



APPLICATION REPORTS 2024

Automation solutions from ifm





A passion for automation

ifm is synonymous for automation and digitalisation with a passion. It makes us happy and proud to see this passion spread from us to our customers and witness how it advances them.

In this ninth edition of "Application Reports", you will once more learn first-hand exactly what this means. Because again, our customers have allowed us a look behind the scenes and shared with us how they have overcome challenges and taken innovative approaches successfully with the help of our automation and digitalisation solutions.

So you can look forward to yet more exciting reports, this time on topics such as sensor-based quality assurance in battery cell manufacturing or in the assembly of scissors, smart valve monitoring in the brewery or digitalisation in cigar storage.

Enjoy reading!

Your ifm Application Report team

Present your know-how to a large audience!

We are constantly looking for exciting and clever solutions you have implemented with our products. Why? Because nothing is more inspiring than successful practical experience. Are you interested in sharing the benefits you are gaining from ifm products with others? If so, please let us know. We will also be pleased to report on your success story in the next issue.

It's that simple:

Send us a short description of your application. We will contact you, visit you on site, take professional photographs and do an interview with you. Based on this, we will create an Application Report. It will not only be published in the next issue, but also in specialist magazines or, on request, as a special print for you and your customers.

Interested? We look forward to your message to application.reports@ifm.com



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Editorial staff:
Andreas Binasch, Philipp Erbe
Photography: Andreas Binasch
Type setting and layout:
Andrea Tönnies
Production: Paula Pötschick

Editor:

ifm electronic gmbh
Friedrichstraße 1
45128 Essen
Germany
Telephone +49 / 201 / 24 22-0
Telefax +49 / 201 / 24 22-1200
E-mail info@ifm.com



Berchtesgadener Land
Reliable temperature
monitoring



Trust is good, control is better

Reliable temperature monitoring in dairy processing

Milk is a high-quality natural product whose processing requires precise temperature settings. The Berchtesgadener Land dairy uses innovative temperature sensors from ifm in key process areas. These special sensors continuously monitor themselves, thus ensuring compliance with the highest safety standards and optimising the quality of the dairy products.

The Berchtesgadener Land dairy, a cooperative organisation situated between the Watzmann and the Zugspitze mountains in the picturesque foothills of the Alps, processes around 300 million kilograms of milk from its farmers every year.

Every year in the idyllic Berchtesgadener Land district, the dairy processes 300 million kilograms of milk produced by its cooperative farmers between the Watzmann and Zugspitze mountains.

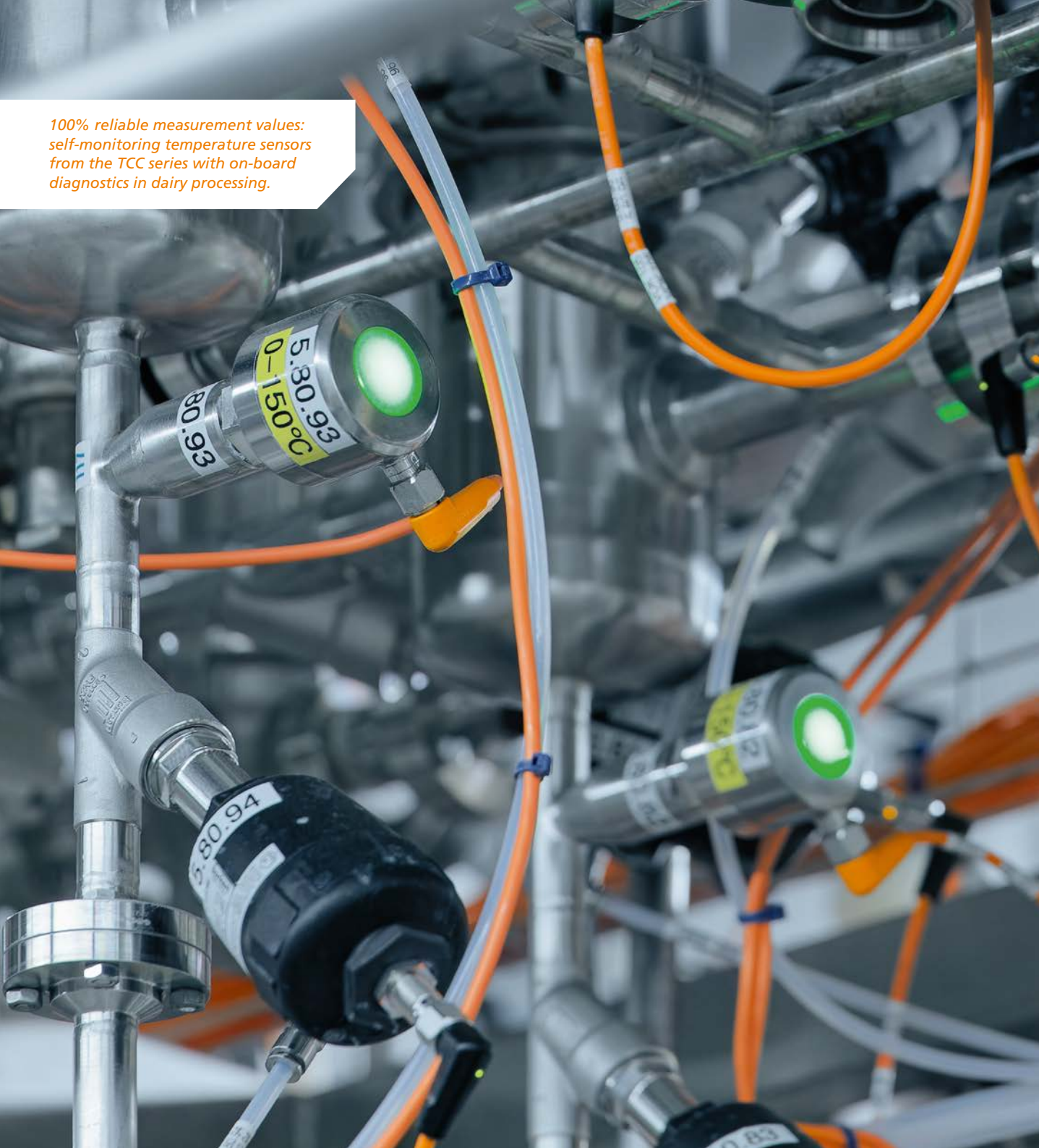


At the production site in Piding, in the BL district, the milk is used to make premium products with the utmost care. Berchtesgadener Land's portfolio includes numerous products such as traditionally produced fresh bottled milk, whipping cream, butter, quark, natural yoghurt, kefir and buttermilk.

