bern, Switzerland

ELEKTRAM
September 3 – 4, 2014 // Hradec Králové, Czech Republic

Tekniikka
September 3 – 5, 2014 // Jyvaskyla, Finland

Automatik
September 9 – 11, 2014 // Brøndby, Denmark

IEAS
September 9 – 12, 2014 // Bucharest, Romania

World of Technology and Science
September 30 – October 3, 2014 // Utrecht, Netherlands

October 2014

OFFSHORE TECHNOLOGY DAYS
October 14 – 16, 2014 // Bergen, Norway

ELOSYS
October 14 – 17, 2014 // Trenčín, Slovakia

HaPeS
October 21 – 23, 2014 // Katowice, Poland

CeMAT Asia
October 27 – 30, 2014 // Shanghai, China

Offshore Energy
October 28 – 29, 2014 // Amsterdam, Netherlands

November 2014

IAS
November 4 – 8, 2014 // Shanghai, China

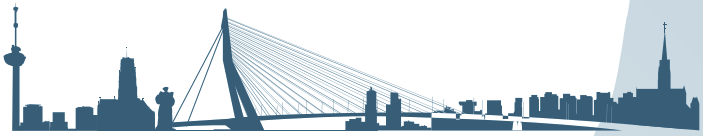
SPS IPC Drives
November 25 – 27, 2014 // Nuremberg, Germany

BAUMA China
November 25 – 28, 2014 // Shanghai, China

www.pepperl-fuchs.com/events

Fiets

The Dutch love their “fiets.” Almost every inhabitant owns a bicycle. Twice as many bicycles take to the roads as cars. However, this passion can sometimes be expensive. Hefty penalties apply even for minor offences such as having faulty pedals (EUR 30) or keeping the bicycle frame in poor condition (EUR 45).



Rotterdam

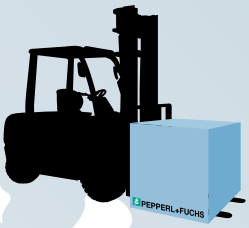
The second-largest city in the Netherlands boasts the world’s third-largest seaport. As a hub for industry and trade, Rotterdam catches the visitor’s eye with its impressive skyscraper skyline and the characteristic angled pylon of Erasmus Bridge, which stands 139 meters high. It is this pylon that gives the bridge its nickname “de zwaan” (the swan).

Koningsdag

On “Koningsdag,” or “King’s Day,” the Dutch celebrate the birthday of their monarch, currently King Willem-Alexander. Old and young alike have fun in the great outdoors. Streets, parks, canals, and houses are transformed into a vision of orange, the color of the Royal House of Orange-Nassau.

1,200,000,000

The Netherlands produces this many liters of beer every year. Two-thirds of this beer is ultimately exported, making the Netherlands the world’s largest exporter of beer.



Country of Exports

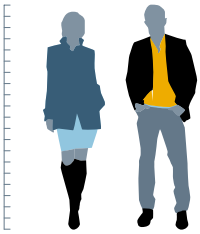
The Netherlands is one of the world’s largest export countries. Pepperl+Fuchs Netherlands sold 319,468 products in 2013, which means a growth of approximately 250 percent over the last four years. 65 percent of these products are delivered to OEM customers, who spread them – installed in machines and plants – all over the world.

Hitchhikers

The Netherlands provides official stops for hitchhikers, known as “liftershalte.” Signs depicting an outstretched thumb indicate that travelers can try to hitch a ride at these locations.

The Tallest

The Dutch are the tallest people in the world. The average height is 1.83 meters for men and 1.70 meters for women.



Tulips, Cheeses, and Other Successful Exports

The Netherlands is this year’s partner country at the Hanover trade fair. With the slogan “Global Challenges, Smart Solutions,” this small country in the heart of Europe is showcasing its solutions for industrial challenges; solutions that are setting trends all over the world. The Netherlands has a great deal to offer, and Pepperl+Fuchs has been active in the country for more than 30 years.

Twice as many bicycles as cars on the roads, a booming tulip and vegetable export market, and old windmills as far as the eye can see: welcome to the Netherlands! A small country on the North Sea coast that has a great deal more to offer than the familiar clichés of cheeses, cows, and clogs.

