



PEPPERL+FUCHS

News for Factory Automation

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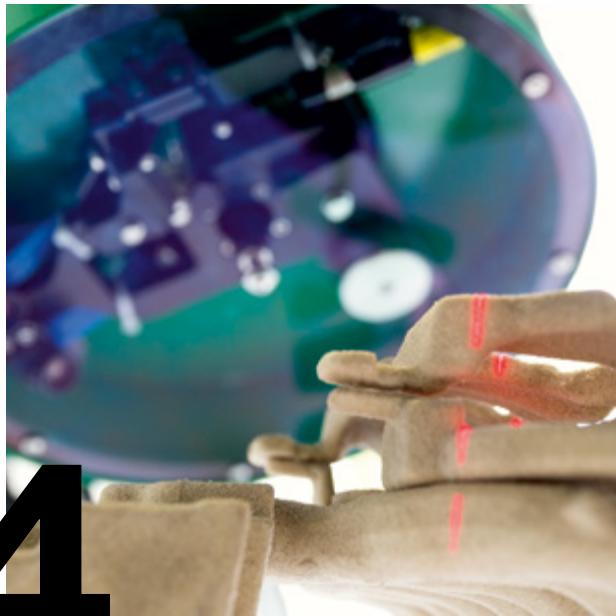
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with a high level of precision

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A Production Representative
for two continents

Dear Reader,

The digitalization of society represents a fundamental change for companies. Medium-sized enterprises like ours can only move forward by collaborating with other companies and advancing the future-oriented project of Industrie 4.0. Again and again, the results have demonstrated the value of such collaborative partnerships. They bring digital change into the present. Along the way, we must not forget that it is a combination of human and mechanical strengths that makes these projects so successful. After all, human beings are not standing in the way of digital transformation; they are at the heart of it.

Of course, the critical parts of a casting mold can be automated and precisely monitored using laser light technology, but someone must first have the idea to do it. And if we look at the field of intralogistics, we can see that a human is still the best “picker” in the picking process; many other tasks can be easily automated. Join us for a tour through our current projects, which are paving the way toward the digital future and Sensorik4.0®.

I hope this issue provides you with interesting insights into the world of Pepperl+Fuchs. Happy reading!

A handwritten signature in black ink, appearing to read "R. Müller".

Reiner Müller
President Division Factory Automation Pepperl+Fuchs GmbH

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



Focus

No Sand in the Gears

The factory glistens with heat. When liquid iron or aluminum is cast for an automotive engine block, temperatures can exceed 1,000°C. In addition to its sweltering temperatures, the casting process is also time and cost intensive. To prevent incorrect castings, the SpinScan3D system from Pepperl+Fuchs' subsidiary VMT Vision Machine Technic Bildverarbeitungssysteme GmbH checks the casting molds during quality control.

Whether at the push of a button or the traditional turn of a key, when the engine starts, the thrill of driving can begin. Cars exhibit engineering skill of the finest caliber: increasingly powerful engines and constant innovations that make driving ever more comfortable. But before a car can hit the road, it first has to take a long trip through production. The manufacturing process is complex and subject to the highest standards of precision—from the smallest screw to the entire body, everything has to be right, down to the last detail.

Engine as Centerpiece

The engine is the car's central component, and its quality must be 100% compliant with the design data. An essential element of this centerpiece is the engine block. Whether made from cast iron or light metal, it is generally manufactured in a casting process. Once the cast material has hardened, it is virtually impossible to adjust the result. VMT therefore developed a solution that checks the quality of the mold using modern image-processing technologies prior to the expensive and time-consuming casting process. Using this approach, the Pepperl+Fuchs Group company ensures that defective engine blocks are never cast in the first place.



Fine Grains, Big Blocks

The casting process is based on a natural material that we otherwise associate with deserts and beaches: sand, pressed and supplemented with a binding agent, serves as a "lost mold" for the manufacture of heavy engine blocks. These sand cores form a negative of the engine block and fill the later cavities during casting. After the casting material hardens, they are destroyed again and used to produce new molds. Each individual engine block is thus created using its own sand mold.

Since the quality of the sand core has a significant influence on an engine block's characteristics, quality assurance must start before casting. Due to the large number of engine blocks manufactured daily, however, checking each sand core individually would require considerable effort. A solution is therefore required that automatically examines the sand cores in detail and can simultaneously determine if they are fit for casting or not.

"The Problem Provided the Inspiration"

Dr. Werner Neddermeyer, Project Manager at VMT, recognized the problems in engine block production and developed an idea. "We considered the measurements that need to be recorded and how we could achieve this using our sensors," he says, describing the initial stages.

"Every point within the sand core must be checked very precisely to make a statement on its quality. This is not easy, considering that sand cores for engine blocks are complex molds."

The proven light section process quickly proved to be the appropriate technology for examining the sand cores in detail.

However, an ordinary light section sensor was not sufficient to record and depict a sand core in all its details. The complexity of a sand core required a more sophisticated sensor system that could examine and check every corner—a challenge that Neddermeyer took on together with Dr. Michael Kleinkes, Development Manager at VMT. The result is a sophisticated interplay of multiple sensors that provide a precise 3-D image of each sand core and automatically compare it with the CAD design data.

SpinScan3D Sensor Symbiosis

The solution uses four SpinScan3D sensors that work in parallel. The movement and interaction of the individual components of this multisensor system are what allow for the exact imaging of the complex molds. A look inside the SpinScan3D reveals how VMT has modified the laser line triangulation for this task. As in the traditional light section process, an optical prism is used to expand a laser's light beam into an evenly luminous line. Two cameras in the SpinScan3D that work in parallel each examine a specific part of the laser line and record the height profile along it. This double laser line triangulation allows for an expanded measuring range without sacrificing measurement accuracy. The particular innovation of the SpinScan3D ultimately lies in the expansion of the sensor to include a motion axis. It is turned by a rotation platform so that the laser inside rotates around its own axis and the projected line runs over the object without interruption. During this process, the two cameras swing around the midpoint of the sensor and continuously record changes to the laser line.

All a Question of Perspective

Due to the rotating movement of the SpinScan3D, the viewing angle of the object is constantly changing at a measuring rate of 300 light sections per second, which results in a multitude of individual snapshots. The intelligent VMT software processes all recorded data, assembling





Down to the smallest detail: with rotating movements of the SpinScan3D, four perfectly coordinated sensors create a detailed image of the sand core and hence data for the casting mold.

» the countless individual images into a point cloud to create a 3-D overall image of the complex form. The reproduction is practically free of shadowing effects. This means that the SpinScan3D records and depicts almost every millimeter precisely. "While subsections of an object might not be recorded by traditional laser line triangulation because they lie in the measurement shadow, the different viewing angles of the SpinScan3D enable it to detect more points," explains Kleinkes. "We therefore provide a much more comprehensive data set and a high-precision 3-D image of complex objects." Thanks to the four perfectly coordinated sensors working in parallel, the VMT system can accurately record even the geometry of the large sand cores used for engine block casting. And the system works so quickly that it does not hold up the pace of production.

Data Processing Is the Answer

Such precise checks are made possible by the VMT software. It processes the large data volume with ease and not only provides the user with a detailed image of the sand core but automatically performs a comparison with the CAD design data for the casting mold. This is done by determining reference points for critical locations of the sand core. The software compares the recorded sensor data with the defined target dimensions and calculates the extent to which the virtual plan and the actual design agree. "This process, which brings together the virtual world and the real world, reflects the need for Industrie 4.0 components to provide electronically readable data from all phases of the product life cycle," Neddermeyer explains. If the quality of the sand core differs significantly from the CAD drawing, a warning message is



This is what our work is really about and what motivates us. We always have our customers in mind and work passionately to find the ideal solution every time.

Dr. Werner Neddermeyer, Project Manager at VMT





Due to the various viewing angles of the SpinScan3D, we are able to provide a much more comprehensive data set and a high-precision 3-D image of complex objects.

