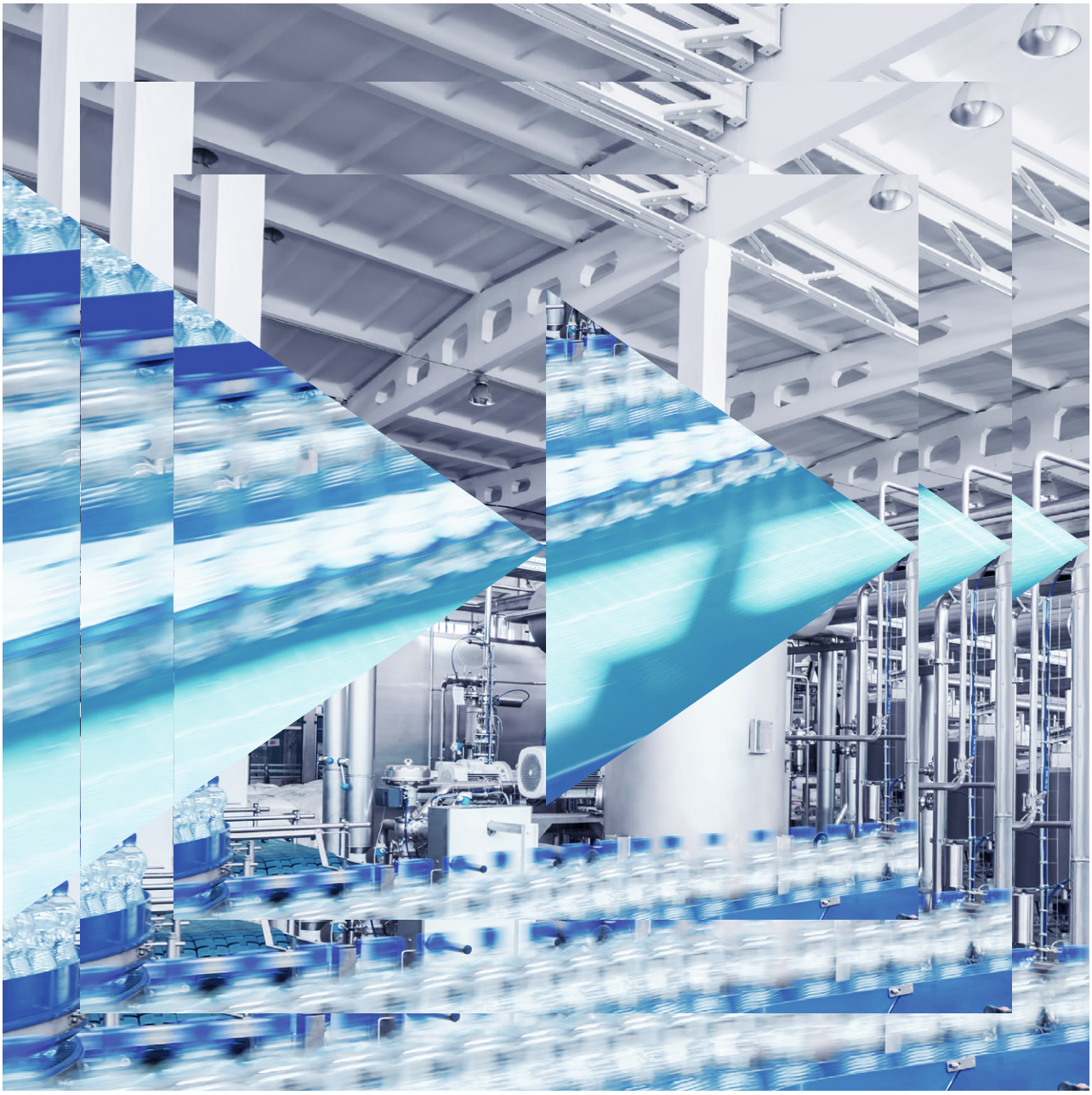
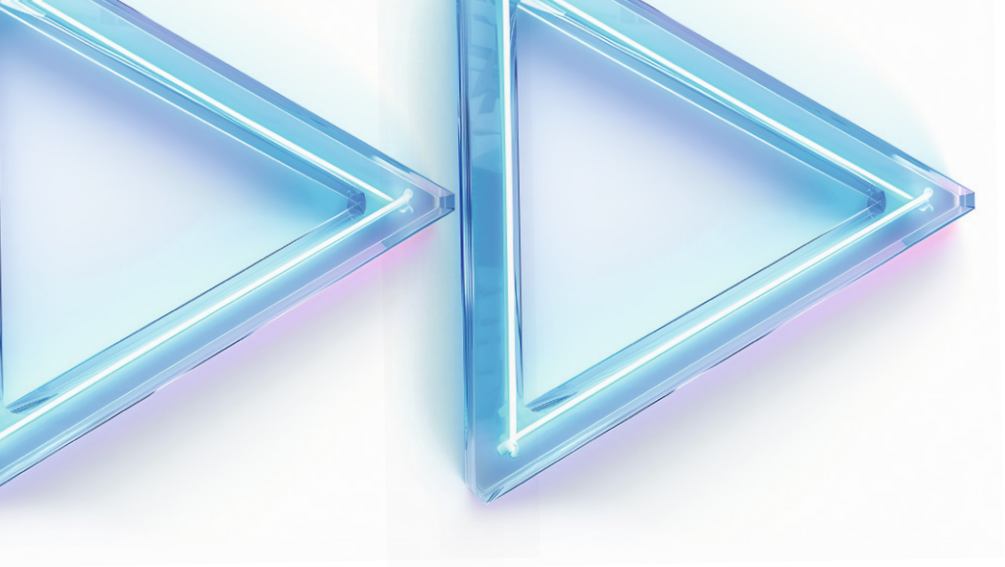
SICK
Sensor Intelligence.

PACE



MAGAZINE 2024

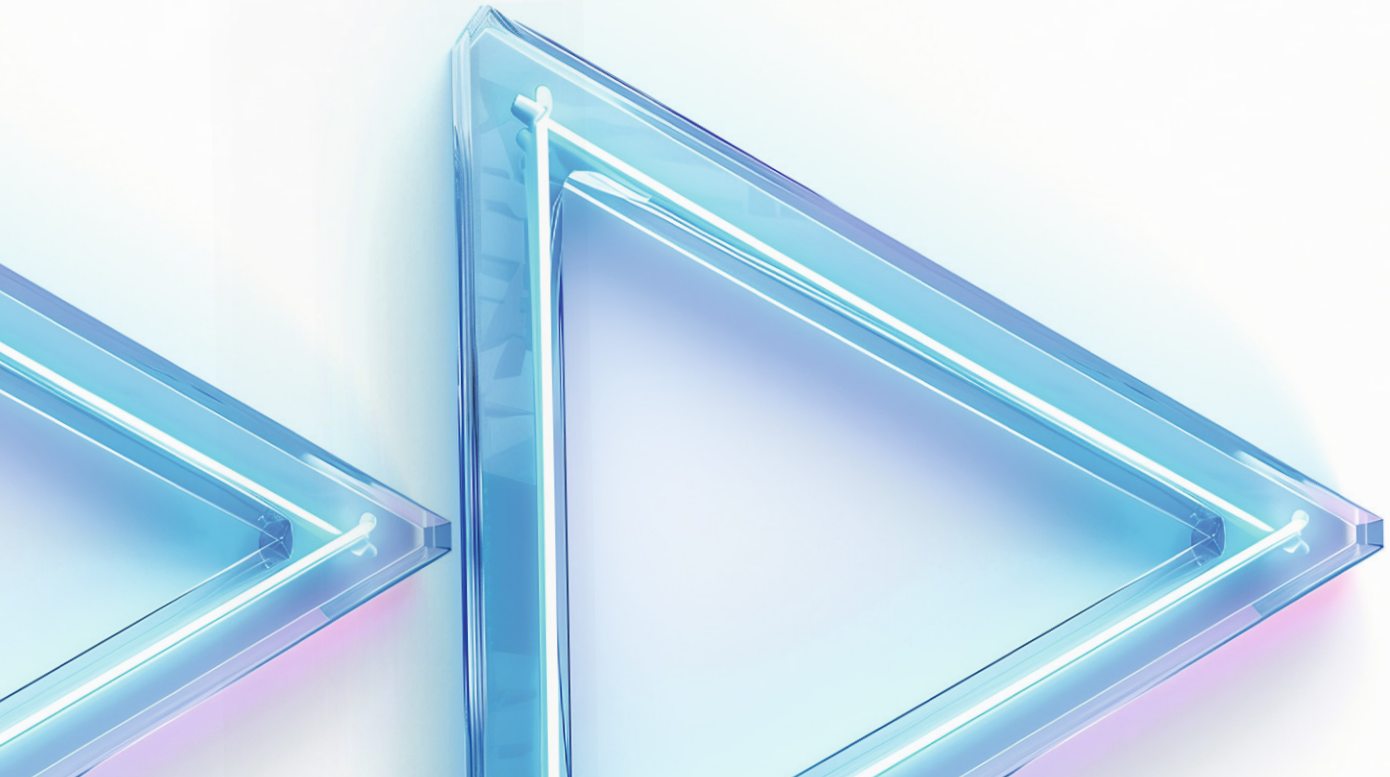


FAST

FORWARD FOR

SENSOR

INTELLIGENCE.



Dr. Mats Gökstorp
Chairman
Products & Marketing

Dear Readers,

The highly dynamic nature of the markets and technological progress require solutions to be found at an accelerated pace. We are constantly adapting our speed in order to gain and maintain a competitive edge for our customers and ourselves by using our accelerating powers sensibly. After all, faster does not automatically mean better, and faster is linked to performance. But faster also means gaining time.

The articles in the magazine show that those who gain a head start and time through speed can use it intelligently for new ideas and sustainable decisions: Working together with the customer to implement innovations that make systems easier for the operator; prevent congestion on conveyor belts with the help of Artificial Intelligence; turning a complex concept into a ready-to-use solution for self-installation that is ready for the market; using an algorithm to ensure seamless compliance for ship operators; or using Deep Learning to automate even more complex tasks even more easily.

Read in the PACE magazine how we set the pace with commitment and Sensor Intelligence.

Mats Gökstorp

F A S T

F A S T E R

01

THE CUTTING EDGE

for tire manufacturing: The MLG-2 WebChecker from SICK is taking cord cutting lines to the next level

It's a Friday morning in mid-January 2024. The place: the large assembly hall at the mechanical engineering company Karl Eugen Fischer GmbH in Burgkunstadt, Upper Franconia. Today, roughly a week before delivery to the customer, the world's leading manufacturer of cord cutting lines for tire manufacturing will put one of the lines through its paces – and we get to be there live to report on it with texts, images and videos. After all, we're talking about a very special machine that, thanks to the installation of a solution from SICK, is taking the performance of these lines to the next level.

Achim Sorg, Lead Account Manager Automotive & Electronics SICK Vertriebs GmbH, and Jörg Weiser, Application Engineer Automotive & Electronic SICK Vertriebs GmbH, have also come to visit their customer KE Fischer today: the two sales experts are the people who first had the idea of applying the SICK solution to this type of line. Together with Frank Schmidt, Head of Software, Electric Engineering & R&D at KE Fischer, and his team, they've now made that idea a reality.