Its national territory spans just 400 km in length and 200 km in width. Although the Netherlands is one of the most densely populated countries in the world, its overall population is less than that of major cities such as Shanghai. And yet, the Netherlands is one of the world’s largest export countries; it is the third-largest exporter of agricultural products, even though just three percent of the population work in the agricultural industry. With Rotterdam being the third-largest port on earth, the country is an important center for global trade.

Low Mountains and Tall People

The Netherlands takes its name from a geographical feature – around a quarter of the national territory is below sea level. The Vaalserberg in the province of Limburg is the highest point in the country at just 323 meters high, which is lower than the Empire State Building. The inhabitants themselves are anything but small. With an average height of 1.83 meters for men and 1.70 meters for women, the Dutch stand taller than any other nation. At the same time, they are considered to be very open-minded – and a little bit crazy. Their motto? "Act normally, that's crazy enough."

Pepperl+Fuchs has been active in the Netherlands since 1972. That year saw the start of its collaboration with process technology company Wildevuur. In 1986, Pepperl+Fuchs took over the partner company and made it part of the corporate group as one of the first foreign subsidiaries. "The new company was called Pepperl+Fuchs Components, and the name said it all," recalls Marcel Tibosch, Sales Manager in the Factory Automation division, who has worked at Pepperl+Fuchs for 23 years. "Our focus was clearly on the sale of individual components."

From the Product to an Overall Solution

The focus on individual products has long since passed, and has now shifted onto overall solutions, following the global trend. "Users today have neither the time nor the specialized staff required to investigate the specific details of explosion protection and the applicable regulations in each case," says Geert van de Wiele, Sales Manager in the Process Automation division. "Customers want to concentrate on their core business. As a supplier of complete solutions, we provide optimum customer support in this area, setting ourselves apart from the competition." His summary of the typically Dutch customer mentality is as follows: "If there is a problem, Dutch people expect you to present the solution quickly. Anyone who manages to do this wins their long-term trust."

With Vanderlande, Pepperl+Fuchs Netherlands counts one of the world's largest providers of luggage conveyor systems among its customers. The company equips airports in London, Paris, and Amsterdam, among other places. In addition, Sales Manager Marcel Tibosch's team at the 's-Hertogenbosch branch serves many other companies in a wide

"If there is a problem, Dutch people expect you to present the solution quickly. Anyone who manages to do this wins their long-term trust."
Geert van de Wiele, Sales Manager Process Automation

"Our OEM customers have a multiplying effect. Customers see the products supplied by Pepperl+Fuchs installed in machines and equipment, and discover the quality of our solutions."
Marcel Tibosch, Sales Manager Factory Automation

Facts and Figures

Capital	Amsterdam
Seat of government	The Hague
Area	41,548 km²
Population	16.82 million (2013)
Form of government	Parliamentary monarchy
Head of state	King Willem-Alexander
Head of government	Prime Minister Mark Rutte
GDP	840.4 billion US dollars (2013)
National anthem	Het Wilhelmus
Internet TLD	.nl
Country calling code	+31

A typical feature of Amsterdam, the capital of the Netherlands, are the “grachten” – narrow, artificial waterways that run through the city center in several rings, straddled by numerous bridges. Because the canals were one of the major ways to transport goods and people in times gone by, taxes for buildings were determined by their width on the canal. The result is houses with very narrow fronts, but standing comparatively high.