Dr. Michael Kleinkes, Development Manager at VMT



► www.pepperl-fuchs.com/news-spinscan3d

automatically sent to the control center so that the defective casting mold can be removed before the casting process. The system thus provides the user with all information needed before the casting process in a form that enables the necessary measures to be determined immediately.

Sensorik4.0®—Added Value for Industrie 4.0

Processing sensor data in a way that supports users effectively and optimizes production processes is an essential task of Industrie 4.0. The sand core inspection shows how VMT can convert large amounts of data into information that is useful and comprehensible for users in practice. Communication-enabled sensors play a key role by making big data accessible—from the field level to decentralized information systems and across all hierarchy levels. Pepperl+Fuchs uses the term Sensorik4.0® to describe such sensor solutions. By providing critical information and its visualization, they make a valuable contribution to Industrie 4.0 scenarios—both now and in the future. They help to shape processes as efficiently as possible along the entire value-added chain while simultaneously relieving the burden on personnel. Together with partner companies, VMT and Pepperl+Fuchs are constantly working on developing and further optimizing such Sensorik4.0® solutions.

No Time to Rest

From the first prototype of the SpinScan3D to the multisensor symbiosis in use today, numerous aspects have already been refined. Even though the SpinScan3D is now being used by customers, the project has not yet ended for Neddermeyer and Kleinkes. “There is always something that can be improved,” reports Kleinkes. “We are constantly working on polishing the system to offer our customers an even better solution.” And SpinScan3D is not limited to sand core measurement. Neddermeyer and Kleinkes have set themselves the goal of further developing the system for mass production and making it suitable for use in numerous other applications that require exact measurements. “This is what our work is really about and what motivates us to find the ideal solution every time. We always have our customers and their possible future challenges in mind—in the age of Industrie 4.0 more than ever,” Neddermeyer concludes. ■

RFID

The Key to the Smart Factory



Everyone is talking about RFID. Noncontact identification and localization is seen as one of the most important technologies on the path to Industrie 4.0. But does it live up to the hype? In an interview, Markus Halbig (Regional Sales Director for the Central Region Germany), Dr. Helge Hornis (Director of Technology, Factory Automation USA), and Dr. Klaus Schmitt (Product Manager RFID) offer insight into the current situation and explain the advantages users can expect in the future.

How do you view the current “boom” in RFID?

Helge Hornis: The perceived boom in RFID is not a phenomenon that has suddenly emerged but is, in my view, the peak of an evolution. Over the years, RFID has established itself internationally as an extremely versatile technology for identification and position determination in a wide range of areas. That it is getting even more attention now, in the context of Industrie 4.0, testifies, on the one hand, to its broad acceptance and, on the other, to huge potential for the future.

Markus Halbig: This assessment is consistent with our market observations. RFID is a technology that has been increasing in demand from our customers for years, and interest is continuing to grow. This applies both to the varied industrial applications that we at Pepperl+Fuchs primarily support, and also to other fields, such as the public sector or retail. Anyone who pays closer attention in everyday life will see RFID tags again and again—for example, in modern public libraries or as small sew-in labels in newly purchased jeans. This means that RFID is a noncontact but, at the same time, also very “tangible” technology (laughs).

Klaus Schmitt: The increased media attention RFID is enjoying at the moment certainly has to do with this omnipresence, which also makes the topic exciting for consumers outside the industry. All areas of public and private life are affected by increasing digitalization and networking. Whether we are referring to the overarching concept of Industrie 4.0, with a focus on the shop floor, or the broader Internet of Things, combining assignment and readability of object-related information is an important topic across all sectors—and RFID is the right solution for this.

Why is the “fourth industrial revolution” so closely linked with identification?

Markus Halbig: Decentralized, networked production with “integrated intelligence” according to the Industrie 4.0 concept can only function with a consistently large volume of information along the entire supply chain and its objects. Implementing this concept in a manufacturing plant means for our customers not only that the large amount of sensor data must be processed but that identification tasks must also be carried out. This starts with parts, tools, and machines and extends to containers or interim and end products. The relationships between these objects must be clarified. RFID thus creates a connection between the actual objects and their electronic container, the so-called administration shell.

Helge Hornis: Correct, the “smart factory” that has been mentioned so often lately depends on individual participants in the production process knowing exactly with whom they are dealing at any given moment. If all machines and components are equipped with RFID tags, they obtain a kind of memory. RFID has the advantage that information can be both read and written. No other technology can accomplish this. On the one hand, this allows for decentralized, flexible, and context-adaptive control of processes, and on the other, this opens up entirely new opportunities for evaluating and adjusting these processes based on comprehensive identification data. ☐



Over the years, RFID has established itself internationally as an extremely versatile technology. That it is getting even more attention now, in the context of Industrie 4.0, testifies to its broad acceptance and to huge potential for the future.

Dr. Helge Hornis, Director of Technology, Factory Automation USA





Tags and readers have continued to undergo rapid technological development. Our colleagues in product development are working constantly to extract every last bit of performance from the technology.

Dr. Klaus Schmitt, Product Manager RFID



» Could you outline an example scenario for our readers?

Helge Hornis: Imagine parts that are moving along a modular production line. They are equipped with RFID tags carrying information about the characteristics of the respective part. RFID read/write heads positioned on the production line read this information. Based on this data, each part then moves into the production cells that are relevant for their further processing. Here, a specific automated work step is triggered according to the information saved on the tag. If needed, the plant operator uses an HMI to visualize the assembly plans and other data associated with the object for the purposes of quality assurance. Thus, the component carries on the RFID tag the exact information required for its own further processing.

What specific advantages does this offer for the user?

Markus Halbig: Without manual effort or downtime for retooling, different variants of the smallest lot sizes can be produced on one production line. This is an effective solution for the key challenges our customers have to contend with in international markets: constant cost pressure, high quality standards, and maximum transparency. Our identification solutions are aimed at precisely these expectations. It is also possible to work more efficiently at the intersection of production and logistics: when, thanks to RFID, logistics knows at what stage and at which point goods are in production, completion and utilization can be predicted much more precisely.

Now it's time for us to talk about the underlying technology. Quite a bit has changed in the past few years. In your opinion, which developments are particularly important?

Klaus Schmitt: Technical progress should be seen as closely connected with today's suitability for Industrie 4.0. Most of our RFID customers are focusing on UHF technology in their applications—that is ultrahigh frequency radio transmission. Systems based on UHF are characterized especially by their high speed. This speed is now becoming more important than ever in the context of Industrie 4.0, which is very efficiency driven. Additionally, UHF tags can now record significantly larger data quantities than they could a few years ago. This is necessary in order to save the more complex and comprehensive information and parameters that are required for decentralized production lines.