Frank Schmidt has been working at Karl Eugen Fischer, where he is now responsible for innovation and digitalization, for over 24 years. Today, he's here to answer our questions and accompany us for the photo shoot and video. At the very beginning of our meeting, Achim Sorg emphasizes how the 39-year-old constantly pursues improvements, exploring new avenues in the process: "Being able to work with a customer who so intensively pursues innovation is an absolute stroke of luck." You can also clearly sense the trusting, easy-going atmosphere between the three men: the SICK salesmen and Frank Schmidt get on famously and are proud of what they have achieved together.

Even tires have belts

Our path leads us through the massive hall to a brand spanking new freshly painted, approx. 40-meter-long cord cutting machine, which is already running in test mode and being closely monitored by several KE Fischer staff. The room smells like metal and tire rubber.

First of all, Frank Schmidt explains what the machine actually does: the line cuts what is known as steel cord calender. This is the rubber-coated steel wire that is needed for the "belts" in tires. Within the line, steel cord is fed from a several-meter-long roll. A huge knife cuts the material, which is fed in at an angle, into individual strips. Depending on the formula, the cutting angle can be adjusted by semi-automatically moving the components used to feed the steel cord on rails built into the floor.

The system now joins these strips, which have been cut at an angle, back together to form an endless strip and then slits this once again into two individual strips. This results in several new spools of steel cord material in which the steel wires run at an angle – which is important for tire stability, as Frank Schmidt

"Our solution makes 'invisible' data visible."

Frank Schmidt
Software & Electric
Engineering & R&D, KE Fischer

explains: “In the next stage of processing for tire manufacturing, multiple layers containing steel and textile cord are combined. That means the cord cutting machine needs to prepare these strips as precisely as possible – so an extremely precise, high-performance edge guiding solution and inline quality monitoring for the material are essential.”

Perspective on digitalization

And where exactly is the innovation built into the line? To answer that, Frank Schmidt has to give us some background information first: until recently, the standard solution in this type of line for measuring the material’s width and ensuring correct feeding on a specific track consisted of a CCD line scan camera together with an actuator, a regulator, and further components. But this approach had a number of disadvantages: “These solutions have to be painstakingly calibrated to ensure that all the material widths we need can be processed by the line,” says Schmidt. Moreover: they’re very high maintenance and in most cases, users can’t make repairs themselves. If the solutions have to be replaced, it means downtime, since the new camera has to be carefully parametrized and calibrated before it can be used.

Achim Sorg had the idea of replacing this impractical “black box” solution with the MLG-2 WebChecker from SICK back in 2020. The automation light grid uses multiple photoelectric proximity sensors, arranged at regular intervals, to precisely measure web width. “This step is a prime example of how we at SICK approach our customers with solutions they’d never considered before,” says Achim Sorg. He and Jörg Weiser, who had years of experience in the tire manufacturing industry, prepared the proposal – which Frank Schmidt welcomed with open arms; he had long-since determined that the line scan camera solution was fragile and high maintenance. “The solution was simply outdated – plus, it offered no prospects for digitalization,” he explains. “I wanted to change that, and the MLG-2 WebChecker was predestined for the job.”

SICK and KE Fischer launched a pilot project to assess the idea’s feasibility – with a positive outcome: In 2021, KE Fischer became the world’s first cord cutting line manufacturer to equip its lines with the MLG-2 WebChecker – initially at just one point in the line, followed by more and more. “In fact, we initially installed the MLG-2 WebChecker at our own expense to give our customers a chance to try out the solution, so that they could make an informed decision about using it,” Frank Schmidt recalls. At SICK’s request, the MLG-2 WebChecker was further adjusted to better meet KE Fischer’s specific needs. And the hard work paid off: Today, more than 20 lines at KE Fischer’s customers include the MLG-2 WebChecker.

Perfect quality management tool

The line we’re looking at today includes no fewer than seven MLG-2 WebChecker. Frank Schmidt takes us along the entire length of the line. The devices continually measure the width of the steel cord web and check, down to the nearest tenth of a millimeter, whether it is within tolerance. If they determine that it isn’t, the line autonomously adjusts, within a certain tolerance limit per servo, until the correct width is reached.

“It’s the perfect quality management tool for the entire production process,” says Schmidt. In addition, the system is highly flexible: the MLG-2 WebChecker can measure web widths of between 145 mm and 3,150 mm. This flexibility makes changing formats child’s play – with no need for downtimes.

To show us how this works, the operators vary the width of the strips that are cut from the roll. “No matter whether the material is centered or staggered, or if there are two webs running in parallel on the line – you can set the MLG-2 WebChecker for it all. In fact, it can measure up to five webs at once,” says Schmidt.

// **01**
The MLG-2 WebChecker can measure the width of the steel cord web and check, down to the nearest tenth of a millimeter.

"It's also substantially lower maintenance than the old solution. Taken together, all this increases machine availability, and with it, ultimately line productivity." And the WebChecker has another key advantage: because it helps the line to produce more precisely, waste in the form of incorrectly cut strips is reduced – a major win for the environment.

But for Frank Schmidt, the MLG-2 WebChecker is above all an important step forward with regard to digitalization: valuable insights can be gained from the data that the light grid generates. The open source basis and fundamental software building blocks were provided by SICK, while KE Fischer developed its own building blocks for the specific application: "Our algorithms intelligently assess the data and prepare analyses that are available to operators, maintenance and quality control staff in real-time," says Frank Schmidt.

Using a tablet, he shows us what this looks like. "For instance, this data can offer insights into maintenance and quality: Where are there problems or room for improvement? What does the web's quality look like – in the upstream production process and here on this line? Our solution makes "invisible" data visible, a clear added value for customers."

Generally speaking, KE Fischer's goal is to make its lines as easy to operate as possible: "'Hands off, eyes off' in the sense of an autonomous machine is our goal. And with the WebChecker, we've come one major step closer to achieving it," says Schmidt.

The three men agree: the MLG-2 WebChecker has the potential to become a new trendsetter for edge guiding and as a measuring system in tire production. "Frank Schmidt has paved the way for that to happen," says Achim Sorg. Throughout the collaboration, both parties have contributed to steadily improving the solution. Accordingly, Frank Schmidt has nothing but good things to say about the customer service at SICK: "That's where SICK clearly stands out from the competition. Achim and Jörg always had time for us and accommodated all our needs and preferences – until we arrived at a solution that was a perfect fit."

It's now afternoon, and the assembly hall is nearly empty. Today's test run is over, and we've got all the material we needed "in the bag." In the weeks to come, Frank Schmidt and his team will make a few last adjustments. After that, the line will be sent to the customer – where all its benefits can be put to best use.

Karl Eugen Fischer GmbH

Karl Eugen Fischer GmbH is the global market leader for steel and textile cord cutting lines, which are essential to the manufacture of tires for motorcycles, passenger cars, SUVs, trucks and offroad vehicles. Founded in 1940, its headquarters and main production facilities are in Burgkunstadt, Germany. The company operates subsidiaries in the USA, China and – following the acquisition of Konštrukta TireTech (KTT), a manufacturer of extrusion and cutting lines for the tire industry, in December 2022 – in Slovakia. Now home to more than 600 employees, over the past 50 years KE Fischer has delivered more than 900 cutting lines to customers in 50 countries around the globe.

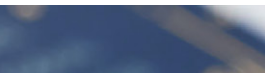
"Being able to work with a customer who so intensively pursues innovation is an absolute stroke of luck."

Achim Sorg
Lead Account Manager
Automotive & Electronics
SICK Vertriebs GmbH

02

DIGITAL FINISHING SPEETEC 1D

ACCELERATES PRODUCTION



At up to 100 meters per minute, the printed paper sheets race through the paper enhancement machine from St. Gallen-based Steinemann DPE AG, one of the world's leading specialists for digital print enhancement in the graphics industry. The printing heads inside the machine can turn packaging, posters and stickers into real eyecatchers; at the end of the process, they sparkle, glitter and shine.

While looking for a way to further enhance the quality of its premium coating and metallization effects, the Swiss company stumbled across an innovation from SICK: the motion control sensor SPEETEC 1D.

After all, there is exactly one factor that predominantly shapes the quality of enhancement: how precisely the speed of the conveyor belt that transports sheets of paper through the machine is measured. Until recently, Steinemann DPE, just like many other companies, had used a classic rubber measuring wheel.

"But this approach has its limitations when it comes to high-quality, delicate materials," says Stefan Schneider, Product Manager for Encoders & Tilt Sensors at SICK in Donaueschingen. It can create friction, dimpling and slippage – and ultimately affect quality.

In contrast, the SPEETEC 1D can measure the speed of objects without touching them. Using the laser Doppler technique, it scans the object's surface with two separate laser beams: two emitters generate the infrared lasers – one in the direction of the material's motion, the other in the opposite direction. When the light strikes the surface, its wavelength is lengthened in the direction of motion and shortened in the other.

On the basis of combined send-and-receive units, the SPEETEC 1D compares the emitted and reflected wavelengths, using the difference to calculate the surface's speed. In this way, it can also determine the object's length, direction of motion, and position.

The sensor is also more accurate than conventional encoder systems such as rubber measuring wheels: on a scale of one meter, it can measure an object's length down to the nearest millimeter, offering maximum reliability for a wide range of applications.

According to Schneider, the SPEETEC 1D is also interesting for the battery industry. “They work with extremely thin films that are coated with electrode material and which should ideally never be touched.” Plus, the sensor is already being used on conveyor belts in the food and beverage sector and in laser-cutting machines for automotive body parts.

SICK’s SPEETEC 1D is the only product of its kind on today’s market: while competitors’ products work in a similar way and have comparable specifications, they are more difficult to implement. As Schneider explains, this is because they use Class 3 lasers, for example, which require certain protective measures on the shopfloor. But the SPEETEC 1D uses a Class 1 laser, which means employees working nearby don’t even need protective glasses or special training. In addition, the competitors’ products cost two to three times as much. As such, the SPEETEC 1D, which has been on the market since 2020, bridges the gap between measuring wheel systems and complex laser velocimeters.

In Steinemann DPE’s machines, the SPEETEC 1D measures the speed of the perforated rubber conveyor belt, which can transport paper sheets measuring one meter by 70 centimeters and spaced 150 millimeters apart. The sensor was installed directly behind an image-processing system that records the sheets’ positions on the belt.

// **01**
With the non-contact motion sensor SPEETEC from SICK, Swissatest ensures that the contact-sensitive test strips can be checked for faults in a user-friendly manner during the manufacturing process.

Thanks to the data provided by the SPEETEC, the heads in the printing tower can now be controlled more precisely. “We can apply digital enhancement, such as delicate metallic text embossing or thinly coated contours, exactly where we need to, with maximum precision,” says David Gräub, Project Manager & Engineer Inkjet at Steinemann DPE. Before-and-after pictures impressively demonstrate the difference. “As a result, our already high-quality offset and digital print products now look even more impressive.”

// **02**
Digital finishing, for example fine metallized lettering or thinly varnished lines

// **03**
High-quality offset and digital prints with an even more elegant appearance

But product quality's not the only thing that's improved – production speed has as well. Thanks to the SPEETEC 1D's accuracy, the belt speed can be doubled without sacrificing quality, allowing jobs to be finished far more quickly. Consequently, for Steinemann DPE, the investment has already paid off.