Lorenz Engljähringer, plant manager at the Berchtesgadener Land dairy, explains the orientation of the business: *"Quality is our top priority. We process the raw milk as carefully as possible and try to produce high-quality products in as few process steps as possible."*

Temperature monitoring

The quality of all milk products depends on maintaining precise temperatures throughout the entire dairy process. High-precision sensors guarantee defined temperatures along the entire process chain, from the inbound delivery of the milk in the tankers to processing and intermediate storage to outbound delivery of the processed final products. The continuous temperature monitoring also extends to secondary processes such as cleaning and sterilisation, to ensure compliance with statutory regulations and hygiene standards.



100% reliable measurement values: self-monitoring temperature sensors from the TCC series with on-board diagnostics in dairy processing.

” The temperature sensors from ifm can be used to ensure high product quality.

Reliable measured values

Sensor-manufacturer ifm has developed the TCC temperature sensor for monitoring temperatures at particularly critical points. What makes it special is its integrated permanent self-monitoring function.

Christian Doll, Technical Sales Engineer at ifm, explains: “The TCC temperature sensor uses two thermally coupled sensor elements, a sensing element and a reference element to conduct precise measurements in the sensor tip. The measured temperature value is generated by the sensing element and provided via the analogue output or IO-Link. The reference element is used for comparison purposes and to verify the process value. Possible effects of ageing cause inaccuracies in temperature measurement and can be identified by a drift between the sensing element and reference element. A warning is triggered if the temperature difference exceeds the predefined calibration check limit. In this case, the LED display on the sensor switches from green to blue and the diagnostic output sends a warning signal to the controller. This unique permanent self-monitoring across the whole measuring range creates trust in the accuracy of the measured value.”

Another advantage of this integrated diagnostic function is that there is no need for a second monitoring sensor to be installed at critical points. This significantly reduces the costs of hardware, installation and calibration. The TCC temperature sensor also revolutionises the conventional cyclical replacement of sensors at sensitive measuring points. Instead of being replaced regularly and preventatively, the TCC can be replaced



Automated processes ensure maximum efficiency.

cost-efficiently as needed. The special feature: the sensor automatically detects when its accuracy tolerance is reached and alerts the user. Only then is replacement necessary – avoiding unnecessary preventative replacement.

The calibrated process values of the TCC sensor can be considered reliable until the accuracy tolerance is reached. This way, the sensor guarantees maximum measurement value reliability and contributes to maintaining consistently high product quality. Every TCC is delivered ex works with a ISO 3-point calibration certificate which also contributes to quality assurance. For maximum reliability, the device serial number can be monitored via IO-Link, representing a new dimension for quality assurance and documentation of the process values.

Digital data transmission and diagnostics with the IO-Link

In addition to the conventional integration of the sensor via analogue output (4–20 mA) and the diagnostic switching output, the TCC can also be connected via IO-Link. This digital communication offers advanced diagnostic options such as being able to separately read the temperature values of the

two measuring elements. This allows the user to recognise trends in drift behaviour early, regardless of the set limit. This function enables early identification of calibration requirements and timely planning of device replacement. In addition, the IO-Link is used to conveniently set the parameters for the sensors, for example to determine the drift limit.

Won over by TCC

The dairy has been won over by the advantages offered by the TCC.

“The temperature sensors from ifm can be used to ensure high product quality. We use the TCC sensors for in-process measurement of product temperature, cleaning temperature and sterilisation temperature. Because the sensor contains two temperature probes, the process remains stable even if one of the measurement probes is defective, because the sensor continues to send the measurement signal of the other measurement element to the controller. These sensors were chosen not only based on their attractive price, but also on their food-safe resistance to alkalis, acids and disinfectants,” explains **Andreas Holleis**, Head of Process Engineering & Automation at the Berchtesgadener Land dairy.

Partnership with ifm

In addition to the temperature sensors, the dairy also uses numerous other ifm sensors including pressure sensors in pipes and tanks and inductive sensors on valve manifolds. This is no coincidence, as plant manager **Lorenz Engljählinger** explains: *“We’ve been working in close partnership with ifm for decades. For us, this is an important building block in achieving our goal of manufacturing high-quality products and being able to make the process safe and efficient.”*

Conclusion

Having trust in measured values is important, but only continuous self-monitoring guarantees a 100% reliable measured value. This is essential in sensitive processes such as milk production that demand the highest quality. The TCC from ifm makes a key contribution to this.



EREMA

Digitalised recycling
systems

Digitalised recycling

EREMA, manufacturer of recycling systems, relies on hardware and vibration expertise from ifm

Drinking bottles, food packaging, bags, toys: many things in everyday life are made of plastic - but we only need some of them for more than a few hours or days. Around 400 million tonnes of plastic are produced worldwide every year. Only a small share of this is recycled and thus reused. Among the players that keep the plastics cycle going and successfully complete it, are the Austrian EREMA Group and PET-Verpackungen GmbH from Germany.

The EREMA Group is committed to giving plastics a new life. To this end, EREMA develops and produces plastics recycling systems and the associated solutions and services. The approximately 7,500 active plants worldwide have the capacity to produce more than 20 million tonnes of recycled granulate.

"To produce the granulate, the plastic is delivered to the operators of our systems in the form of flakes, which are already shredded, clean and sorted," says **Florian Schieder**, R&D Management & IPR at EREMA Engineering Maschinen und Anlagen GmbH.



The recycling material is delivered to the plant operator in the form of flakes.



The sensor data from the recycling plant is collected decentrally via an IO-Link master and forwarded to the control system in bundled form.

"The flakes are then dehumidified, compacted, melted, filtered and then granulated in our plants. The granulate produced is the basis for reusing the recycled material to manufacture new plastic products."

If food-grade granulate is to be produced, as is the case at PET-Verpackungen GmbH, for example, the flakes are shredded at a higher temperature and under vacuum.

"On the one hand, this ensures that the material is decontaminated, and on the other hand, this special treatment enables us to achieve better colour properties for both the granulate and the end product,"

Florian Schieder continues.