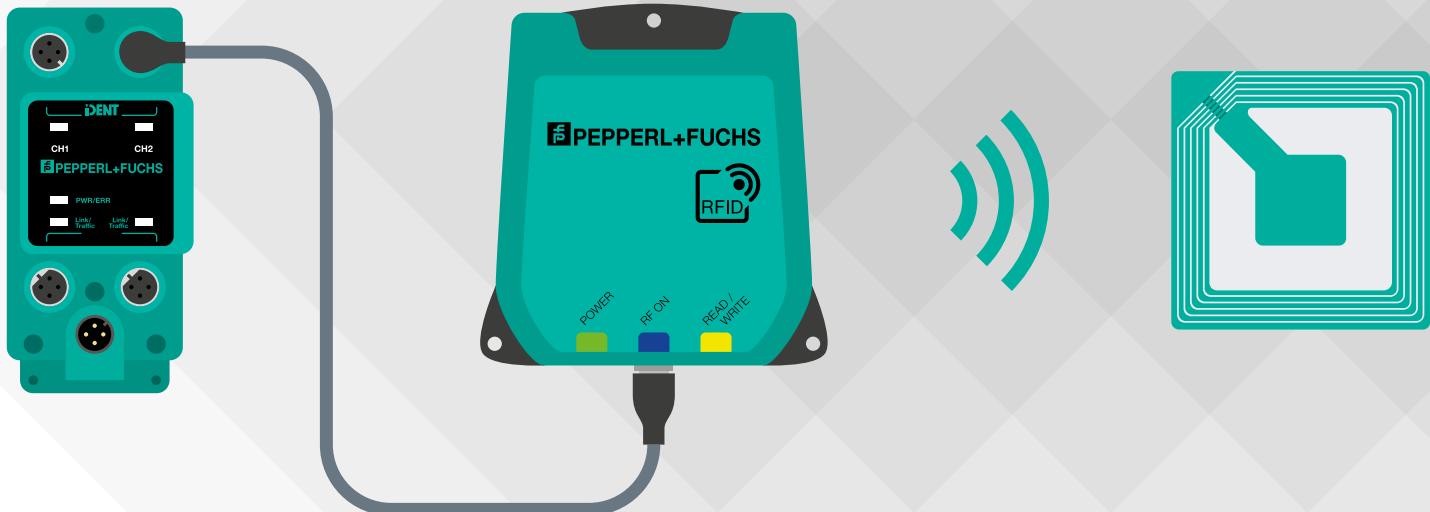
Markus Halbig: In addition, UHF tags are now so affordable that equipping an entire production process with tags is substantially easier to accomplish from a cost standpoint. At the same time, there is an array of tag designs available on the market. This means they can be easily integrated into a wide variety of processes from the most diverse industries. However, the right frequency must be chosen individually for each application. Pepperl+Fuchs is currently the only manufacturer offering an RFID system that can control the different read heads of all current carrier frequencies at the same time. This gives users maximum flexibility and future-proofing with minimal integration costs.

Klaus Schmitt: Tags and readers have actually continued to undergo rapid technological development. Our colleagues in product development are working constantly to extract every last bit of performance from the technology. For example, our F190 and F192 UHF read/write

heads offer switchable antenna polarization, which assists in reliable tag detection. The radio signal for these devices is emitted with a variable preferred direction, which permits excellent reliability in tag detection. These read/write heads can also capture large amounts of data from many tags within a wide detection field at one time—all important characteristics for future production lines.

Helge Hornis: In the context of Industrie 4.0 and the Industrial Internet of Things, connection to external software systems outside the traditional control loop or in addition to the PLC logic is, of course, also relevant. The potential of such approaches was of interest to Pepperl+Fuchs

long before the current trend. More than 15 years ago, we introduced the world's first Ethernet RFID system. Today, this Ethernet connection is more important than ever. EtherNet/IP, PROFINET, and other Ethernet-based protocols have noticeably come to the fore in recent years. The interpretation of production data exported from the RFID system, for example in ERP or MES, is a topic that will remain with us in the years ahead. OPC UA seems to be emerging as the future standard for this and will further simplify the integration of RFID systems. Therefore, we expect that the current proprietary protocols and various drivers will gradually lose relevance, and RFID will be even more in demand than it already is. ■



► www.pepperl-fuchs.com/news-rfid-hub



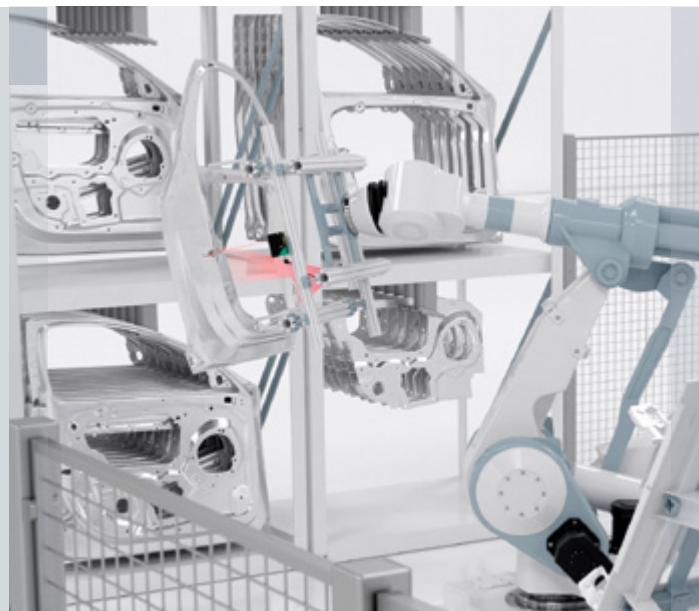
Without manual effort or downtime for retooling, different variants of the smallest lot sizes can be produced on one production line.

Markus Halbig, Regional Sales Director for the Central Region Germany



The Perfect Match

In the middle of an automobile manufacturer's assembly line, two robots, running at full speed, connect car body panels. They check, grasp, position, and weld. The SmartRunner Matcher plays a crucial role in this interplay of speed and precision. This new light section sensor provides application-specific profile measurement with integrated evaluation in a compact housing.



Learn more about ...

SmartRunner technology and the SmartRunner Detector, the specialists for high-precision monitoring tasks:

→ www.pepperl-fuchs.com/news-smarrunner

Alongside the "Detector," the "Matcher" is one of the first two representatives of the new SmartRunner technology. These products are based on a unique combination of light section sensor and vision sensor including LED lighting, thus opening up a range of completely new possible applications. "The result is plug-and-play light section sensors that can be used immediately and that have each been optimized for their specific task at the factory," explains Product Manager Christoph Blankenburg.

Perfectly Aligned for Precise Welding

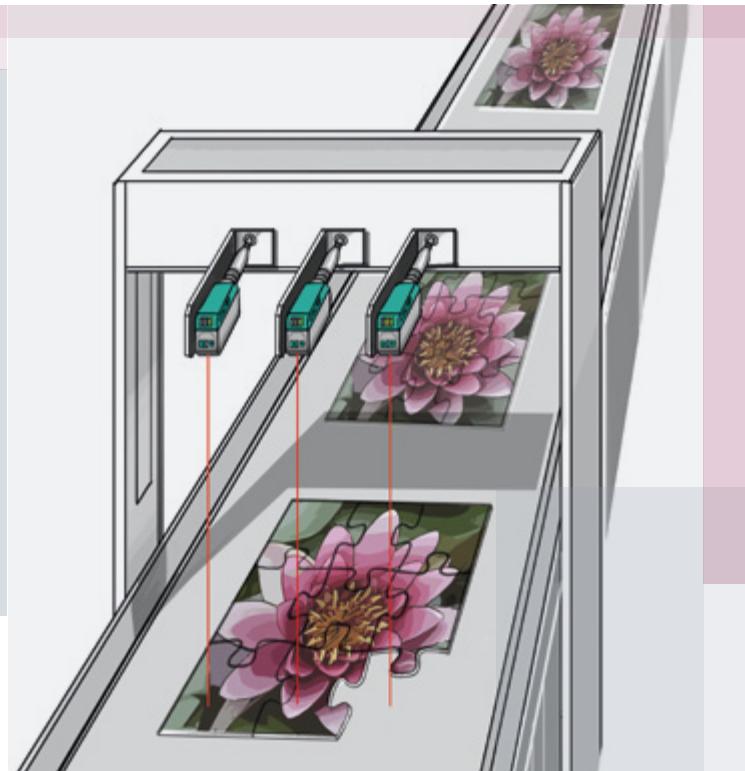
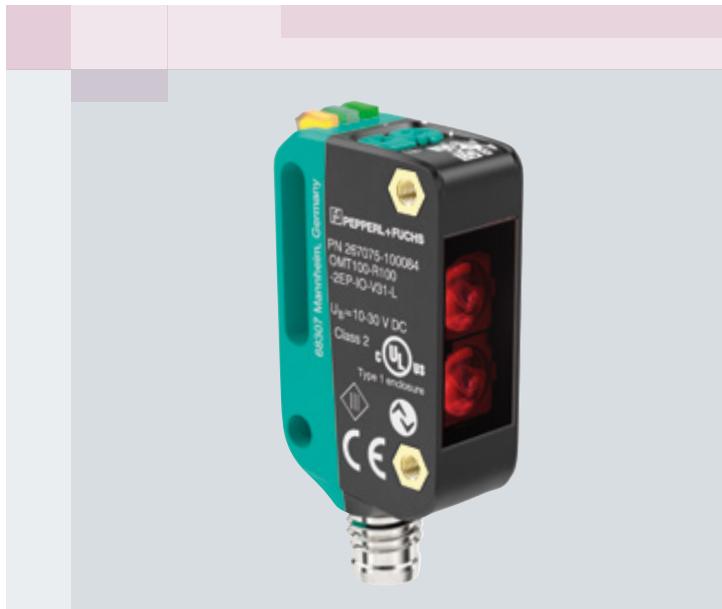
The SmartRunner Matcher's job is—as the name suggests—to perform a precise comparison of profiles. The best application example of this is car body construction in the automotive industry: piece by piece, industrial robots assemble the different sheet metal parts into a metal garment. The individual components must be precisely aligned before they are grasped, positioned, and welded by the robots. To check the correct alignment of the car body panels, two SmartRunner Matchers are used, each of which has been taught in a precise edge of the car body and refers to the profile comparison as a reference contour. Only after the correct component has been positioned exactly do both sensors issue a corresponding switching signal, allowing the robot to grasp the object unimpeded. "This creates a fluid process for the teamwork between sensor and robot that prevents unplanned down-times and damage to expensive car bodies and robots," Blankenburg explains.