And the best part, according to Stefan Schneider from SICK, is that the SPEETEC 1D has made customers' lives much easier. "When we discuss the sensors, many of them are amazed at what it can do." And without the need for any major changes, since getting started is quick and easy: just install and you're ready to go.

"We can apply digital enhancement, such as delicate metallic text embossing or thinly coated contours, exactly where we need to, with maximum precision."

David Gräub
Project Manager & Engineer Inkjet
at Steinemann DPE

03

COMPRESSED AIR: ROOM FOR IMPROVEMENT

Detecting and locating air pressure leaks: new solution from SICK successfully completes pilot project at a major beverage bottler

When it comes to industrial applications, small leaks in compressed air systems are par for the course – and can mean substantial costs. SICK has now developed a solution for locating air pressure leaks, one that completed its pilot application at a major beverage bottler with flying colors.

They're small, hard to find, and cost cold, hard cash: tiny leaks in the compressed air systems used in industrial production. Pressure losses of up to 30% are common. This not only harms performance, but, depending on the size of the plant, can cause annual costs in the five-digit euro range for a medium-sized enterprise – costs that could be avoided.

In March 2022, the Head of Production at one of nine German sites belonging to a major independent beverage bottler learned that SICK was working on a corresponding solution: in a publication from the Fraunhofer Institute for Manufacturing Engineering and Automation (IPA) on "Automated Leak Detection in Compressed Air Grids," the solution, which the institute was jointly developing with SICK AG at the time, was presented. The two partners had decided to pool their resources for the project in the spring of 2021: SICK contributed its expertise in sensors, while the Fraunhofer IPA brought its AI and manufacturing engineering know-how to the table – the perfect combination.

For the Head of Production, one thing was clear: the application would be the ideal fit for his bottling site, which was home to various air-pressure-intensive processes – like inflating PET bottle preforms. Here, too, air pressure leaks were a well-known problem, one that his employees had already tried to track down by depicting consumption on a dashboard and by manually looking for leaks during downtimes on weekends – a situation that the Site Manager urgently wanted to change.

Data makes leaks visible

He got in touch with SICK, and it soon became clear: the two parties wanted to enter into a pilot project for this first practical application of the solution. This was followed by commissioning in the summer of 2022, and in mid-September 2022, the first filling line equipped with six FTMg (Flow Thermal Meter for Gases) sensors and the digital service commenced operations.

Here's how it works: For specific lines, the sensors measure the pressure, temperature and flow volume of the compressed air, which allows them to calculate the energy contained within it. The data is saved on the device itself and on a web server and can be viewed by users at any time on a range of end devices – essentially, classic condition monitoring, which generates a wealth of information.

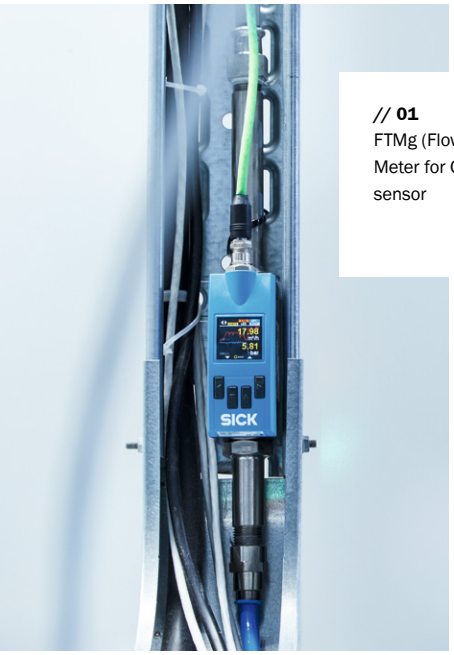
Evaluation with self-learning algorithm

But what sets the solution apart is the use of a gateway to connect the sensor data with the digital service Monitoring Box FTMg Premium: this specially designed cloud application uses a self-learning algorithm to analyze the sensor information, compare it with historical data, and convert the results into straightforward tables and diagrams. In this way, the system can independently identify line-specific deviations and/or spikes in consumption that point to potential leaks. In addition, the solution can provide profitability calculations, statistics and trends, as well as aggregated data that yields further insights, e.g. into the compressed air costs per unit produced or CO_2 consumption per unit produced. The corresponding software for the data analysis was developed and tested by the data scientists at SICK in Hamburg.

By the end of September 2022, roughly ten days after the solution had been integrated into beverage bottling, the first data analysis was ready – and

"The potential savings per year are roughly 1 million m^3 of compressed air, which amounts to 57,000 euros on three machines."

Eugene Lawrence
Strategic Solutions Manager, SICK



// 01
FTMg (Flow Thermal Meter for Gases) sensor

left the customer thoroughly impressed. This was followed by the installation of FTMgs on additional lines, and the second data analysis paved the way for implementing optimization measures in three filling machines. Over the next five months, 44 more FTMgs were installed on five of the site's production lines.

Solution provides more transparency

The Site Manager's assessment is thoroughly positive: "The solution offers us more transparency on our compressed air consumption per production line and machine, which allows us to compare different types of machines, precisely identify leaks and implement optimizations," says the Head of Production. "This reduces downtimes and the time and expense for repairs, which boosts our production efficiency. Plus: it saves us quite a bit of money."

The potential cost savings can be easily calculated: "The potential savings per year are roughly 1 million m^3 of compressed air, which amounts to 57,000 euros on three machines," says Eugene Lawrence, Strategic Solutions Manager, SICK, who was a central figure in the solution's development. "And a second automatic analysis recently identified additional potential of 0.5 million m^3 – from downtimes alone. That means the total potential is even higher, and we might be looking at nearly 100,000 euros in cost savings per year."

Overall, the pilot project was a complete success, as Alexandra Schindler, Digital Business Consultant Integrated Automation at SICK, agrees: "That's first and foremost due to the tremendous commitment on the part of the customer – it was an absolute windfall. We worked together on a very close and trusting basis," she says. The solution was jointly adapted to the requirements for this first practical application and even expanded with an additional function: "In response to feedback from the customer, we added a new algorithm to the Monitoring Box FTMg Premium service, one that automatically records compressed air consumption when the lines are on standby – a component that had never existed before." How satisfied the customer is can be seen from the fact that they also present the solution as the "best case" in their in-house communications. The solution is now slated for installation at two more of the bottler's sites.

Cost savings + environmental protection

Following the successful pilot project, since October 2023 the solution has been available as a "regular" product worldwide – and is continually being refined. "For instance, right now we're working to develop dynamic leak detection and a dynamic early-warning system, which will tentatively be available by mid-2024," says Eugene Lawrence.

By the way: Beyond cost savings, environmental protection is a hefty argument in favor of the solution. "Companies are under increasing pressure to save energy and improve their carbon footprint. In this regard, too, identifying and repairing compressed air leaks holds tremendous potential," says Alexandra Schindler.

By the way: Even if the specific solution for the beverage manufacturer is 100 percent an in-house SICK development it's also important for collaboration between SICK and the Fraunhofer IPA: for example, its practical application provided valuable insights and helped identify further challenges that the two partners are now jointly addressing. In addition, they are working together to steadily refine the algorithms and learn even more from the data – which, in turn, will inform and improve SICK's future customer solutions.

04

LECTOR8512 TO GO: UNBOX, SET UP AND GET STARTED

SICK'S NEW TRACK & TRACE SOLUTION STANDS OUT THANKS TO ITS INTUITIVE HANDLING

The Lector One Box with its ready-to-use solution that customers can install themselves makes sensor applications more appealing for small and medium-sized logistics customers – and shows just how quickly SICK can bring needs-oriented solutions to market.

It all began in the USA: SICK's Product Center America (PCA), part of the Business Cluster Integrated Automation, recognized the demand for an intuitive track & trace solution for small and medium-sized logistics customers and their applications – and especially for the American market. After all, despite SICK's impressive reputation when it comes to providing extensive and often complex logistics solutions for large firms, the brand had been largely irrelevant for customers on the lookout for an easy-to-use track & trace solution.

Thanks to an innovation hailing from our colleagues in the USA, that's no longer the case: "The new Lector One Box is a simple, ready-to-use solution for less complex logistics applications, one that customers can even install themselves," explains Bernd von Rosenberger, Senior Vice President Integrated Automation.

One box – three variants

"The product offers a top-notch solution for reading bar codes to identify packages and parcels, making it the perfect fit for all customers with logistics applications – no matter whether they're in warehouse/materials handling, retail, or for parcel identification in factory automation. Since it can scan up to 15,000 parcels per hour, we can accommodate a host of applications."

ONE

BOX

INSTALLATION AND SETUP

15–20

MINUTES

UP TO

15,000

PARCELS

3

VARIANTS

In mid-2023, the Lector One Box was rolled out on the American market, in three variants – depending on the desired range of functions – and has been available to all customers ever since. Customers will find everything they need for their specific application inside the high-quality, sturdy laminated cardboard box: a SICK camera (Lector8512 Flex) with Auto-ID function, used to read the bar codes; all the required cables; a mounting plate with built-in mounting bracket, so that the camera can be installed in the perfect spot over the conveyor belt; and everything else you need to get started.

Easy and fast

What's more, the integration is child's play: the mounting plate has a pre-installed CDM (Connection Device Module) jack, and the setup software is designed to accommodate users with less technical know-how. All in all, installation and setup only take 15 to 20 minutes, and thanks to the detailed, straightforward instructions, nothing can go wrong. In every sense, "fast and easy" is the name of the game for the Lector One Box.

When it comes to simplicity and speed, the Lector One Box offers a range of benefits – and not just for customers, but also for SICK: "The solution tremendously reduces time and effort for our Sales staff," says Ron Jubis, President of Sales for North America. "In the past, when we received this type of customer request, we would have fired up our entire Sales machinery. But now we don't have to. And that's a benefit we can pass on to our customers: they receive a new solution with minimal fuss."

“The feedback from our American customers shows us they’ve been waiting for a solution just like this.”

Mike Neuberg
Strategic Product Manager

Generally speaking, the Lector One Box is an impressive proof point for SICK’s efforts to rapidly recognize customer needs and offer corresponding market-ready solutions: “This product reflects a number of aspects that we’ve strategically integrated over the past few years,” says Patrick Booz, Product Manager Integrated Automation.

Standards from system and solutions

“For one thing, it’s all about making systems reusable, helping to establish a certain level of standardization. Solutions like the Lector One Box let us do exactly that. By creating standards based on a given system and multiple solutions, we can get to market much faster – and the same goes for meeting customer needs. That’s exactly the pace that we need. With the Lector One Box project, we’ve made a huge stride.”

SICK believes that products like the Lector One Box will massively grow in importance in the future – on the market as a whole, and for SICK in particular: “For less demanding applications, simple solutions like this one will become more and more important. The trend toward using – wherever possible – solutions that can be installed quickly and easily isn’t just clearly recognizable on the Auto-ID market,” explains Bradley Thomas, Director, Market Product Management, Business Unit track & trace, Stoughton, USA.

And Bernd von Rosenberger is convinced: “With solutions like this one, we can do away with the misconception that SICK only stands for particularly complex applications – by taking away customers’ inhibitions to explore our world of sensors. Many customers continue to appreciate our ability to tailor solutions to their specific needs [laughs]! With the Lector One Box, we’re breaking new ground in terms of serving both types of customer and generating a corresponding awareness – that things can also be nice and simple when the application requirements permit it.”