Up to 80 vibration sensors per system

EREMA relies on sensor technology and IO-Link masters from ifm to control the manufacturing process.

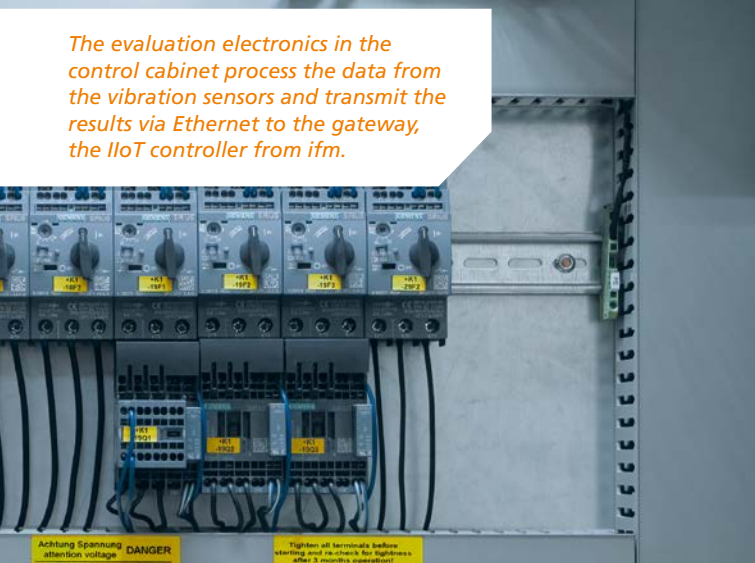
"We have been using pressure sensors, photoelectric distance sensors and flow sensors for a long time to ensure that all relevant process values are adhered to and that the material flow takes place at the required speed," says Yvonne Kappacher-Winter,

Development Project Manager PredictOn at EREMA Engineering Maschinen und Anlagen GmbH.

The IIoT controller transmits all sensor data to the higher IT level, where it can be accessed by EREMA customers at any time on a laptop or smartphone.



The evaluation electronics in the control cabinet process the data from the vibration sensors and transmit the results via Ethernet to the gateway, the IIoT controller from ifm.



” At ifm, we receive everything from a single source, from the sensor to the evaluation electronics, IO-Link master and gateway.

“We are now digitalising our systems even further by equipping motors, gears, vacuum pumps and roots compressors with a total of up to 80 vibration sensors and other oil condition sensors. This enables us to precisely record the system’s maintenance requirements. The customer can see information on the health status of the system via our PredictOn predictive maintenance system both directly on the system and via our BluPort customer portal. This enables early damage prediction and the planning of appropriate maintenance measures to minimise downtimes,” says Yvonne Kappacher-Winter.

Digitalisation: everything from a single source

Florian Schieder adds: “We have customers who operate their systems around the clock and produce up to six tonnes of granulate per hour. The long-term availability of our machines is becoming increasingly important for us and our customers. It was clear to us that we needed more sensor technology and further digitalisation in order to be able to detect and avert impending failures at an early stage. We needed a strong partner who could support us with the right products and expertise in vibration analysis. At ifm, we receive everything from a single source, from the sensor to the evaluation electronics, IO-Link master and gateway. This makes it easy for us to offer the customer a seamless solution. They can see the processed data on their laptop and smartphone at any time and take appropriate action, including ordering spare parts from us.”

Containers made from 100 per cent recycled material

PET-Verpackungen GmbH also appreciates precisely these possibilities of data-based maintenance planning. As part of the Wiegand Glas Group, the company primarily produces PET preforms for the beverage industry, but also moulded PET containers with a capacity of 10 millilitres up to 30 litres. “The topic of recycling is becoming more and more important for us. Our customers are increasingly asking for products made from recycled materials. In some cases, the proportion is 100 per cent,” says Matthias Raab, Operations Manager at PET Packaging.

“That is why we decided to commission our own recycling plant three years ago and chose EREMA as our technology partner.” PET-Verpackungen produces up to 50 tonnes of granulate every day for further processing.

“In order to maintain the production process, it is important that all systems and processes function reliably. The digitalisation solution from EREMA supports us enormously here, as the condition monitoring and planning of maintenance is considerably simplified by the data provided,” says Raab.

Conclusion

With integrated solutions for digitalised, comprehensive system monitoring, ifm helps EREMA to offer its customers added value in the plastics recycling process. Thanks to condition-based maintenance, system availability is increased and the recycling potential is maximised.

Up to 80 vibration sensors are installed in a current EREMA system. For example, they monitor the motors and gears of the system.





**Fraunhofer
Research Institution**

Sensor-based
quality assurance



Research into more efficient battery cell production

The Dualis 2D vision sensor from ifm keeps a close eye on electrode manufacture

Electromobility is still racing along the fast lane worldwide. Between 2020 and 2023 alone, the proportion of registered e-vehicles increased from below five per cent to an estimated 18 per cent – and the trend is clearly rising. However: if the intended mobility transition is to be fully accomplished, one thing in particular is required: increased capacity in the production of powerful batteries – and very soon, too.

As the link between science, research and industry, the Fraunhofer Research Institution for Battery Cell Production FFB intends to contribute to ensuring that the development of new, powerful cell formats is accelerated.

The target for Europe has been set: the EU aims to play a more important role in the battery cell production market in the future, and has set itself the target of considerably improving production efficiency by as early as 2030.

This is to include reducing rejects to below five percent – an ambitious undertaking, as Fabian Kux, Research Associate (Quality Assurance) at the Fraunhofer FFB clarifies: *“Reject rates are still noticeably high along the entire battery production process chain worldwide.”*


Well-adjusted plants produce around 10 per cent scrap; this percentage may be even higher during the ramp-up phase. *“Therefore, our aim is to accelerate the manufacture of innovative and, above all, efficient battery cells,”* says Kux.

Quality assurance using 2D vision sensors

The FFB already ascribes an important role to automation technology. *“An important element of our research is working out how sensor technology can help to enhance the quality of the products and the efficiency of the individual process steps.”*

Within the framework of a joint project with ifm, Kux and his team are testing the possibilities for using the Dualis 2D vision sensor, for example.