Easy Commissioning, Flexible Operation

The commissioning of the new light section sensor proves to be extremely easy. "The user simply needs to mount the device, direct it at the profile to be recorded, and parameterize it using teach-in—that's all." Thanks to its wide coverage area of 180 mm, the SmartRunner Matcher allows the necessary flexibility even for temporary modifications to production. "If production is switched to a different car body, for example, it is not necessary to reposition the existing sensor system. A simple teach-in is sufficient to set up the sensor for a different profile," Blankenburg says. Additionally, the integrated vision sensor plus LED lighting makes it possible to parameterize the sensor quickly and easily using Data Matrix control codes. "This is a key advantage for flexible production in particular, because any number of sensors can be taught in again effortlessly using codes that can be generated individually," Blankenburg reports enthusiastically. ■

R100 Puts the Pieces Together

Vietnam, 2011: 1,600 students at the University of Economics, Ho Chi Minh City, put together 551,232 puzzle pieces of a lotus flower over a 14.85 m x 23.20 m area, earning an entry in the Guinness World Records. Now, imagine if the last piece had been missing ... unthinkable. To guarantee that a puzzle has all its pieces, R100 series photoelectric sensors help during production.



► www.pepperl-fuchs.com/news-r10x

Once the image has been chosen and printed on special paper only a few millimeters thick, a stamping process gives the puzzle its final pattern. It is especially important at this point that all pieces are present for further processing. To check every single piece, photoelectric sensors from the R100 series are mounted in a row and detect a complete side of a puzzle in one pass. Because a single puzzle piece is usually no wider than 2 cm and each piece must be recognized individually, 25 sensors are required for a 70 cm x 50 cm puzzle, for example. R100 distance sensors fit into the process perfectly because their extremely compact housing allows not only individual detection but also seamless, space-saving integration.

Another challenge is the correct detection itself, because a puzzle piece is not only small but can also be very thin (often only 1.6 mm). R100 sensors detect even minimal height differences precisely and reliably. They detect independent of color and have an extremely small black-white difference—the actual puzzle image plays no role. Even in high-frequency lighting or under changing conditions, they exceed expectations with an optimal result. In this regard, they even offer technical advantages compared to high-priced camera solutions.

The secret of the R100 distance sensors is Multi Pixel Technology, which combines the proven triangulation principle with the measurement functionality of standard distance sensors. The compact size of the measurement core makes integration in a very small housing possible so that even tight spaces are no problem. After stamping, only the complete puzzles are broken apart by machine, shrink-wrapped, and prepared for distribution. Now nothing can stand in the way of the next record-breaking puzzle session. ■

Trust Is Good, Redundancy Is Better

The tenth driver's cabin of the morning rolls past the vehicle engineer. By now, he knows what it's like to have the imposing driver's cabins and truck bodies hanging over him while he inspects the powerful machinery. As he works, he places his trust in the capability of the heavy-duty monorail conveyor. This trust is based on an adaptive safety concept realized by the company gmo Industrieautomation with the help of state-of-the-art, redundant rotary encoder solutions from Pepperl+Fuchs.



Monorail conveyors, often used in manufacturing and assembly lines in the automotive industry, make high demands on technology when it comes to safety. "Personal safety within the manufacturing area beneath the conveyor is of particular importance," explains gmo Managing Director Volker Ostrowski. If existing plants need to be modernized—preferably without extended production downtimes—this also poses considerable challenges for solutions providers. "On the one hand, plant operators demand at least performance level d to transport suspended loads safely in the monorail conveyor hoisting

gears. On the other hand, they are naturally looking for cost-effective solutions," says Bernd Fischer, Key Account Manager Automotive and part of a three-member project team at Pepperl+Fuchs, as he summarizes the industry demands.

Movement and Downtime Safely Monitored

Whether lifting and lowering or gripping and swiveling, a monorail conveyor has many tasks. In addition to the speed of these actions, the direction of movement and specified downtimes for a position



must also be monitored. This movement and downtime monitoring is performed in the monorail conveyor hoisting gears. A redundant safety concept is needed to maintain the stated safety level. This is usually provided by means of various technologies. Industry experts tend to use products from various manufacturers for this because the sensors need to differ from each other significantly, an approach that can increase the functional and failure reliability of a system. "Because we at Pepperl+Fuchs have a rotary encoder portfolio that includes both optical and magnetic operating principles, we are able to achieve the highest safety level by linking together standard components," Fischer reports, adding: "This combination ensures that systematic failures are excluded. As a result, every safety brake that is installed on a monorail conveyor hoisting gear is brought into a safe state."

Two Absolute Rotary Encoders, Double Reliability

The challenge was posed as part of plant modernization in the movement and downtime monitoring of the monorail conveyor hoisting gears. The solution lay in direct mechanical length measurement. This was tackled using two cable pull rotary encoders from the Pepperl+Fuchs Premium Line mounted in parallel. Thanks to the different sampling technologies employed, they create a redundancy, thus meeting the safety requirements of EN ISO 13849-1. One of the two absolute rotary encoders works using an optical scanning principle. "The light of an LED falls on a rotating disk with a code pattern, which creates a periodic modulation of the luminous flux. Since each position has been assigned a unique bit pattern, each angular position provides a unique pattern and thus an absolute position value," says Product Manager Stefan Horvatic, explaining the operating principle. "The advantage of absolute rotary encoders very clearly lies in the absolute position value, which is available at all times; there is no need for time-consuming reference runs, either when switching on the machine or if there is a failure of the supply voltage."

Appealing and Wear-Free

This is also true of the counterpart: the second rotary encoder for movement and standstill monitoring. It uses an innovative, magnetic operating principle and is set apart in the 0.1° class through its high precision and dynamism. "This component uses a two-axis Hall effect sensor, which generates a sine or cosine signal via a rotating magnetic field. This signal is processed by an internal processing unit so that the process value is equal to the output value of an absolute rotary encoder with optical scanning," says Nils Schlemmer, another Product Manager at Pepperl+Fuchs, emphasizing its distinguishing features. "Other than complying with the required redundancy, using the mag-

netic rotary encoder allows us to benefit from its compact size. The maintenance and service requirements are also low, because there is no mechanical gear that can wear out."