The box has no idea of the gravity of its significance. The basic idea of fundamentally simplifying the selection and installation process is gaining momentum – in the USA and around the globe. “The feedback from our American customers shows us they’ve been waiting for a solution just like this,” says Mike Neuberg, Strategic Product Manager, PCA, Bloomington, USA – the ideal conditions for conquering new market segments in other countries with the same approach. And by the way: This is just the first step for the “One Box” solutions, more easy-to-use “One Box” solutions are being developed.

“That’s exactly the pace that we need. With the Lector One Box project, we’ve made a huge stride.”

Bernd von Rosenberger
Senior Vice President
Integrated Automation.

05

OVERCOMING BOUNDARIES SAFELY

The new, comprehensive safety solution Dynamic Safety is intended to deliver unprecedented speed for automation. In the following, Benjamin Heimpel, Head of Safety Solutions, and Patrick Vollmer, Head of Safety & Automation Detection, explain how the concept works, the potential that it holds, and why SICK is now jointly developing it with a pilot customer.

Patrick Vollmer
Head of Safety &
Automation Detection

In production, more and more processes are being automated. This poses a number of challenges for conventional safety systems. What are they?

BENJAMIN HEIMPEL: Take autonomous mobile robots, for example. In order to move materials independently and safely from A to B, they're equipped with laser scanners or cameras that cover a 1.5-meter-radius field. If a person or another robot enters the field, for safety reasons the vehicle immediately stops instead of trying to avoid the obstacle. The resulting downtimes limit productivity. As a result, many companies only use these robotic vehicles in work areas where there is enough room for employees to avoid them. In narrow aisles and other tight spaces, they choose to do without them – even though here, too, they could greatly profit from automation.

Dynamic Safety is intended to overcome these limitations and bring a new level of speed to automation. How will it do so?

PATRICK VOLLMER: Dynamic Safety involves a comprehensive approach in which we monitor the entire workflow. We determine – in real time and in a functionally safe manner – the positions of all persons and objects. In the future, we'll use various technologies to do so, depending on the application. Using algorithms, we can reliably gauge the distance between the person and potentially dangerous objects and decide how to respond. For example, can the vehicle take an alternate route to avoid a delay or stop? Does the person need to be warned? Or is there a risk of collision, which means the vehicle has to stop? In this way, SICK, as a safety solutions pioneer, will successfully automate various processes that still can't be run with sufficient functional safety.

Why do we even need more automation?

HEIMPEL: First of all, to free employees from simple, monotonous and repetitive tasks so they can focus on more challenging ones. And secondly, many of our customers have complained to us about how the lack of qualified staff is impacting their productivity. In areas like logistics, warehouse and machinery, many positions remain unfilled. Consequently – and not just in industry – efforts are being made to tap the full potential of automation. Once we've succeeded in doing so, we'll also be far better equipped to deal with global crises like the COVID-19 pandemic.

VOLLMER: The goal is to make the entire system resilient to external influences so that it can respond to changes dynamically. Production processes need to run with as few interruptions as possible. We'll achieve that with Dynamic Safety, which, instead of just certifying individual machines or sensors, will cover and certify the entire factory; it's a real game-changer.

SICK is working on the Dynamic Safety solution together with a major pilot customer. What led to this collaboration?

HEIMPEL: What we're tackling with Dynamic Safety is a huge field of topics that we need to rapidly address. After all, whoever presents the first solution can take home the Holy Grail – and that could be SICK. We've seen that we can move development forward much more quickly when we understand what makes our customers tick, which applications could be of interest to them, and where the real challenges lie. The customer receives a tailor-made solution, while we massively gain speed.

CONSULTING SERVICES

- Risk Assessment
- Digitalization IT/OT Assessment
- Safety Concept
- Digitalization IT/OT Integration
- Installation and Commissioning
- Verification and Validation

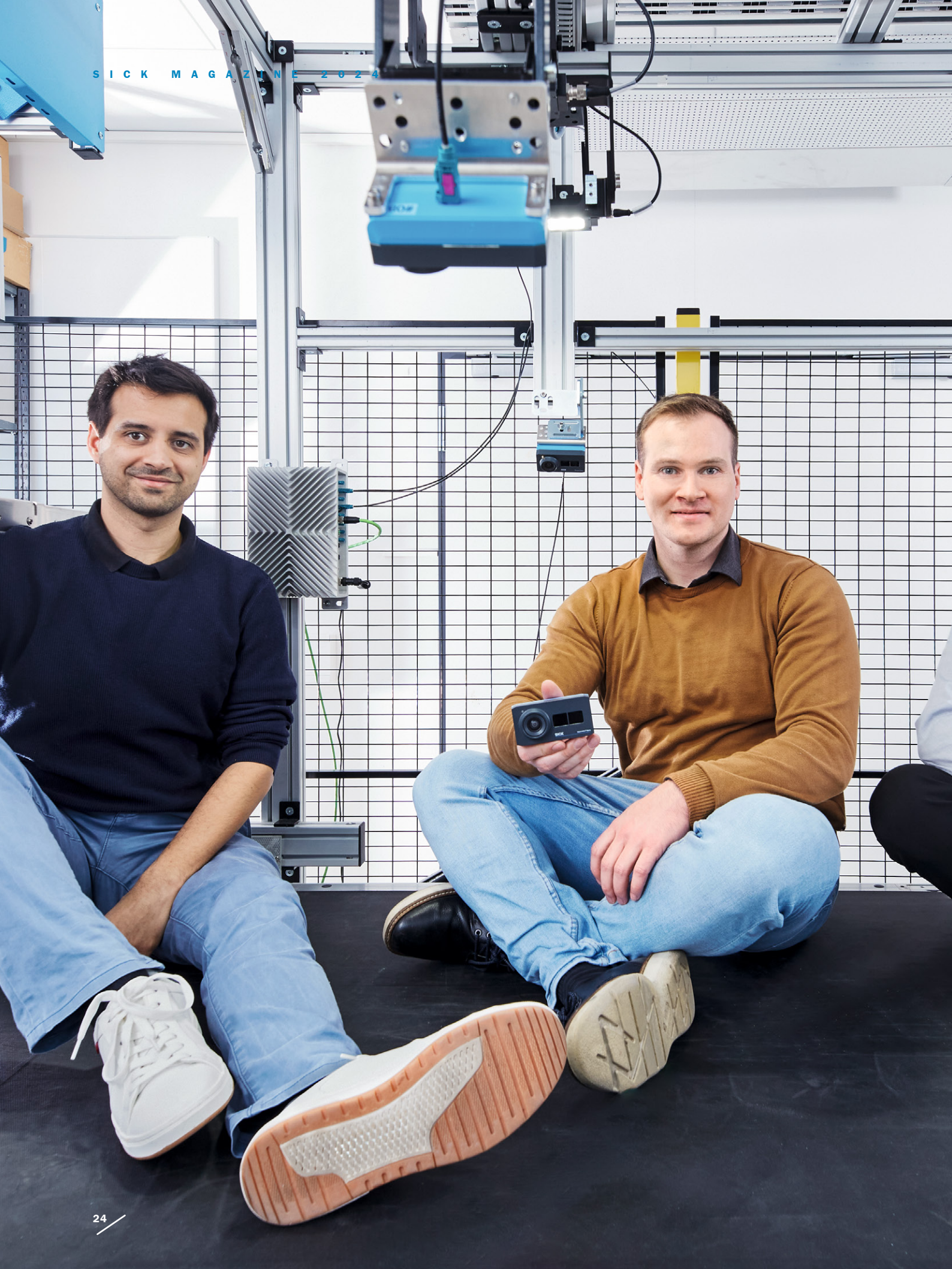
VOLLMER: If we fully developed a solution before ever approaching the customer, we'd miss out on the early-stage feedback loop. Using our current approach, we can directly test early prototypes, which aren't yet safety-certified, on the production line and gain valuable insights, e.g. on whether the expected productivity boost is quantifiable. A further aspect of collaborating with pilot customers involves operating in a business ecosystem – our goal for Dynamic Safety isn't just to increase SICK's market share; through the business ecosystem, together with our partners we're creating a new market.

Dynamic Safety is also very important at SICK. But in which areas?

HEIMPEL: At a very simple level, we're currently testing Autonomous Mobile Robots (AMRs) at our facilities in Hochdorf. In the medium term, we want to implement Dynamic Safety in our production, but also in electronics. There is a broad range of possibilities, since the concept is so comprehensive in nature that it's not limited to a certain sector or application and can fundamentally speaking be used in all areas where self-driving vehicles and robots interact with people.

"What we're tackling with Dynamic Safety is a huge field of topics that we need to rapidly address. After all, whoever presents the first solution can take home the Holy Grail – and that could be SICK."

Benjamin Heimpel
Head of Safety Solutions



06

SICK-START-UP COMPASS

A self-learning camera system to detect non-standard-shaped objects

In SICK's Start-up Arena, Govinda Kempermann is trying to get an unruly cable under control. The cable connects a 3D camera with a graphics processor – and mustn't interfere with the sensor, which is also part of the new setup. But the cable is stubborn and keeps twisting back in the other direction. Finally, Kempermann clamps it onto a metal brace.

"Here, we're working on a system that can elegantly and efficiently solve multiple logistics problems," says Josef Baak. The 49-year-old, together with systems engineer Kempermann (38) and software developer Jan Gerber (29), makes up an in-house start-up at SICK. They chose the name Compass, which stands

for Cognitive Machine Perception – a Scalable Solution. The three of them work in a former production hall at SICK headquarters. The room is divided by plywood walls, and the ceiling panels have been torn out; there's plenty of room to think.

One of the problems they're trying to solve is jammed baggage carousels at airports. Time and time again, backpacks, umbrellas, and baby carriages create blockages. "For airports, this is a real problem. First of all, the transport system can be damaged; furthermore, passengers can get impatient if they have to wait too long on their baggage," says Jan Gerber.

Neural networks deliver decision

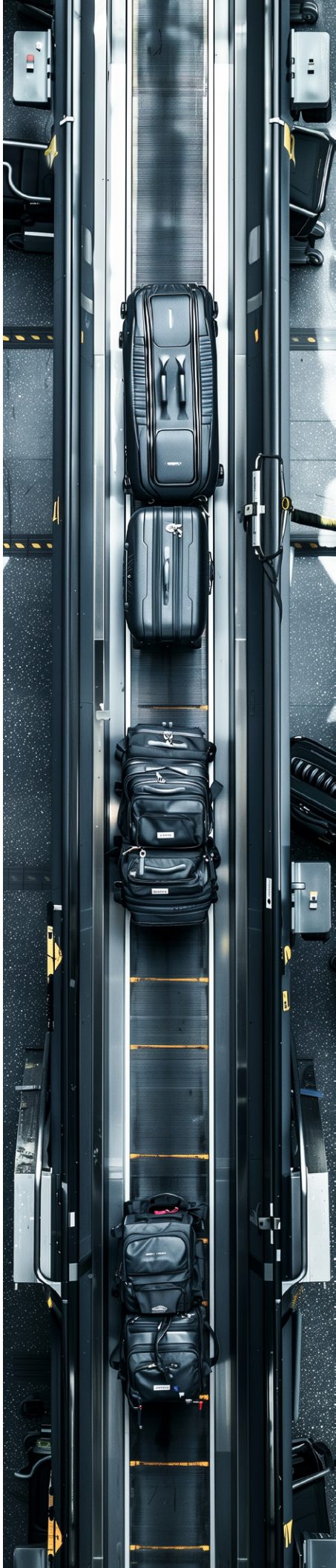
The day before, the three of them didn't get back from Amsterdam until late at night. They spoke with the operators of Schiphol Airport about how their system could be integrated into baggage transport and what the operators were looking for in order to avoid blockages.