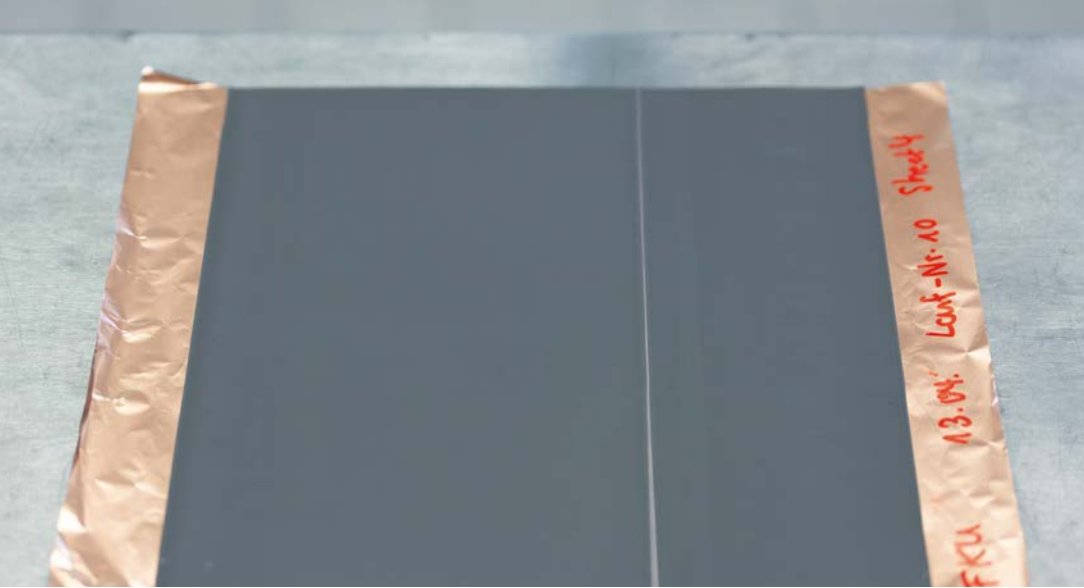
At the beginning of the production process, the Dualis vision sensor (O2D5) monitors the application of the slurry. Double-sided monitoring is also being tested at the Fraunhofer Research Institution.

The Dualis checks contours and surfaces and compares the actual state with the target specification. This enables reliable detection of the smallest differences in details, such as missing retaining clamps or malformed threads.

In addition, surface dimensions can be analysed, such as – in this specific use case – those of the slurry, a paste of active materials, conductive additives, solvents and binding agents, that has been applied. The vision sensor reliably recognises a defective application and emits an error message. The process can then be readjusted to avoid further rejects and to maintain a high level of product quality in the manufacturing process. Integrating the vision sensor is extremely simple: the 2D vision sensor can be parameterised for most use cases by means of the teach function of the free ifm Vision Assistant software and its parameterising assistants and a few mouse clicks.

Three applications for the Dualis

“In consultation with automation specialist ifm, we identified three applications for which the Dualis can be used,” explains Kux. “The first application involves detecting defects in the freshly applied electrode slurry on the surface of the film substrate. You see, contamination or missed areas will have a negative effect on the safety and performance of the cell and must therefore be identified as scrap,” says Kux. “The dimensions of the coating are checked at the same time. In a continuous application process, the width of the film is measured; in an intermittent application process, the length is also measured.”



Gaps in the slurry coating result in rejection and it is imperative that they be identified. ifm's Dualis vision sensor indicates this defect, thus helping to keep the reject rate to a minimum.

Always precisely wound

If both sides of a film are being coated, a second Dualis is used to inspect the underside.

"In this case, we have to ensure that the slurry is applied to both sides in equal measure in order to guarantee the required quality."

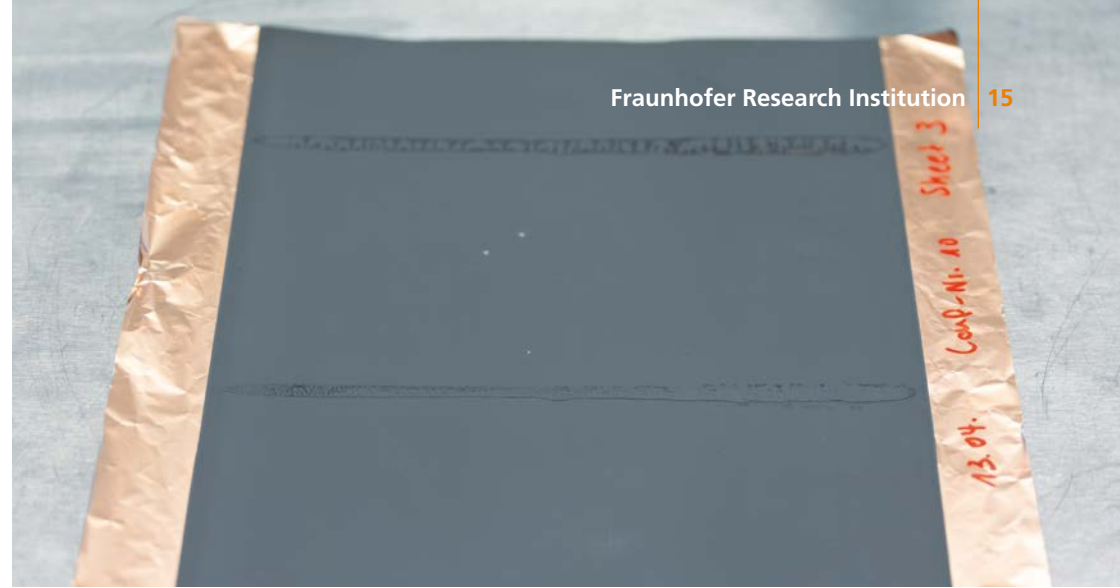
In the third scenario, the Dualis inspects the edge of the film and coating.

"Wet slurry is applied to the film and then goes through a drying process. The coated, dried electrode film is then wound up. Otherwise the irregular load can damage the film and coating."

From the digital twin to the battery passport

The vision sensor data can be used not only to reduce the reject rate at an early stage and ensure quality. From 2026 it will be mandatory for all newly produced batteries to have a battery passport. This will contain information not only about the supply chain and the new or recycled raw materials used, but also about the performance and health of the battery.

"All the data that the sensors record along the entire production process can be transferred to the digital twin. This can then be used to easily create the battery passport."