However, because a monorail conveyor requires more than just movement and standstill monitoring, other aspects needed to be considered during the modernization. The grasping of conveyed loads, transport to the assembly stations, compliance with height limits, and positioning at the appropriate working heights must be precisely monitored. "The joint planning discussions show how many of a plant's aspects can be taken into consideration but can also be solved by a holistic motion sensor system," says Fischer, recalling the design phase. Optical and inductive sensors from Pepperl+Fuchs are also used, such as laser distance sensors, which help prevent collisions and reduce speed in monorail conveyor chassis. "We value the cooperation with Pepperl+Fuchs, not only because they offer a comprehensive portfolio of sensor systems, but also because they understand the requirements and connections that are important to us. This enables us to provide integrated solutions for the end customer that stand apart in terms of their safety and cost effectiveness," Ostrowski sums up happily. ■

→ www.pepperl-fuchs.com/news-cablepulls



iGo Where You Go

Picture your ideal coworker. Independent but still a team player? Highly motivated and enthusiastic without being distracting? Gives you breathing room but is there when you need them? Now imagine we are not talking about a person but a horizontal order picker: the iGo neo CX 20 from STILL. Together with the Pepperl+Fuchs R2000 2-D laser scanner, an innovative new helper has been created for the logistics sector to be there every step of the way.

The daily routine in a warehouse consists of lifting and loading, bending and transporting, walking and standing. People who choose the job of a picker must be physically fit, stress-resistant, and meticulous. As a provider of intelligent intralogistics solutions, the development team at STILL is constantly looking for ways to improve logistics processes. When it came to horizontal picking, efficiency needed to be increased. "Our goal was to increase performance, making fatigue-free work possible, and provide improved ergonomics through increased route efficiency," reports Christian Fischer, Director of Business and Automation Solutions Product Management at STILL: "We achieved this goal with a full 30% increase in picking performance."

Autonomous and on Demand

Previously, operators had to climb on and off to move the horizontal order picker—the goal was to reduce this to a minimum and make the movement of the vehicle as autonomous as possible. "Because our Sales and Research and Development departments have been cooperating closely with Pepperl+Fuchs for years, we shared with them our vision for 'automation on demand,'" Fischer reports. The new product needed to move and steer autonomously and follow the operators intelligently. The vehicle also had to meet the demanding safety requirements of a warehouse by avoiding obstacles, reducing its speed if necessary, crossing intersections only with operator approval, and maintaining a defined distance to shelves.

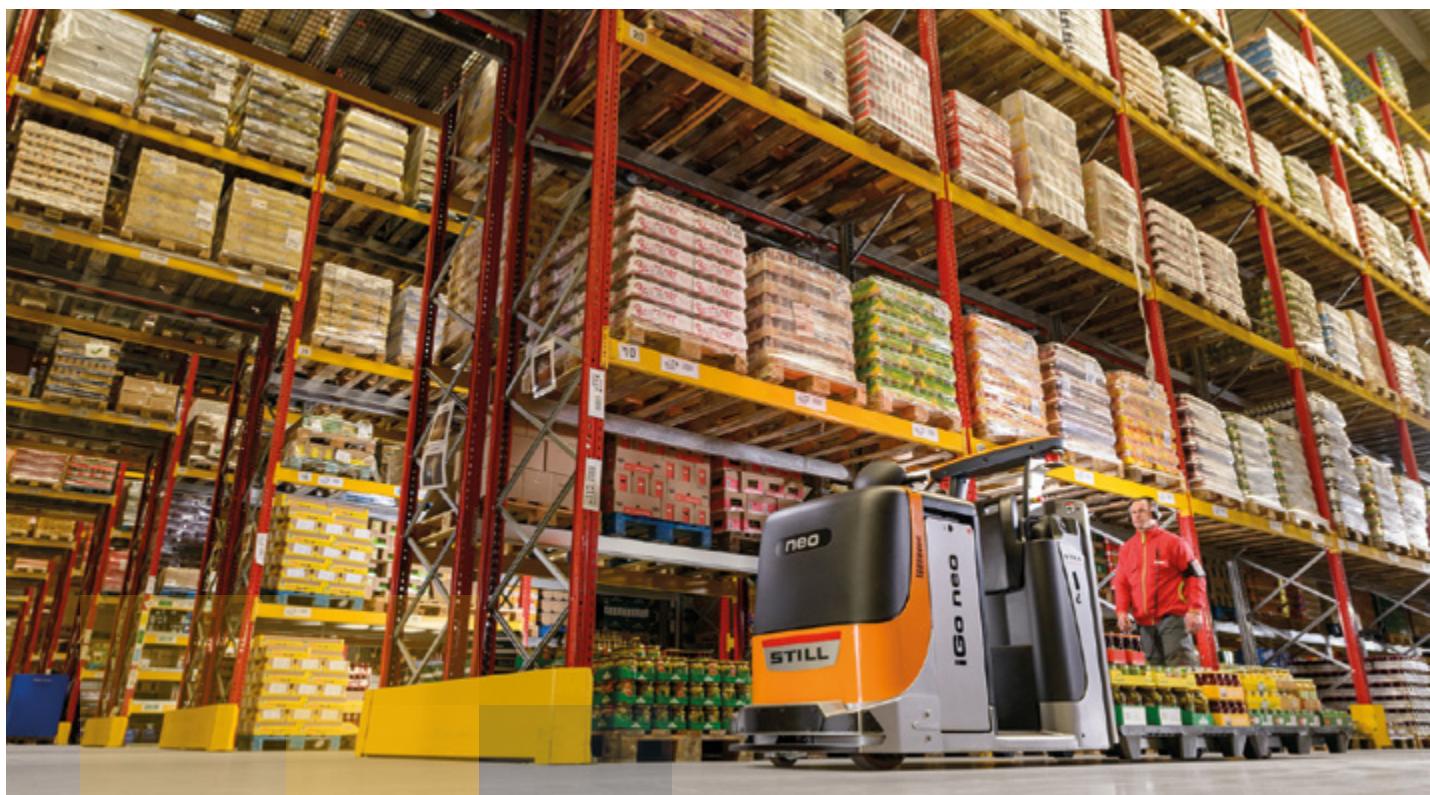
"The R2000 2-D laser scanner perfectly fulfills the requirements for the robot-based assistance system," says Alexander Hermes, Key Account Manager at Pepperl+Fuchs. The distance-based photoelectric sensor is equipped with innovative Pulse Ranging Technology (PRT) for reliable and unambiguous measurement results. It reliably detects objects and is unaffected by interferences like extraneous light. For the iGo neo CX 20, one optimally fitting HD model from the R2000 family is mounted on both the left and right sides behind the driver's seat. The employee climbs onto the order picker and manually drives it to the targeted shelf. Here, the vehicle control identifies this person as the responsible picker from the R2000 measurement data and follows them continuously using multidimensional object recognition. "Thanks to its 360° measuring angle—combined with a small spot size, high angular resolution, and a measuring range suitable for long distances—the sensor has a complete panoramic view. It doesn't matter if the operator is next to the order picker, in front of it, or behind it; the iGo neo CX20 will find them," Hermes adds. The system, consisting of a vehicle control and two laser scanners, is not diverted by other order pickers or other operating personnel. Further, the initial setup is easy and the vehicle is ready to use immediately after delivery. "The vehicle follows the operator independently, detects their position, and

always positions itself perfectly in relation to the shelf and the person," Hermes adds. Its intelligence also allows it to detect empty shelves and pass them. All of this happens while adhering to the many safety regulations—the vehicle will even wait for operator approval before crossing intersections. "With this application, which makes day-to-day order picking easier and increases concentration on the task at hand, we were able to take an important step forward for robotics in intralogistics," Fischer summarizes. "The 'new coworker' will not leave its operator's side." ■

I've Got My Eye on You ...