Kempermann places a backpack under the two cameras with the stubborn cable, while Gerber starts up the system on his laptop. The backpack activates the sensor, and the 3D cameras, installed across from the sensor, send images to the graphics processor. "In addition to a normal photograph, our sensor generates what is known as a depth image, which depicts the distances in the room," Kempermann explains. Using the two images, the graphics processor from US-based company Nvidia creates a point cloud that depicts the backpack in three-dimensional space. "That's the basic information that we then feed into the neural nets," says Gerber.

They plan to add more neural nets. After all, it takes three or four consecutive nets just to detect the backpack; then another net decides whether to transport the backpack or discharge it. The advantage of this solution: flexibility for the customers. They can define the categories that the AI – since that's what the neural nets form – uses to make its decisions.

"For airports, this is a real problem. First of all, the transport system can be damaged; furthermore, passengers can get impatient if they have to wait too long on their baggage."

Jan Gerber
Software Engineer, SICK



// **01**
Time and again, rucksacks, umbrellas, and musical instruments block baggage carousels

Or they can use the factory presets as much as possible. “Most likely, the customer will need to keep adjusting the categories,” says Gerber. For example, when new backpacks are brought to market that are especially prone to creating jams.

Training the system with data

For the next step, the start-up needs data: photos of baggage that should ideally be discharged. This data is used to train the system. Baak, Kempermann and Gerber plan to gather photographs at the airports in Paris and Amsterdam in the near future. But before that, they have an important meeting – with the SICK Executive Board. “A week from today, we’ll have the chance to pitch our idea. Then they’ll decide whether or not to give us a budget,” says Baak.

For a successful pitch, they have to demonstrate that there’s a concrete, real-world application for their idea: improving baggage transport at airports. But that’s not all – in order to offer long-term prospects, the product has to be scalable, i.e., it has to have potential applications beyond airports.

Pocket-sized 3D camera

Josef Baak opens up a presentation on his laptop. One slide shows a huge pile of parcels at a logistics center, dumped there with no rhyme or reason. Beside it is a photo of a parcel that has been damaged and sloppily taped back together. This already hints at the larger market that the start-up hopes to penetrate: parcel shippers want to know at any given time where their parcels are – and if any are lost along the way. Multiple 3D cameras installed at key positions in a parcel-sorting center could make a significant difference.

And when a package is delivered but arrives damaged, customer claims have to be as fast and easy as possible. “Our 3D camera solution can be flexibly and affordably applied in all these areas,” says Baak. He takes a Visionary T-300 3D camera out of his pants pocket. A small box, only about nine centimeters long, four centimeters tall and three centimeters wide, can hold two cameras. “The only reason we can do that here is because we have a product development team that is working on the sensor right now, backing us up,” says Baak. What’s new about the Visionary T-300: the computer is now separate. Thanks to a collaboration with Nvidia, this makes it possible to offer customers flexible and tailor-made solutions.

And flexibility is always called for, particularly in the start-up business, no matter whether it’s in development or marketing. Originally, Baak, Kempermann and Gerber wanted to use the 3D camera in a parcel-handling robot; and they may still get the chance. In the meantime, the three entrepreneurs have successfully made their pitch. Without missing a beat, they switch gears and soon land at the airport.

07

FROM BESTSELLER TO PERFORMANCE PLATFORM

From the TiM to the picoScan100. Though they're both 2D LiDAR sensors from SICK, there's a minor quantum leap between them. "Light Detection And Ranging" sensors are among the key pioneering technologies of industrial automation. With the picoScan100 product family, SICK has once again pulled out all the stops to lead the way.

Especially for driverless transport vehicles like Autonomous Mobile Robots (AMRs) and Automated Guided Vehicles (AGVs), they're indispensable: LiDAR sensors use light-assisted object detection and distance measurement – in the form of laser scanners – to monitor robots' surroundings, provide orientation, identify obstacles, and gauge distances. In this way, they boost both safety and efficiency in complex industrial and intralogistics settings.

LiDAR is a variant of a sensor technology vital to SICK. In 2011, shortly after rolling out the TiM product family, the sensor specialists became the market leader for small, compact and cost-efficient 2D LiDAR sensors. Today, more than a decade later, the highly successful product is still part of the portfolio. The picoScan100 family and platform, and the launch of the picoScan150 in September 2023, were meant to take this impressive performance up a notch. If you consider the "magic triangle" for sensors, it looks like it was a success: the TiM's successor offers at least three times the range, angular resolution, and scanning frequency.

Next-level hardware and software

"When we started product development back in 2020, our approach was to preserve the best aspects and consistently expand the potential on the hardware and software side," says Cornel Rombach, Head of Product Management Compact LiDAR, explaining the underlying philosophy. This can also be seen in the fact that the housing size is nearly identical, helping ensure quick and easy device integration. In addition, there's outstanding measuring performance and high adaptability – including a working range that has been extended from 25 to 75 meters, improved detec-

tion capabilities thanks to the patented HDDM+ technology, and optimum "field of view" even under the most adverse indoor and outdoor conditions. For outdoor operation, the Multi-Echo Filter is the basis for eliminating the influence of rain and dust from the measurement data. In this regard, "speed" means the robot can detect even small and dark objects from afar, allowing it to drive at higher speeds. At the same time, the sensor can easily be adapted to the individual conditions on site. Moreover, the picoScan150 is a software-defined product, equipped as standard with an onboard web server, ready-to-use drivers, and the required interfaces as a System Plug concept. Here, "speed" means making integration as quick and easy as possible.

Cleverly engineered, down to the smallest screw

The "keep it simple" approach even extends to the most basic hardware products, the screws. In the picoScan150, all the screws are standardized, which means robotics manufacturers only need one hex wrench to install it. In Rombach's view, it's all part of SICK's strategic principle "make it easy," which can be seen not just in every aspect of the picoScan150, but in all the solution provider's products: "Our goal is to support customers in every phase of the product lifecycle – from choosing the right variant, testing, integration in their systems, comprehensive long-term support, all the way to product replacement."

The prerequisite for doing so was SICK's unique approach, which included numerous preliminary talks with the customer company, deploying a test robot, and even a small tour through the US. According to Rombach: "We listened very closely to the customers' needs, while the test robot allowed our entire team to step into their shoes. In addition, we received direct feedback from important robotics customers based in the USA. In those markets that we couldn't visit in person, we had several conversations via video call. All these factors together helped us take a major step forward."

Defining the market standard once again

The results are nothing to sneeze at. In just two and a half years, a new LiDAR sensor platform has established itself as the market standard and allows SICK to rapidly respond to changing customer requirements with new product variants. At the same time, all users benefit from the picoScan150's range of features, which allow them to speed up on their own. And that doesn't apply just to robotics companies, but fundamentally speaking to all users looking to automate their processes with the aid of object detection and localization, e.g. to monitor the immediate vicinity of lock and dam systems, to control the milling performance of construction machinery, to continuously monitor volume flow on conveyor belts, etc., etc., etc. – the potential applications are virtually limitless.

"We listened very closely to the customers' needs, while the test robot allowed our entire team to step into their shoes."

Cornel Rombach
Head of Product Unit
Compact LiDAR

According to Rombach, the history of the TiM and picoScan100 LiDAR sensors is yet another good example of how, when it comes to product development, SICK never focuses on speed alone. "It's more important to find the right speed at the right time, so that our customers themselves can really pick up speed."

08

AI MADE EASY

SICK Nova brings artificial intelligence to sensors

Deep Learning from SICK opens up new avenues in industrial automation – making it possible to automate increasingly complex tasks and to do so more easily. SICK Nova's AI tools allow sensors to be trained for customer-specific tasks with little effort.

"Artificial intelligence (AI) is really nothing new," says Dr. Ola Friman, Head of R&D Intelligent Machine Vision and Head of Deep Learning Framework Autonomous Perception at SICK's Linköping site in Sweden. "In recent years, however, much more data has become accessible, and the available computing power has multiplied. This opens up completely new fields of application for us."

The new AI technology, based on what are known as Deep Neural Networks, or Deep Learning, is known to be particularly good at interpreting texts and images. And that's where SICK comes in: "Our smart cameras generate and process a wealth of images. AI allows us to use those images for new applications in industrial automation," Friman explains.

One central AI solution offered by SICK is SICK Nova. The software runs directly on SICK sensors and cameras and provides the basis for configurable image processing solutions that are suitable for a wide range of industries and applications. SICK Nova is currently pre-installed on six 2D and 3D sensor models and uses a variety of imaging technologies.

SICK NOVA

Machine vision made easy

SICK Nova is the foundation software for configurable machine vision solutions in a broad array of industries and quality control applications. Featuring a user-friendly web interface and AI capabilities, SICK Nova supports experts and non-experts alike so they can quickly and easily handle even the most challenging applications. SICK Nova runs on a multitude of 2D and 3D vision sensors, leveraging different imaging technologies. Moreover, users can conveniently extend the software's functionality with both user-developed and ready-made SICK Nova plug-ins. With this kind of scalability, SICK Nova is a safe choice that ensures cost-effective ownership.

"The AI is trained to recognize what a 'correct' object or product looks like."

Viktor Smedby
Strategic Product Manager 2D Vision

Thanks to its extremely user-friendly web interface, virtually any user can implement even advanced applications quickly and easily, even without prior knowledge or programming skills. In addition, users can easily extend the functionality of the software with plug-ins of their own design, making the solution a safe investment and highly scalable.

Intuitively operable web interface

Viktor Smedby, Strategic Product Manager 2D Vision Autonomous Perception in Linköping, explains how the AI tool in SICK Nova works in practice: "SICK Nova has all the traditional tools for image-based quality control, such as measuring a distance or a diameter for tolerance-checking. With the AI tools it offers, you can also entrust the sensor with complex recognition tasks, like sorting objects." To do so, however, the AI must first be trained – which is child's play with SICK Nova's intuitive web interface.

"The user places the object to be recognized in front of the camera several times, in different positions, and has it take the corresponding pictures. They then 'code' all these images as a product class. This process is repeated with the objects of other product classes. That's already enough to train the artificial intelligence directly on the sensor so that it can reliably distinguish between these objects," says Smedby. If the requirements change, the sensor can simply be reset using the "Reteach" button. "The sensor then collects the next images, learns from them and continues its work independently. As a result, it only takes a few seconds to learn a new product variation or design."