The Dualis also reliably identifies irregularities or pockets in the applied slurry, assuring quality and high productivity.

A good example of a successful partnership

The Fraunhofer FFB is still in the start-up phase. In the future, the Münster location will provide the capacity for high-volume, industrial-scale production.

"This is intended to enable us to produce batteries at high throughput in order to jointly test new technologies with partners in industry in research projects in real conditions. The collaboration with ifm is thus a good example of how we can test, optimise and upscale the battery cell manufacturing technologies of the future with our partners."

Conclusion

In partnership with the Fraunhofer Research Institution for Battery Cell Production FFB, ifm can test its Dualis 2D vision sensor in real conditions. In the future, the resulting insights will help everyone: the Fraunhofer FFB, ifm, battery cell manufacturers and electromobility as a whole.

"In consultation with automation specialist ifm, we identified three applications for which Dualis can be used."



Gardena
Quality control
during assembly



Monitoring with precision

2D vision sensor monitors small parts during assembly

In manufacturing, delicate components often need to be checked before the next processing step. Gardena, a recognized manufacturer of gardening tools, relies on powerful vision sensors from ifm.

Gardena is the leading German brand for irrigation products, mechanical cutting tools and classical gardening tools. Based in Ulm, Germany, the subsidiary of the Swedish Husqvarna Group successfully manufactures and distributes its products worldwide.

At its plant in Niederstotzingen near Ulm, Gardena produces manual shears, loppers and grass shears. Production Manager **Jens Starke** states: *"Our very high vertical range of manufacturing starts with the processing of supplied stainless steel coils, including punching and laser cutting of the blades, followed by hardening and, above all, grinding, which is the core competence of our plant and decisive for shear quality. Then, the blades are coated and assembled."*

The ifm vision sensor checks that the parts are correctly assembled.

Semi-automated production

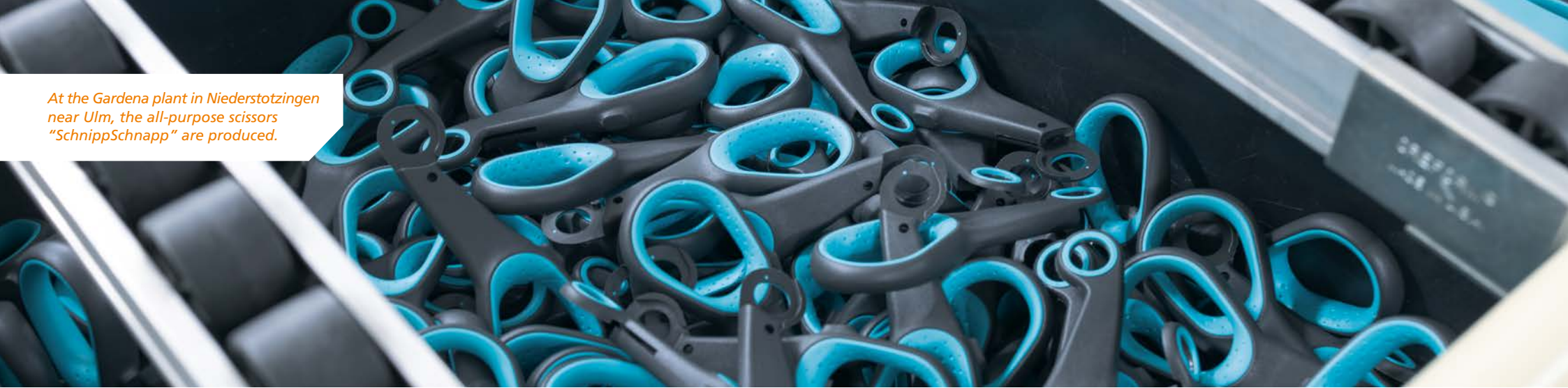
Significant portions of the production process are automated. For example, robots are used to feed the metal sheets to the punching or laser cutting systems. During grinding, robots precisely guide the blades along the grind stone. This ensures consistently high product quality.

However, some tasks are still carried out manually, such as the final assembly step of Gardena's all-purpose scissors "SchnippSchnapp". Here, a small disc spring is manually inserted into a recess in one of the scissor halves. This will later allow the scissors to open and close smoothly. To ensure flawless product quality, the system automatically checks whether the disc spring has been inserted correctly before screwing the parts together.

The components are assembled manually. This allows assembly of different types of shears on the same production line.



At the Gardena plant in Niederstotzingen near Ulm, the all-purpose scissors "SchnippSchnapp" are produced.



The vision sensor checks whether the disc spring is in the joint and whether it is the right way round (on the left) or the wrong way round (on the right). Rejects due to assembly errors are reliably prevented.

Sven Cermak, tool setter at Gardena, explains: "Position detection is very special here, because the very small and flat disc spring sits in a recess. Inductive or photoelectric fork sensors would not be useful here. This is why we use ifm's camera system. It can even detect whether the spring has been inserted the right way round."

The 2D vision sensor O2D

As inductive or photoelectric fork sensors are not suited for this specific position detection task, the O2D5 vision sensor from ifm is used. This camera-based sensor was specially developed for optical 2D object inspection. It uses blob analysis to compare sets of contiguous pixels, comparing the size, shape and other properties of the disc spring with a programmed target surface.

The ifm parameter setting software Vision Assistant allows easy and quick set-up of the sensor. The user simply defines image zones in which the objects to be detected are located. Using the teach method, a reference image is recorded and then tolerance limits are defined. As soon as these limits are exceeded, the sensor generates an error signal.

The O2D5 device is equipped with an ifm memory stick on which all parameters and settings are stored. If the device needs to be replaced, the stick can be used to easily transfer the data to the new sensor.

” We have been working closely with ifm for many years and have developed outstanding solutions together



With the help of the “Vision Assistant” software, the sensor can be easily adjusted to the desired application using the teach function. Fine-tuning is possible thanks to optional parameters.

Extraneous light as a challenge

A particular challenge for camera-based inspection systems are changing light conditions, such as sunlight entering through windows depending on the position of the sun and hitting the objects to be inspected. In such cases, the ifm system proves to be particularly reliable. The trick: During measurement, the system takes five shots at different exposures and automatically uses the image with the optimum exposure for comparison.