An innovative menu navigation system has been expanded into a real-world application. The R2000 2-D laser scanner has an interactive display that allows it to show text and graphic messages. For its first public presentation, the photoelectric sensor was given two eyes that followed the movements of trade-fair visitors and thus "kept an eye" on them.

During the commissioning of the iGo neo CX20, this function has been made an integral component of the vehicle-picker interaction. With its interactive display, the sensor shows the operators that they are registered with the selected horizontal order picker when it is in driving mode and also who exactly the machine is following.



www.pepperl-fuchs.com/news-r2000



www.still.eu





In Shape for Success

It started with a pilot project in Mannheim preproduction in 2007. Today, LOOP—Pepperl+Fuchs' lean management system—is an integral component of the corporate philosophy. True to the “less is more” motto, this helps us avoid inefficiency along the value chain and systematically align all activities to the benefit of our customers. Join us for a look behind the scenes at our formula for success.



The quickest route to the goal does not always have to be the direct one; it is often the looping detours that lead to success. The best example is LOOP: Lean Operation and Organization in Production. With its lean management system, Pepperl+Fuchs implements the flow, rhythm, pull principles, and the zero-error principle in its own unique way—always with the goal in mind of fulfilling customer needs efficiently and flexibly. In doing so, the focus is on designing stable and transparent processes without any kind of waste. “LOOP is a continuous process, which—as the name itself says—runs through loops,” explains Christian Schwöbel, Director of the department for Global Lean and Technology Management. “Our team is always looking for solutions that help prevent waste and increase value creation for our customers and for us.” To achieve this goal, detailed analyses of the processes, operations, and workspaces are necessary.

The principle seems simple: separate wasteful activities from value-adding ones. But what is waste and what causes it? “Time and resources are the main things that can be wasted—on a small and a large scale,” answers the LOOP expert. “This could be disorder in the workspace or careless coordination of entire process chains. A consequence could be overproduction, high inventories, and waiting times. To say nothing of ineffective work processes and rework.” It is important to recognize these and similar weak points and to remedy them. Particularly in the era of Industrie 4.0, peak operational performance is demanded every day in order to meet the customer’s desire for individuality, availability, and, of course, the highest production quality. ☐

» “A real-world example: at our facility in Ho Chi Minh City in Vietnam, we were able to use LOOP to improve the processing time and productivity in manufacturing our L2 series sensors by more than 25%,” Schwöbel outlines. To achieve this, the LOOP team shifted, linked, and optimized entire process steps. The result is a production process according to the one-piece-flow principle. “Once the raw material has been put in motion, production should preferably not stop at all until the product has been packaged at the end and can be delivered directly to the customer,” Schwöbel explains. “Unavoidable interruptions, such as hardening or drying processes, are integrated into the process as optimally as possible.”

All levels at Pepperl+Fuchs work closely together—both top down and bottom up—to recognize and make use of these and other potential improvements. The Shop Floor Management (SFM) also takes on a key role here. “As a valuable management tool, it helps to visualize weaknesses, optimize processes, schedule resources, and solve problems where they occur—quickly, directly, and without bureaucracy,” Christian Schwöbel says, adding: “This, in turn, considerably increases our adherence

to delivery dates.” For this purpose, team leaders and employees meet daily at fixed times for “SFM cockpits.” A ritual that the responsible managers incorporate into day-to-day operation. The ongoing, direct exchange and rapid decision-making channels also act as a driving force for greater commitment and initiative among employees.



Loop

Positive Interim Result

LOOP was introduced at Pepperl+Fuchs more than nine years ago. Today, the expert sees a positive interim result: “Cooperation with our facilities around the world is working very well. Our tips have been taken on board and implemented successfully.” An international team now consisting of 15 experts works steadily and purposefully every day to get a little bit closer to the ideal of waste-free production. In other company divisions, such as the European Distribution Center in Mannheim, the new Global Distribution Center in Singapore, or our worldwide Solution Engineering Centers, the proven LOOP methods are also being adopted with great success—and things are expected to progress even further.

To continue the success story and implement lean management throughout the company, the lean management team has been separated from the Global Lean and Technology Management department and placed under the leadership of Stefan Klein, directly under the management board. “Our mission is to promote consistent and optimized alignment of all our business processes throughout the organization while focusing on the value

stream, thereby introducing a profound change—to practically embed the lean approach in the company DNA,” Klein as Director of Global Lean Management says enthusiastically. Schwöbel adds: “Because customers are ultimately the focus of all company departments, we are all pulling together for them, aiming to serve them faster and more reliably in the future. LOOP, together with other lean management strategies, is laying the foundation to make Pepperl+Fuchs even more dynamic—almost like a ‘fitness program’ for our customers’ benefit.” ■



新加坡

Singapore

All of Asia in One Country

Considered the gateway to Asia: Singapore, as multifaceted as a country can be.

In 1979, Pepperl+Fuchs ventured into the Far East for the first time with the foundation of a subsidiary in the Southeast Asian city-state. Today, the automation company from Mannheim has strong roots in the “Lion City” and appreciates the local culture and rich traditions.

Lively alleys in Chinatown, the scent of exotic spices in Little India, hustle and bustle at the bazaar in the Arab Quarter, and finally the impressive Marina Bay—Singapore is a diverse melting pot, characterized by a wide variety of cultures, a colorful mix of Asian traditions, and an ultramodern business hub. Anyone who visits the city-state in the south of the Malaysian Peninsula will be equally impressed by rituals, temples, and foods from all parts of Asia as by the futuristic skyscrapers and cutting-edge technologies. It is no wonder that nearly 1,500

German companies have settled here to serve the Asian market—because the cultural diversity in Singapore promotes understanding of other Asian countries.

Numerous Reasons Attract Companies to Singapore

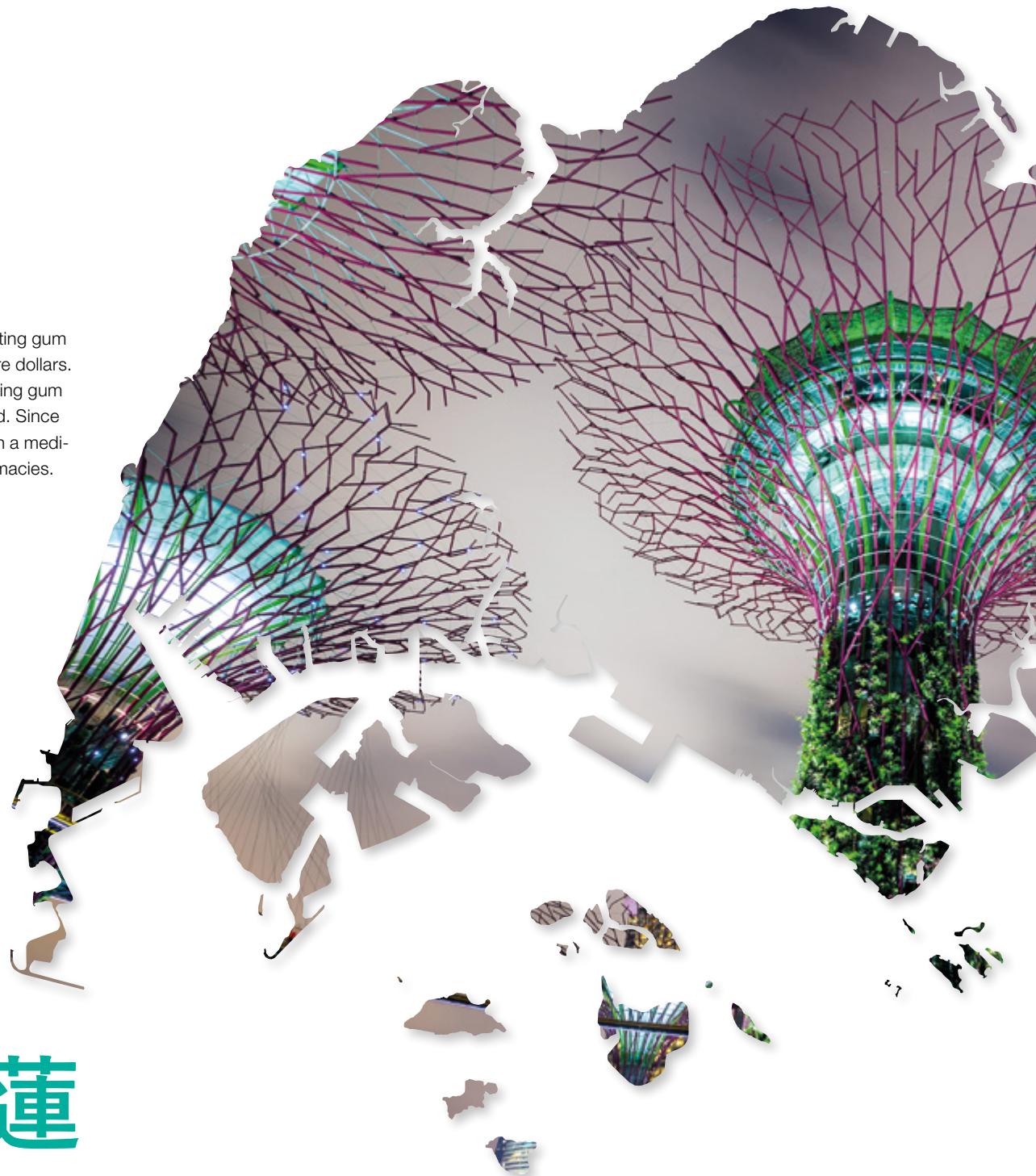
In 1979, Pepperl+Fuchs founded its first subsidiary outside Europe with its own production in Singapore. The city-state was chosen as the first facility in Asia not only because of its diversity. ➤