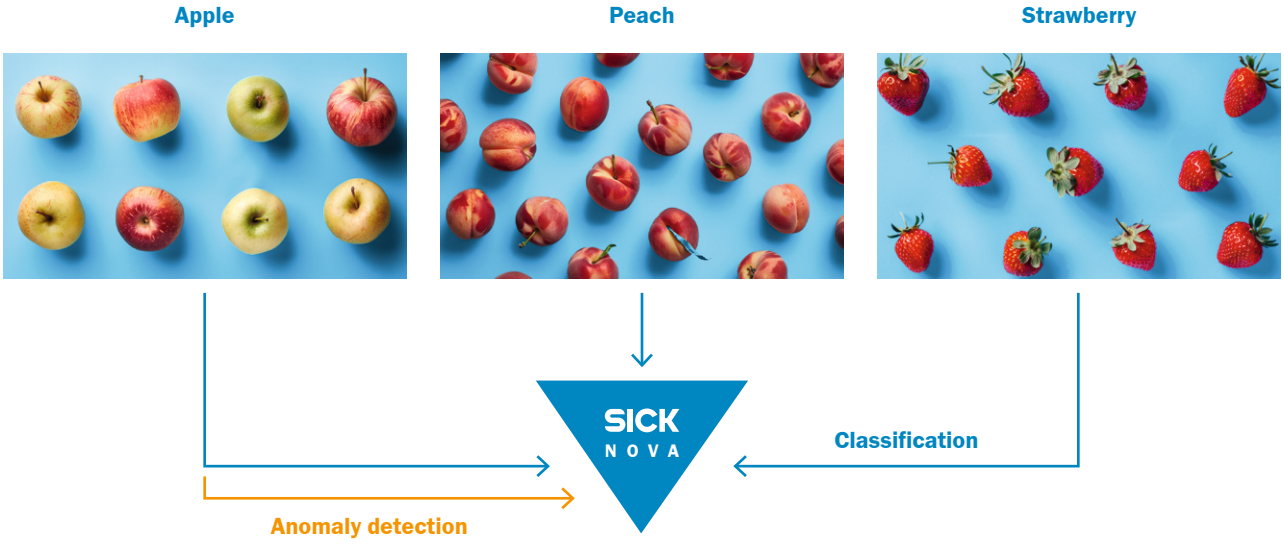
Reduction to a clear and simple decision

If the number of different objects to be sorted is extremely large, or if the required computing power exceeds the sensor's capacity, SICK's dStudio can help: "This is a cloud software package with significantly more computing power than the sensor itself has room for," explains Ola Friman.

Users can simply upload large quantities of image files that they have previously sorted and classified. dStudio then takes over the training of the deep neural network.

"Back on the sensor, this AI application can reduce a complex problem to a clear and simple decision and execute it independently," says Friman.

Classification and beyond



“This is a cloud software package with significantly more computing power than the sensor itself has room for.”

Dr. Ola Friman
Head of R&D Intelligent Machine Vision
and Head of Deep Learning Framework

Defining deviations

This classification and sorting application is particularly valuable for the manufacturing industry, where packaging designs can change quickly. “In April 2024, we’ll launch a new AI camera sensor, the Inspector830, with even faster performance,” says Viktor Smedby. “We are focusing on the consumer goods and packaging sectors, where faster speeds are generally required. We’re convinced that this is an innovation that will take our AI solutions’ performance to a whole new level.”

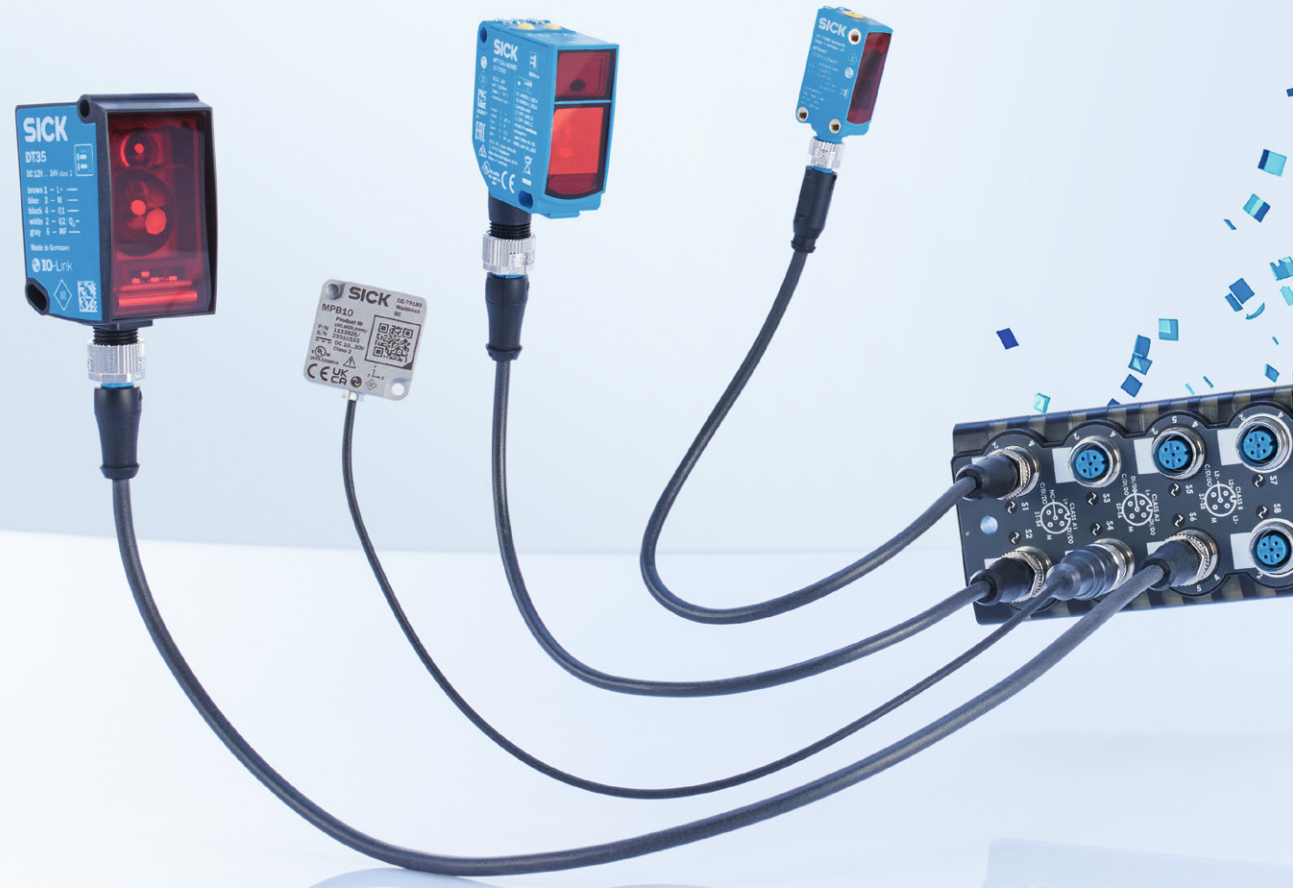
But SICK Nova can do more than classify objects. In August 2023, a second AI feature was launched – the “Anomaly Detection Tool,” a function that puts SICK ahead of its competitors: “The AI is trained to recognize what a ‘correct’ object or product looks like. Any deviation from that standard is detected and discharged – without the user having to define what these deviations might look like,” Viktor Smedby explains. “It doesn’t get much easier than that.”

Yet another AI function is the ability to locate complex products or objects in front of a sensor, something that is particularly interesting in connection with the use of robots for automatic object picking or for avoiding collisions with detected objects. “We’ll continue to develop AI innovations within and around SICK Nova, with a focus on both reliable performance and ease-of-use,” Ola Friman concludes.

09

GATEWAY TO THE FUTURE

Sensor Integration Gateways (SIGs) or IO-Link masters are used to exchange data, e.g. between sensors on a field bus. Especially in connection with the increasing degree of industrial automation, this data is valuable for optimizing processes and improving plant coordination. With the SIG300, SICK is taking its IO-Link masters to a new level: intuitive controls and seamless installation in automation systems simplify integration into customers' downstream automation processes.



“Ideally, customers shouldn’t even notice our product in their day-to-day operations,” says Daniel Bruno. “If it’s doing its job in the background without anyone noticing, then you have a satisfied customer.” What the product manager is referring to are what are known as IO-Link masters, and in particular, the new SIG300, an innovative gateway that SICK developed for optimized data transfer. The device is designed to transfer data, e.g. between IO-Link devices and a field bus, or between sensors and a machine. The data can then be directly applied to optimizing plant control.

The key to the world of automation

“Vertical integration into our customers’ world of automation” is the name of the game. Simply put, it’s all about making production data available that is as transparent, clearly structured and easy to interpret as possible. This data is provided, for example, by sensors mounted on a conveyor belt that count the number of parts produced or check product dimensions. When aggregated, the data offers insights into the quantity, errors, cycle rates, and positions for a tremendous range of products. When this information is analyzed intelligently, it helps customers optimize their control processes, minimize errors, and draw conclusions on how to make their processes more efficient. “For example, in our own production we measure the fill levels of adhesives containers and, on this basis, refill them precisely – without any standstills. In this regard, the SIG300 is the key to making data available transparently,” says Bruno.

Gateways themselves are nothing new. And SICK’s portfolio also includes traditional IO-Link masters as “enablers for data transfer.” But the SIG300 truly opens a gateway to a new world. The product can also be intuitively operated via USB connection and configured using its integrated web server. As such, it fully delivers on the SICK maxim “make it easy.” In addition to communication using standard protocols, the SIG300 offers a logic editor, giving customers the freedom to apply smaller, decentralized logics, which can yield a range of benefits, depending on the individual case. One example: using the logic editor, data can first be gathered before being transferred in consolidated form – which translates into substantial cost savings for all cloud services, which charge per data transfer.

Detecting potential errors before they occur

Aspects like condition monitoring services and predictive maintenance, which are so vital for industrial plants, can substantially benefit from the new gateway. “With the SIG300, we can achieve extremely high data transfer rates,” says Bruno, before giving an example: “When it comes to monitoring larger motors, we can now diagnose errors very early on, based on the vibrations. If you train the corresponding sensors with deep learning and historical sensor data, it paves the way for probabilistic fault prediction, which can save costs and resources.” Bruno is confident the new product will easily outperform previous solutions. And even if a new gateway is only a small step in the expansive technological universe – the SIG300 is a giant leap for our customers.

Did you know?

On real-world shop floors, you’ll rarely find “pure-bred” lines with components from just one brand. In practice, IO-Link devices like the SIG300 have to be integrated into various manufacturers’ control systems. Accordingly, SICK offers an IO-Link Function Block Factory online – a “generator,” so to speak, that allows users to create manufacturer-neutral function blocks. In this way, SICK is helping make the heterogeneous machinery landscape more manageable and greatly simplifying implementation for customers.

10

A SMART GUY

Sensors are used throughout the industry, e.g. to simplify processes and ensure quality. As a result, the tiny devices are now facing greater and greater challenges. With the W4S, the youngest and smallest member of a particularly innovative photoelectric sensor focus portfolio from SICK has now been brought to market.

It's a bit like an educational show for children: how are labels applied to cups of yogurt? How are tablets put in blister packs? And how does the lid end up on the can of nuts? How can you tell if a bag of cookies is sealed, or if an electronic component has been installed in the right place? Sensors can provide the answers to these questions – and the new W4S sensor is particularly clever. After all, the W4S is an "Optical Expert" and the latest addition to an innovative photoelectric sensor focus portfolio from SICK.