Sven Cermak is very pleased with the solution: *“On this system, extraneous light does not play a significant role, but we use the same camera on another production line where we have to inspect extremely small parts in the millimetre range. There are large windows there, which means that we have to deal with more pronounced changes in light conditions. Even in this environment, ifm’s camera provides excellent results.”* The integrated polarisation filter in front of the camera lens maximizes detection efficiency, allowing highly reflective objects to be detected without any problems.

ifm as a reliable partner

Introducing new technology to an organisation requires comprehensive consultation, as the best solution will only be successful if it fits within the context within which it is being implemented. The partnership of several decades between the renowned garden tool manufacturer Gardena and the specialist for automation solutions ifm emphasises this cooperation.

Sven Cermak: *“We have been working closely with ifm for many years and have developed outstanding solutions together, including the introduction of the camera. Initially, we did not know which systems are available on the market or what is technically feasible. The product experts from ifm advised us expertly, ensuring short and direct lines of communication. We were able to test different camera versions and the collaboration was extremely successful.”*

There are many production lines at different sites, where production processes are monitored and quality checks are performed. Here too, the vision sensor from ifm proves to be a highly valuable solution.

“We always check whether we can use the camera in other areas as well. We now have three or four cameras in our department. Of course, the cameras are also used extensively by other departments and sites, even more than here,” says Sven Cermak.

Jens Starke is confident about the future: *“One big project is still to come, where certain factory standards have to be met. It all centers around sensors, camera technology, scanning and similar topics, so it would be great to work on this project with ifm.”*

Conclusion

The vision sensors from ifm prove to be a highly effective solution for production control and quality assurance, in particular for small parts monitoring, where conventional position sensors reach their limits. With its slogan ‘close to you’, ifm not only demonstrates its commitment to hardware, but also its active support and expertise.

Production Manager Jens Starke sums it up this way: *“The ifm slogan ‘close to you’ definitely reaches the shop floor.”*



Gerber humidors

Digitalising cigar storage



A feel-good oasis for cigars

Industrial automation technology for a perfect climate in Gerber humidors

Storing valuable cigars is almost a science. True aficionados spare no expense in storing the rolled tobacco leaves in sophisticated humidors. What you cannot see: Behind the façade, sophisticated technology maintains a constant humidity to keep the aromas and consistency of the cigar in optimum condition.

Founded in Duisburg 140 years ago, Gerber is a joiner's business that is steeped in tradition.

Karl-Heinz Gerber is the fifth generation of his family to lead the company and explains: "We are still traditional joiners, but we also cover a broad spectrum of services including store fitting, interior fittings and exhibition stand construction. A few years ago, we also launched 'Gerber Humidor'. This brand represents our passion for creating the perfect, unique piece of furniture with equally perfect humidity for cigar aficionados. Our mission is to build the world's most beautiful humidors. To do this, we use the best and most expensive woods on the market."

So it is no wonder that Gerber's customers include Hollywood greats and famous football stars.

Comprehensive expertise required

From a purely technological point of view, a humidor ensures that cigars are stored in optimal conditions and therefore maintain their value and quality. Our customers have high standards, as **Karl-Heinz Gerber** knows: "You need to have a very high level of technical expertise to ensure the optimum humidity in these humidors. The humidity level can be set by the cigar aficionado depending on their taste and preference. What makes it complicated is that the external climate conditions have an impact on the humidors."

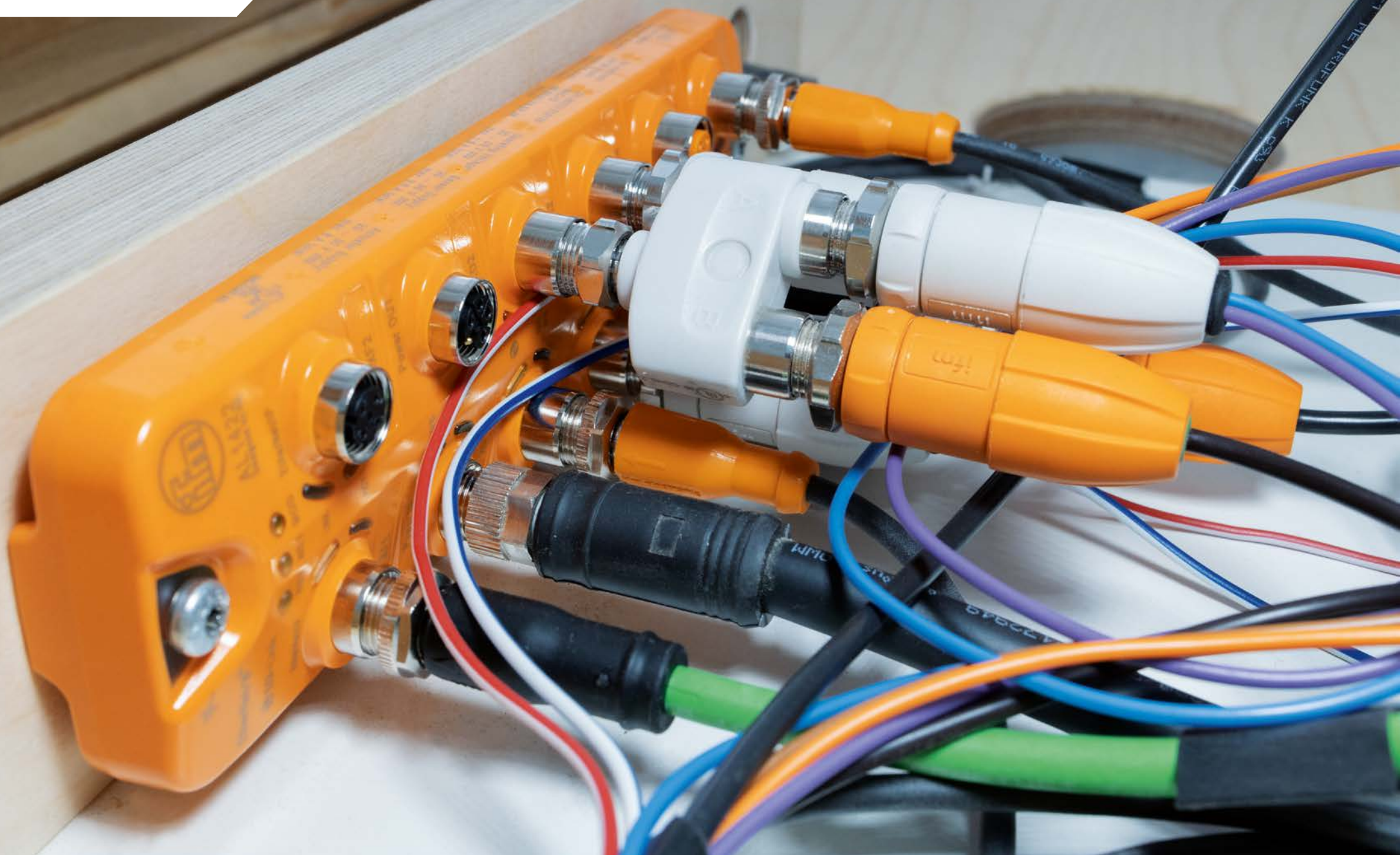
This is why Gerber humidors offer an automatic humidity regulator developed and implemented in cooperation with the automation specialist ifm.