獅城

Lion City. The English name of Singapore is an Anglicization of the native Malay name for the country, Singapura, which originates from Sanskrit, meaning "Lion City." The state's ideals, represented by the five stars in the flag, are democracy, peace, progress, justice, and equality.

膠

Chewing Gum. Spitting gum costs you 500 Singapore dollars. Until 2004, selling chewing gum was generally prohibited. Since then, you can buy it with a medical prescription in pharmacies.



榴蓮

Durian. The country's delicacy and stinking fruit durian is prohibited in the metro. It tastes like a blend of melon, banana, and kiwi fruit.

生活費用

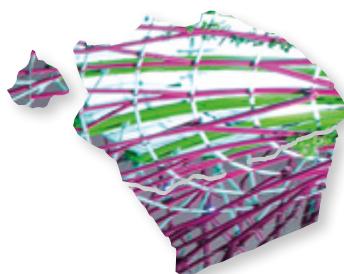
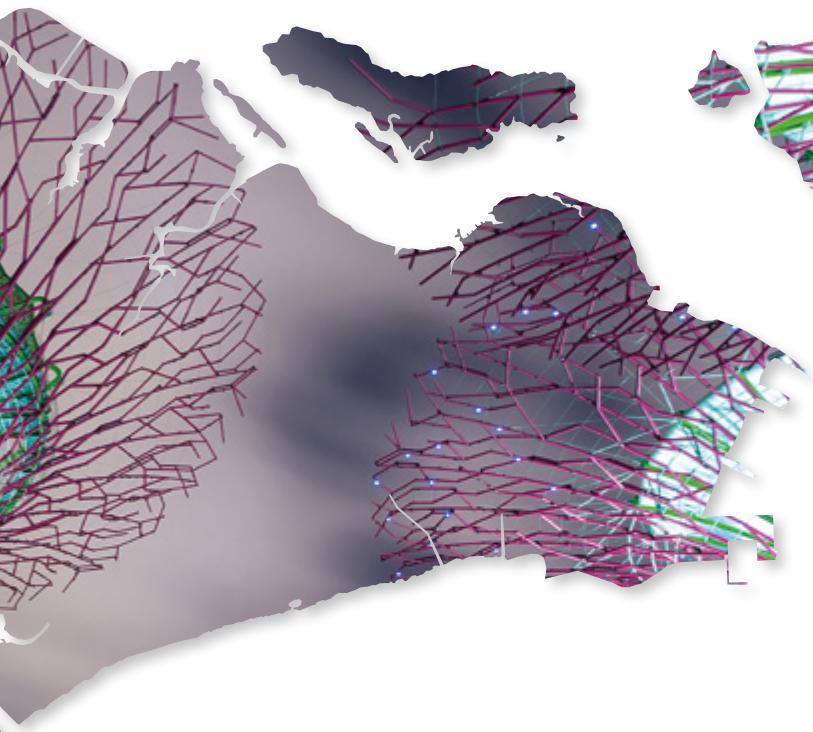
Cost of Living. Singapore is one of the most expensive cities in the world.

國歌

National Anthem. You can find the national anthem in microtext on the back of the 1,000-dollar note.

Figures+Facts

Capital	Singapore
Area	718.3 km ²
Population	5,498,000
Form of government	Republic
Head of state	President Tony Tan Keng Yam
Head of government	Prime Minister Lee Hsien Loong
GDP	270.8 billion US dollars (2011)
National anthem	Majulah Singapura



Edwin and Kafka are the first generation of “Poly-goes-UAS” students at Pepperl+Fuchs in Mannheim.



» “Political stability, anticorruption measures, and also the stable legislative environment were important points for us even back then, and Singapore fulfilled them,” explains Mehmet Hatiboglu, Managing Director for Production, Logistics, and IT at Pepperl+Fuchs. These aspects remain true. Singapore is still one of the countries that affords the best protection of intellectual property rights, as Hatiboglu further explains. This is a key advantage for companies whose products are often copied abroad.

In logistical terms, Singapore is ideal because the country excels with outstanding infrastructure: the Port of Singapore is among the busiest transshipment ports in the world, and approximately 1.8 million tons of freight are transported through Changi Airport every year. “In matters of logistics, Singapore is the central hub in Asia,” reports Jürgen Seitz, Director of the Singapore facility. “The government also supports

companies in the import and export of goods. The regulations are very business-friendly, so they considerably simplify logistical efforts,” Hatiboglu adds. For these reasons, the decision to establish the Global Distribution Center (GDC) in Singapore was also an easy one. Pepperl+Fuchs products will travel all over the world from the newly built logistics center with a total area of 20,000 m².

Investment in the Specialists of Tomorrow

Out of 2,400 employees in the Asia region, approximately 1,000 are at the Singapore facility today. For the future, Pepperl+Fuchs is also focusing on training qualified young professionals here. For example, the company is working together with the government agency Singapore Economic Development Board (EDB) and other German companies in the “Poly-goes-UAS” program. The partnership allows young people from Singapore to pursue dual engineering studies in Germany. »



Once they have passed the hurdle of the selection process, students first attend a German course in Singapore before they get their first taste of Pepperl+Fuchs air in Mannheim in a pre-study internship. The subsequent three-year course of study at Baden-Wuerttemberg Cooperative State University includes multiple phases at the company so that the students are always in contact with practical applications and get to know the business in all its facets.

Graduates of the program are highly qualified to work for the Mannheim company in Singapore. "In addition to a dual university degree, participants also have the necessary understanding of Asian cultures and markets—and at the same time are familiar with the roots of Pepperl+Fuchs," explains Seitz. "This is a big advantage for all participants when it comes to communication and mutual understanding and allows us to strengthen the Singapore facility for the long term." ■



Singapore

Is Asia for Beginners

Eddy Wijaya

Production Representative SEA

Eddy Wijaya has been working as a Production Representative at Pepperl+Fuchs in Mannheim since May 2016. Before that, he worked for the German company at its Singapore facility for 17 years.