This next-generation sensor family offers customers – frequently companies in the packaging industry – not just a consistent user experience across all devices, but also outstanding performance: "An optical sensor's job is to detect light," explains Kristina Holm, who's been a Product Manager for Photoelectric Miniature Sensors for the past nine years. "And that job is often highly complex." For example, how can the sensor tell the difference between a reflection and a real object? How can it detect transparent objects? And how can it recognize them before a moving background?

The brains behind the eyes

Though high-quality optical equipment forms the foundation, the key ingredient of the W4S's outstanding performance is also and particularly "experience." "We drew on our know-how from countless customer projects and put it into specially designed logic chips – ASICs," explains Product Manager Thomas Schulz, who is jointly responsible for the W4S family with Kristina Holm. "A tiny brain that is the result of extensive R&D – and which offers us a major edge over our competitors around the globe."

In addition to the chips, the W4S includes a data communication feature that supports diagnostics and logical connections with other devices. As a result, multiple sensors can be interlinked or the sensors' direction, relative distance, and how clean/dirty they are can be determined. Thanks to these features, the new W4S delivers stable data, even under challenging lighting conditions – and with it, the most important basis for Industry 4.0. "That's a very important aspect of the product family," says Kristina Holm. "For truly intelligent industrial processes, we need robust data series based on reliable object detection. And that's exactly what our innovative little sensor delivers, even for complicated jobs." After all, no matter if the objects are tiny, paper thin, or completely transparent, you can be sure: they won't slip past the sensors from the W4S family.

"We drew on our know-how from countless customer projects and put it into specially designed logic chips – ASICs."

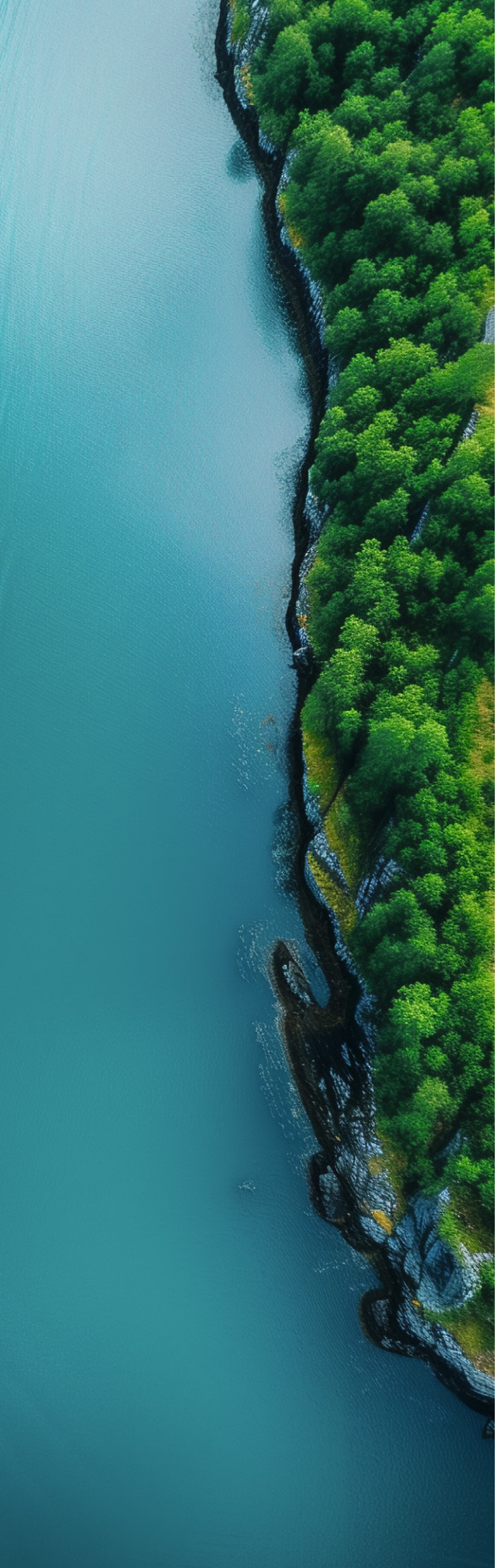
Thomas Schulz
Product Manager for
Photoelectric Miniature Sensors

11

NEW AI SOLUTION FROM SICK

guarantees uninterrupted emissions monitoring on ships

Increasingly stringent laws and regulations on emissions monitoring pose a challenge for shipyards. Digital solutions can help – like SICK's MARpems: the system delivers valid emissions data, even when monitoring systems break down.



The SICK Maritime Suite, the digital solution for the maritime industry, has now been expanded with a further intelligent component: MARpems, which stands for Maritime Predictive Emission Monitoring System, guarantees the availability of emissions values on board ships – even when the data from their Continuous Emission Monitoring Systems is interrupted. It can do so thanks to an algorithm that, in the event of an interruption, calculates certain key parameters on the basis of the remaining exhaust-gas data, ensuring seamless compliance for ship operators.

"MARpems is the result of a start-up initiative launched by SICK in 2018," says Fabienne Jäckle, Product Manager Cleaner Industries. "As there was already this type of solution for land-based applications, we recognized an attractive business case in the maritime sector and developed an initial corresponding product."

"This is the only solution of its kind on today's market, while the acceptance of flag states is the highest possible form of acceptance."

Hinrich Brumm
Head of Industry Group Mobility & Outdoor Automation

Results were soon available, and even in this comparatively early phase of product development, SICK got the classification society DNV on board, to ensure that the solution would also be officially recognized. A clever move: the data model underlying MARpems was assessed by DNV Service in Høvik, which issued a "Statement of Product Capability" for it. In turn, DNV Maritime in Hamburg provided a technical evaluation of MARpems's functionality for scrubber applications and confirmed its suitability to the German flag.

Continuous monitoring of emissions values

In the summer of 2023, it was time for MARpems's premiere: in Long Beach, California, the solution was first installed on a container ship from the CPO shipyards. CPO has been working with SICK to develop digital solutions for the maritime sector since 2020. Since the installation, CPO has had access to the entire SICK Maritime Suite and its various functions, which offer comprehensive information on emissions, the performance of the exhaust-gas treatment system, the status of the emissions monitoring equipment, etc.

More concretely, the new digital service MARpems works as follows: ships that run on marine fuel oil have onboard exhaust-gas treatment systems, called scrubbers, which reduce sulfur emissions. Continuous Emission Monitoring Systems (CEMSs) – like the MARSIC analyzers from SICK – check the scrubbers' efficiency by measuring the sulfur dioxide and carbon dioxide concentration in the treated exhaust. Ship operators are required to constantly monitor these emissions values, record them, and report them to the authorities as needed. When a CEMS breaks down, certain exhaust-gas values become unavailable, and the ship operator can no longer prove their ship's compliance with the maximum values. Normally, faulty sensors can only be replaced by trained technicians. This poses unforeseeable risks for ship operators, such as additional manual labor, higher costs due to more expensive fuel, or even financial penalties for failure to comply.

Digital twin on board

But MARpems offers a way out: "Essentially, we're talking about using a digital twin of the faulty CEMS," says Jäckle. "If a CEMS malfunctions or breaks down, the software automatically kicks in: machine learning models use the available operating data from the ship and scrubbers to calculate the current emissions. In this way, MARpems ensures temporary emissions conformity and therefore compliance with IMO regulations."

"The officially recognized MARpems, as part of the SICK Maritime Suite, is an outstanding innovation that addresses a major pain point for customers."

Christian Lohner
Product Manager at SICK

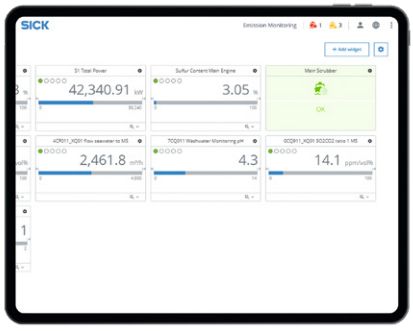
Although generally the same machine learning models are used, they are individually trained for the respective ship using its specific data from the past several months.

Authorization by flag states

In addition to ensuring compliance while also reducing the time and effort when a CEMS breaks down, MARpems has another positive effect: the solution increases transparency on the status of the emissions monitoring equipment and scrubbers, which can help to avoid or plan short-term repairs and maintenance. Accordingly, the system boosts process reliability and reduces service calls to a minimum. All in all, MARpems increases operating efficiency and competitiveness.

Today, MARpems is officially recognized by the flag states Germany, Malta and Liberia. Flag states define supervisory regulations concerning technical and administrative matters on board the ships flying their flag. The approval of further flag states is expected in the near future: “We’re already in talks with the maritime organizations of further countries,” says Fabienne Jäckle. “In this way, we’re actively expanding the acceptance of our solution, step by step.”

The field of application for MARpems is extensive: worldwide, roughly 5,000 ships* have a scrubber on board, and a major percentage of them already use monitoring systems from SICK: “We’ll introduce these customers to MARpems,” says Jäckle. “By implementing it, they can take another important step toward the digitalization of shipping.”



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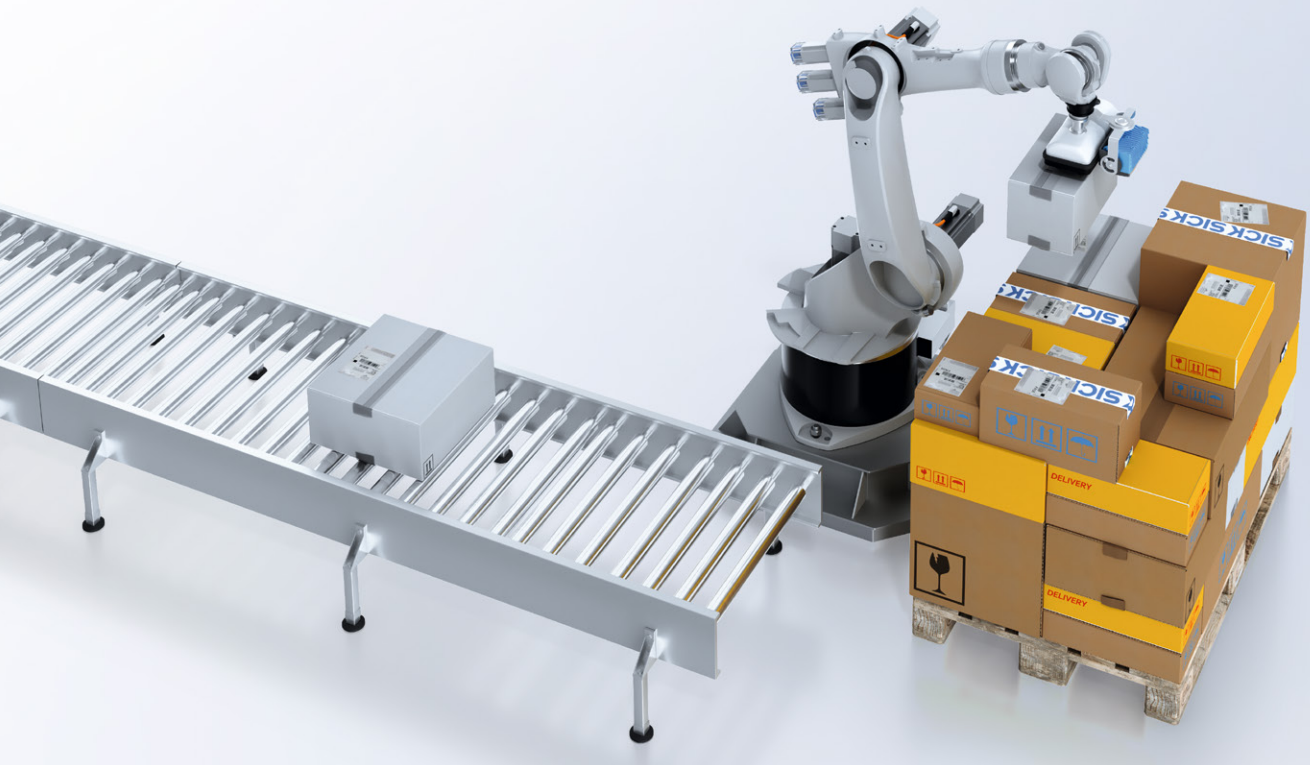
Holistic view of emissions and the performance of the exhaust-gas purification system

“Machine learning models use the available operating data from the ship and scrubbers to calculate the current emissions.”