"We measure and control humidification and dehumidification. In doing this, we take into consideration the ambient humidity, which can be very different in different countries around the world. At the same time, we also have to control the ventilation. So, all in all, it's a very unique and complex situation. The art here is in ensuring the perfect humidity on all levels of the humidor. It requires experience and, of course, the right technical equipment," says **Gerber**.

Humidors provide optimum humidity to ensure that expensive cigars are stored perfectly.



The consistent use of connectors here on the IO-Link module prevents cabling errors and makes it possible for components to be easily replaced in the event of a fault.



” The edgeController is ifm’s first product to feature an automation server. So, if any problems arise, you can easily access it via remote maintenance.

Wanted: a partner with international experience

When Gerber decided to forge ahead with the automation of its humidors a few years ago, they had to find a partner with an industrial background, active in the German and international markets. The head of the company explains why this was necessary: “We deliver our humidors worldwide, so we want to offer maintenance-free solutions because international support is time-consuming and expensive. Our customers store very expensive cigars in our humidors – we’re talking five or six figures here. That’s why we needed a partner that could supply us with reliable technology. We did our research and found that partner in ifm.”

Requirement: Simple cabling and remote maintenance

In the joiner’s workshop in Duisburg, the humidors, which are often the size of cupboards, are assembled with the highest standards of craftsmanship using fine woods and veneers and equipped with electronic components for humidity regulation. However, after extensive testing, the humidors must be dismantled and packaged for delivery. “We need to ensure that our humidors can be operated effortlessly and function flawlessly at all times anywhere in the world. That’s why we opted for an easy-to-use, i.e. plug-and-play, system for connecting the electronic components. Another of our requirements was



remote maintenance, namely the capability to make adjustments, for example in response to changes in habits or climate, for instance with the help of intelligent AI systems,” explains **Karl-Heinz Gerber**.


For this reason, all sensors are IO-Link compatible and connected via an IO-Link master module. This module collects the data and transmits it to the controller via EtherNet/IP interface. The advantage of this IO-Link communication is that it not only makes it possible to use the controller to set parameters for the sensors, but also provides an insight into the sensor. For example, it makes it possible to read the sensor’s minimum and maximum values. The diagnostics parameters saved in the sensor can also be called up using the controller, which allows for quick, precise analysis in the event of a fault. Devices installed in the humidors, such as ventilators or lighting, are also controlled via the IO-Link master. The advantage here is the standardised M12 connectors. Neither the assembly

All components are connected using standardised M-12 connectors.

nor the replacement of components requires an electrician – all you need to do is screw connectors into the module, which makes wiring errors impossible.

Everything from a single source

Dirk Scheffler, Senior Field Technical Sales Engineer at ifm, played a significant role in the implementation of the control technology and the development of the software: “All of the automation components needed to come from a single source. That’s why we chose the ifm edgeController as the central control unit. This unit meets all of Gerber’s key requirements: simple wiring, deep diagnostics both during commissioning and for the end customer, attractive visualisation and the option of remote maintenance.”

A man wearing a white t-shirt with 'GERBER' on the back and red suspenders is working on a wooden cabinet. He is wearing safety glasses and has a yellow pencil in his ear. He is looking at the interior of the cabinet, which is illuminated with warm light. The cabinet has several shelves and a door with a keyhole.

Top-class craftsmanship for sophisticated, unique pieces.

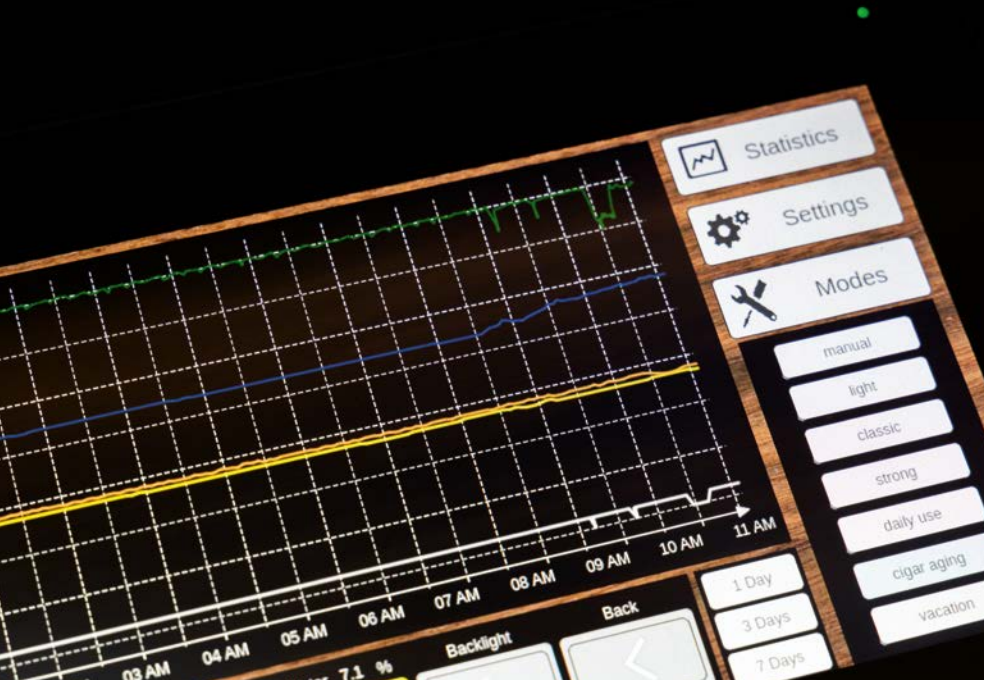
Past measurement readings can be displayed clearly on the widescreen display.