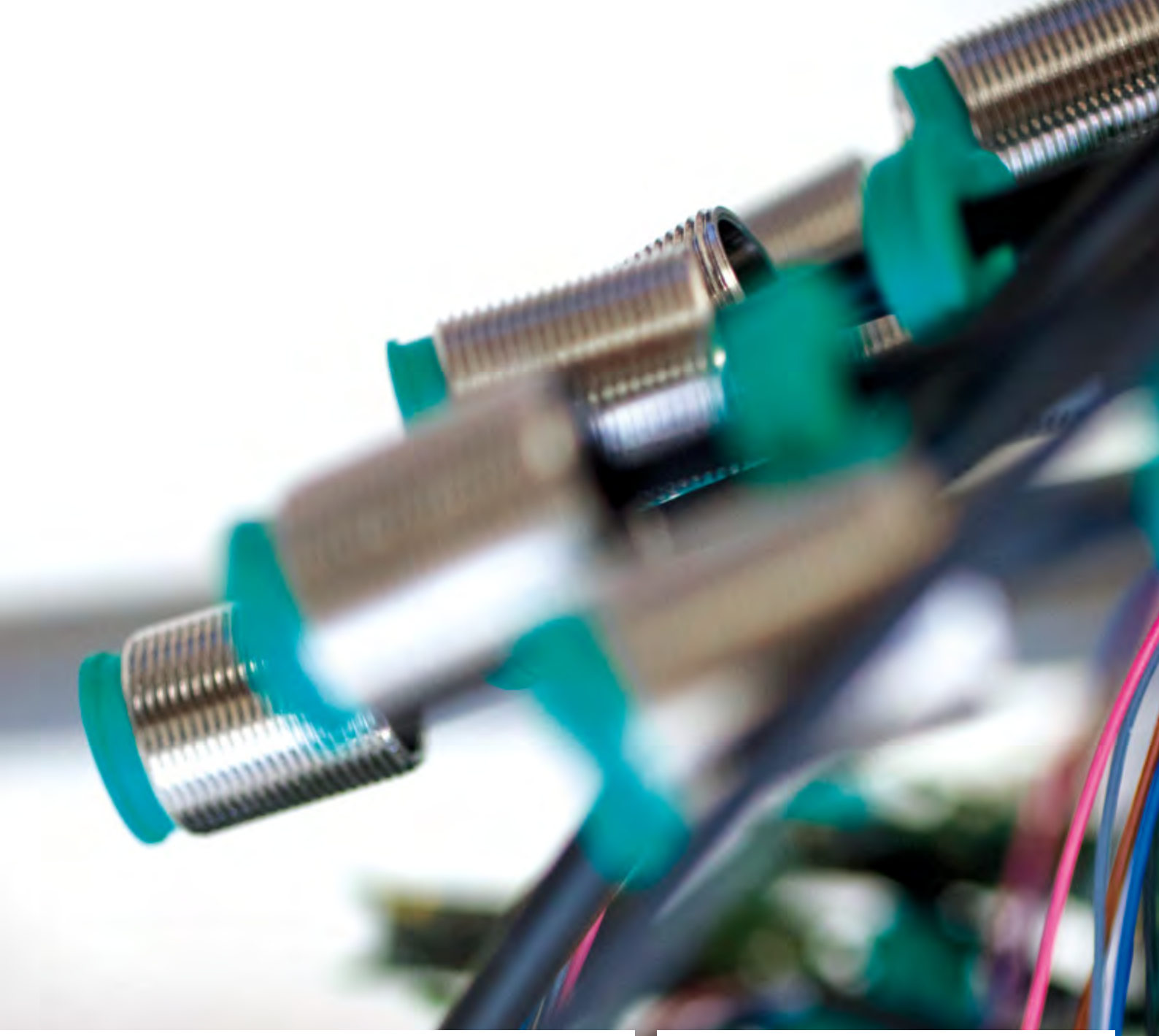
variety of sectors, including mechanical engineering, material handling, automotive, agricultural machinery, and distribution systems. “The strong focus of our customers on the export market has a pleasant side effect. Not only do our products gain a wider reach in the world in the machines and plants of OEM customers, we can also carry our solid reputation far beyond the Netherlands’ borders,” explains Marcel Tibosch.

Beyond National Borders

For customers in the process industry, national borders do not play a major role. This applies from the very beginning. “The process industries today are highly internationalized. A large portion of our projects involve multiple countries – and with open sea between them,” explains Geert van de Wiele. In addition to the chemicals and petrochemicals industry, the industry for the offshore extraction of oil and gas is a key market for Pepperl+Fuchs Netherlands.

Orange Fever

Even though the international spirit is prevalent in the Netherlands, the country enthusiastically celebrates its own national identity. King Willem-Alexander and the royal family are extremely popular. Orange is not only the symbolic color of the Royal House of Orange-Nassau, but also the entire nation, as seen at every major sporting event – particularly with soccer as the national sport. At soccer events, it is not only the national team and fans that dress in orange; the entire country seems covered in orange. The phenomenon that the Dutch themselves describe as “orange fever” is rampant. ■



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