Fabienne Jäckle
Product Manager
Cleaner Industries at SICK

* Source: https://afi.dnv.com/statistics/DDF10E2B-B6E9-41D6-BE2F-C12BB5660107



12

DEPALLETIZING: LET AI DO IT!

Wherever large quantities of products or goods have to be transported, you'll find pallets. All too often, the laborious and monotonous task of loading and unloading them is still done by humans. High time for PALLOC: SICK's AI-assisted localization system, which effectively teaches industrial robots how to depalletize.

They're standardized, often made of wood, and there are currently millions of them – most of them brimming full – underway in international economic flows: pallets. Here, what counts most is efficiency and speed: once they've arrived at their destination, their contents need to go to production, the warehouse, or be shipped further as soon as possible – no matter how varied those contents are. So far, this arduous and monotonous job has been left to humans or highly complex robotic solutions.

What was missing was the intelligent integration of AI: "We analyzed the robotics trends identified by various independent market research institutes and listened to what many of our customers, robotic systems integrators from the logistics and consumer goods sectors, had to say," recalls Maik Ahlers, Market Product Manager Robotic Solutions at SICK, explaining the reasons behind developing PALLOC (PALlet content LOCalization). "Our customers wanted a way to achieve 24/7 operations and to overcome the lack of qualified staff using accelerated, robot-based 'plug & play' automation."

With our camera system PALLOC, we can meet those needs.

Integrating deep learning

To do so, PALLOC combines SICK's tried-and-trusted 3D snapshot camera Visionary-S and a pre-installed and pre-trained neural network integrated in the camera, which eliminates the need for an expensive industrial PC. It also features – and this is what sets it apart – a deep-learning-based depalletizing algorithm. The result: a uniquely compact robot guidance solution that measures the contents in seconds. Installed on a

robotic arm or in a stationary position over the pallet, the system can rapidly recognize a theoretically unlimited number of box variants on the pallet's topmost level, identify their cubic (or square) shape, and transmit the positioning coordinates to the robot control system. "Unlimited number" because, thanks to a user-friendly suite of AI tools, an unlimited number of further box variants can be added to the factory-installed neural network, which has already been trained for a broad range of boxes. As such, PALLOC, which, thanks to web technology, doesn't need a separate industrial PC, is surely one of the most future-proof robot guidance systems of its kind. Moreover, its Ethernet link allows it to be integrated as a standalone solution to control virtually any cobot or industrial robot.

Putting human expertise in the sensor

A key difference from previous depalletizing solutions is the use of integrated deep learning in conjunction with the high-performance camera. The deep learning method allows the system to be trained using images and examples and develop new assessment techniques. In this way, human experience is essentially integrated into the sensor, constantly improving its accuracy. SICK has the requisite deep learning and camera expertise to merge artificial intelligence and sensor technology. As a result, Peter Nilsson, Strategic Product Manager in cooperation with Market Product Manager Maik Ahlers in Germany, was able to accelerate the product's development:

"Together with our specialized Robot Guidance team and a Sweden-based Vision Team, we drew on the existing Visionary-S camera technology to develop the robotic guidance system PALLOC in just over twelve months."

Speed and SICK's consistent focus on ease of use are also reflected throughout the product. "On site, our localization system for robot guidance can be installed in less than an hour, the sensor can be quickly and easily mounted, there are plenty of connectivity options, and no in-depth programming skills are needed for the AI," says Maik Ahlers, summing up the system's benefits.

Further variants already planned

It's hardly surprising that there's considerable interest in PALLOC in the logistics sector and consumer goods manufacturing.

Accordingly, further variants are already planned, e.g. for identifying the frequently used, standardized Euro-boxes (KLT boxes) or for bags.

And what about AI-assisted depalletizing for crates of all shapes and sizes?

Maik Ahlers has to smile: "Tailor-made depalletizing for cubic crates of different sizes, or what we call mixed depalletizing, is still a technical challenge on a rapidly growing market. It's also the next stage of development that SICK is already focusing on."

So, rest assured: SICK's development of products tailor-made for customer needs is picking up speed.

"Tailor-made depalletizing for cubic crates of different sizes, or what we call mixed depalletizing, is still a technical challenge on a rapidly growing market."

Maik Ahlers
Market Product Manager
Robotic Solutions

13

SOLVE TASKS WITH AI IN UNPREC-EDENTED QUALITY

A conversation with Dr. Stefan Odermatt, Senior Vice President Research & Development Integrated Automation, and Dr. Shane MacNamara, Senior Vice President Research & Development Autonomous Perception, on the importance of digital solutions for SICK, the role of Artificial Intelligence, and a 20-year-old slogan that's now more relevant than ever.

Dr. MacNamara, Dr. Odermatt: Thanks to the digital transformation and the rapid advancement of Artificial Intelligence, our world is spinning faster and faster. What do these developments mean for SICK?

DR. SHANE MACNAMARA: SICK has a tremendous portfolio, encompassing roughly 40,000 products and solutions. How can we shape that portfolio in the future without constantly expanding it? In this regard, digitalization plays a key part: software is becoming an integral component of our sensors, opening up new functions and, with them, a completely new dimension of solution development. Digital solutions will help us meet our customers' needs in a more focused way.

DR. STEFAN ODERMATT: In addition to "Software Defined Sensing," that is, software as part of our sensors, a further aspect is the use of software at the machine and process level: here we're coming ever closer to our customers' IT systems and connecting them to the shop floor, that is, the manufacturing and logistics level, to solve problems in industrial automation.

DR. SHANE MACNAMARA: In short, software solutions make us faster and more flexible, since they can be adapted. That's also a major advantage for our global business. In this regard, our Business Clusters are responsible for developing building blocks, which are then "put together" in the respective regions. The "last mile customization" is done as close to the customer as possible at one of six globally distributed Engineering Hubs, which are currently being set up. All in all, this approach offers us a level of scalability we've never had before.

Let's talk about Artificial Intelligence. How long has AI been important for solution development at SICK?

DR. STEFAN ODERMATT: Artificial Intelligence, or Deep Learning, grew in popularity in roughly the mid-2010s; since then, we've increasingly focused on it. In 2017, SICK even launched a Deep Learning start-up. Here, the focus wasn't on a single product; rather, the goal was to view the topic comprehensively and integrate AI / Deep Learning in our sensors, but also to solve more complex automation problems using AI on industrial PCs. Even back then, our goal was to achieve cross-divisional collaboration. This evolved into today's Deep Learning Framework, an element that connects everything else: it's where you'll find the majority of our AI experts, and their know-how is available to everyone in the company.

DR. SHANE MACNAMARA: By the way, SICK was the first company to offer "On Device Learning," long before our competitors: the device learns how to complete small tasks using the AI alone, without any edge device or cloud connection. For larger AI tasks, scalability is possible via an edge device or the cloud. In the last two or three years, access to these AI solutions has become much simpler, both for integrators or plant constructors – our primary customers – and for the end users who apply the solutions, not to mention our own Development and Sales. In a sense, AI has been "democratized." What that means for us: by using AI solutions, we can solve far more problems, while also becoming relevant for more customers.

So, software and the possibilities that AI offers are also important for SICK's internal processes?

DR. SHANE MACNAMARA: Software and AI offer valuable support for our Development and Sales. For instance, we can digitally simulate problems involving customers, like a certain size of parcel or variance in a track & trace application. Methods like simulation and digital twins, as well as AI methods, allow us to more easily adopt a customer perspective and select the corresponding sensor solution. This makes people's jobs easier, not just in Development but also in Sales. As such, digitalization is accelerating the process of finding the right product and a tailor-made solution for the respective customer.

DR. STEFAN ODERMATT: AI also facilitates product and software development in a very concrete way: for instance, last year we rolled out an "AI Copilot" for software development. Initially limited to a pilot project with 200 employees in six countries, the tool is now available to SICK staff worldwide. It provides our software engineers support with finding errors, with generating tests, with explaining software code, and even with writing code. And here, too: AI has massively democratized and simplified these processes. Also, the tools are improving exponentially, which means they'll offer us even better support in the future. We're also entering into targeted collaborations and acquiring new solutions to keep pace with the latest developments – in this case, trying to develop everything in-house wouldn't be productive.

Have customers now come to expect solutions with AI from SICK?

DR. STEFAN ODERMATT: No. It's more like this: a customer comes to us because they have a problem they want us to solve for them. How we do it is secondary. Sometimes we don't need AI at all. Though the percentage of AI solutions will surely continue to grow, I'm convinced that, ten years from now, there will still be "classic" solutions with no AI.

Could you give us an example of a typical AI application from SICK?

DR. STEFAN ODERMATT: SICK has installed what are known as thermo portals for tunnel operators in a number of European countries. Located near tunnels on major traffic axes, they can detect overheating vehicles before they enter the tunnel, helping avoid vehicles catching fire in a tunnel and demonstrably improving tunnel safety. These systems have been in use for more than a decade and previously used classic image-processing methods. In the past, we had frequent false alarms, for one thing because, when in doubt, the alarm was sounded.

But such false alarms mean a great deal of time and expense for tunnel operators – from shutting down the tunnel, to calling in the fire department and then sending them away again, etc. For roughly the past two years, these systems have used AI, based on statistical data from these thermo portals' ten years in operation. And we've seen: after just a short time, the AI-based method did the job significantly better than the classic algorithm, which had itself been steadily improved over more than ten years – we're talking about a 10- to 20-fold reduction in false alarms! AI is enabling us to improve safety for our fellow citizens in unprecedented quality – very much in keeping with our philosophy of "using technology for good."

Another typical AI application from SICK is for the track & trace area, where Artificial Intelligence is used to determine whether there are currently bags or boxes on the conveyor belt – information that is essential for the sorting center. To take advantage of this option, customers can purchase a software upgrade.

Is SICK going to become a software provider?

DR. SHANE MACNAMARA: Today, software developers make up roughly 40 percent of SICK's Development staff. But of course, that doesn't mean we're going to turn into a software provider. Though the digital aspect is extremely important for our company, our sensors continue to be the basis for everything else; software and AI solutions are simply making them more and more intelligent. In fact, you could say that the slogan we introduced in 2004 – "Sensor Intelligence" – is now more relevant than ever.

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