In an interview, he told us more about his duties and experiences at Pepperl+Fuchs.



Mr. Wijaya, you have been in Germany since May.

Have you settled in well?

I have settled in very well, but it has not been too hard. I had already lived in Germany for eight years during my studies at Technische Universität Darmstadt. So I knew what to expect (*laughs*).

So you must like Germany if you are back again?

I like Germany very much; Europe in general fascinates me. There are so many beautiful places to be discovered here and so many traditional things: a castle here, a château there. It's possible to drive into the countryside, visit a wine festival in the Palatinate region, run, ride a bicycle, and enjoy nature and culture. In contrast, in Singapore people always want to enter another air-conditioned building quickly due to the temperature. People spend their free time completely differently.

But is there anything that you miss?

Honestly, the food: simply going to a food court and eating some noodles with meatballs—I do miss that. But when I'm in Singapore, I miss *doner kebab*. And, of course, the hearty cuisine: *Handkäse mit Musik*, a German specialty cheese, *Saumagen*, stuffed pig's stomach, and wine spritzers (*laughs*).

What are some of your responsibilities as a Production Representative?

I work in the product transfer section. Even when I started working for Pepperl+Fuchs in 1999, I was involved in the transfer of ultrasound products from Mannheim to Singapore. Now, I'm here to bring an Asian point of view to the planning and preparation of product transfers. Thanks to my experience in this area, but also to my understanding ☺

個熔爐

A Melting Pot



» of how things work in the Asian market, I can draw attention to things that otherwise would only be noticed later and have to be changed. At the same time, I can promote more understanding in Singapore by explaining things that the local colleagues there might not be familiar with and understand. So my job has a lot to do with communication and understanding, both in Mannheim and in Singapore.

What brought you to Pepperl+Fuchs in 1999?

After studying in Germany, I returned to Asia. As a company, Pepperl+Fuchs offered me the perfect combination: on the one hand, because it's a German company and I studied in Germany and, on the other hand, because it fit my field of study, electrical engineering. Right at the first interview, I noticed that the chemistry was good, and it has stayed that way. Colleagues were incredibly accommodating, and I am still in contact with many of them today. I also meet up with many of them again here in Mannheim.

In your opinion, what is the advantage of companies having a facility in Singapore?

Singapore is Asia for beginners (smiles). Back then, Pepperl+Fuchs was one of the pioneers that made the leap to Asia. Many attractive conditions were created—for companies as well as for employees. That's why many well-educated people come to Singapore even now, which is naturally good for companies. In addition, Singapore

has a good strategic location. It is central, all of Asia is within easy reach, and there are many advantages in terms of logistics. Singapore also has a very Western orientation, so it gives companies from all over the world easier access to all of Asia. Singapore is ... like New York. A melting pot.

Final question: coffee or tea?

(laughs) Both. I definitely need a cup of coffee in the morning and also while I work. But in the evening, I also enjoy drinking a cup of tea.

Thank you very much, Mr. Wijaya! ■



EVENTS 2016/17

MEORGA MSR-SPEZIALMESSE

November 09, 2016
Bochum, Germany

SPS IPC DRIVES

November 22 – 24, 2016
Hall 7a, Booth 330
Nuremberg, Germany

VALVE WORLD 2016

November 29 – December 01, 2016
Hall 4, Booth 4A22
Düsseldorf, Germany

11

MANUFACTURING INDONESIA

November 29 – December 3, 2016
Hall C, Booth 7517
Jakarta, Indonesia

12

2017

01

02

INDUMATION.BE

February 08 – 10, 2017
Booth H1-A141-1
Kortrijk Xpo; Belgium

03

LOGIMAT

March 14 – 16, 2017
Hall 3, Booth 3B08
Stuttgart, Germany

CFIA

March 7 – 9, 2017
Rennes, France

04

HANNOVER MESSE

April 24 – 28, 2017
Hall 9, Booth D76
Hanover, Germany

05

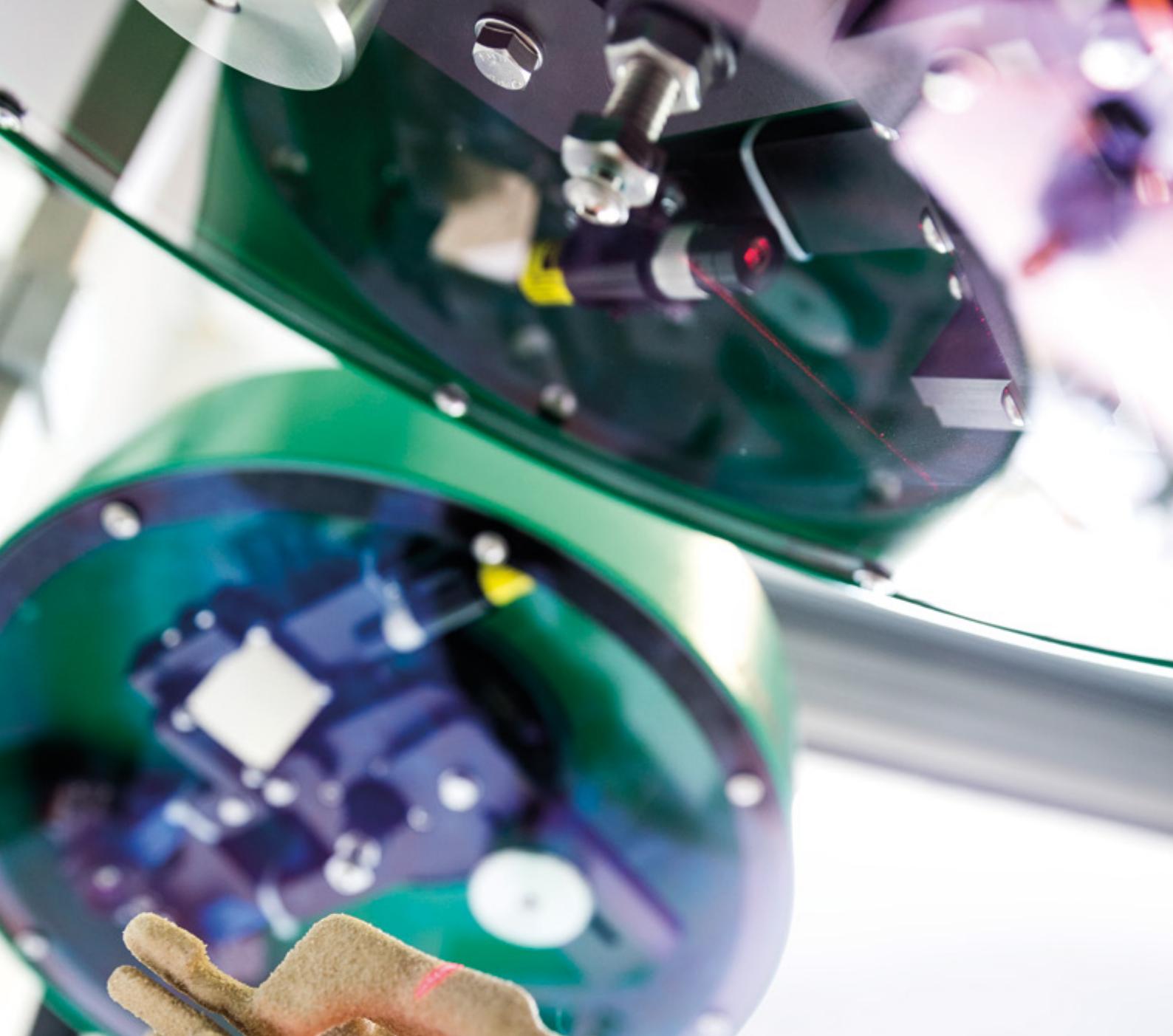
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