A truly multitasking centrepiece: the edgeController

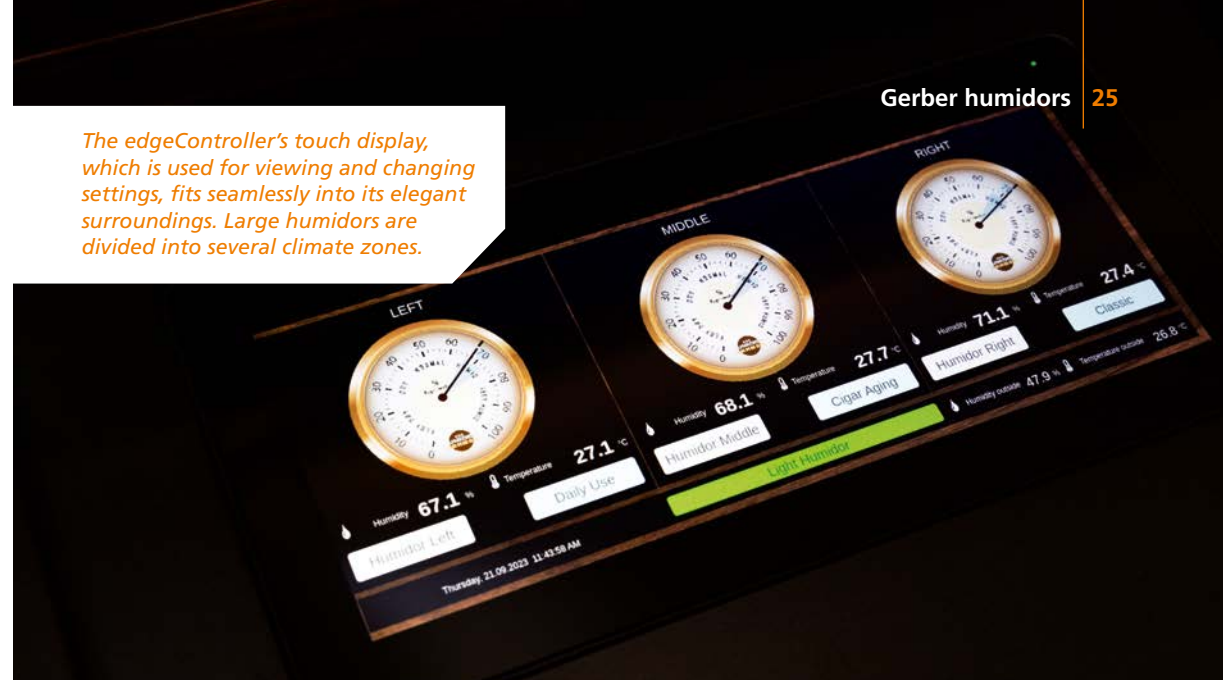
ifm's edgeController is much more than just a conventional PLC. The eye is immediately drawn to the impressive 12.3-inch graphics display on the top of the device, which has a resolution of 1280 x 480 pixels to enable sophisticated visualisations. In its humidors, Gerber has chosen a photorealistic display in which the key measurement, humidity, is stylishly visualised on a virtual analogue hygrometer. Users can also choose between different views, for example to look at past measurement readings or change the settings.

The actual program processing is handled by a powerful 1.3 GHz quad-core processor which operates at full performance at ambient temperatures of up to 60 °C. CODESYS V3.5 is used for programming.

One of the edgeController's outstanding features is its extensive connectivity. Either as an IT gateway or as a link to the cloud: The edgeController can transmit the recorded and prepared data to the most common cloud platforms such as AWS, Microsoft Azure, Google Cloud and AnyViz.



The edgeController's touch display, which is used for viewing and changing settings, fits seamlessly into its elegant surroundings. Large humidors are divided into several climate zones.



In addition, the edgeController speaks the leading standard digitalisation languages such as OPC UA and MQTT. Industrial Ethernet protocols such as EtherCAT, EtherNet/IP or Modbus TCP can be used to collect and process data in real time.

Dirk Scheffler explains another feature that is important to Gerber: "The edgeController is ifm's first product to feature an automation server. So, if any problems arise, you can easily access it via remote maintenance. All you need is for the edgeController to be connected to a router via an Ethernet cable, for example to a router."

This way, the IO-Link infrastructure makes it possible to take a look into every individual sensor, which enables detailed and accurate (remote) diagnostics. If major adjustments are required, Gerber can also carry these out via remote maintenance. "Another advantage of the integrated automation server is that it makes it easy to install updates," adds Scheffler.

Reliable power supply

One important aspect is voltage fluctuation. In some parts of the world, the power grid is not as constantly stable as in Germany. In this regard, ifm power supplies offer a crucial advantage by providing a sufficient buffer in the form of a broad input voltage range of 110 to 300 V AC, which largely compensates for voltage fluctuations and thus ensures that humidors can operate continuously. Moreover, the power supplies are intelligent, using IO-Link to communicate diagnostic values such as output voltage, load currents, power supply quality or the cause of automatic shutdowns in the event of a fault.

Integrated electronic fuses provide additional protection against overloading and short-circuiting. The fuses can be reset via IO-Link.

Other separate electronic fuses in the secondary circuit provide additional protection by allowing individual components to be switched off selectively in the event of a fault. These fuses are also IO-Link compatible, which enables comprehensive diagnostics using the edgeController in the event of a fault.

A resounding success

This project represented a premier for both Gerber and ifm, because it was the first time the edgeController had ever been used.

Karl-Heinz Gerber sums up positively: "Together, we've done a lot of development work. The software needed to be developed from scratch, often even outside regular working hours. It's fantastic when you're passionate about a project. ifm also provides fist-class service. We can rely on their support team responding immediately. We have done a lot of development work in the last few years and all I can say is: sensational. I hope that this success continues."

Conclusion

This project impressively demonstrates the symbiosis of top-class workmanship and high-end technology. It shows that industrial automation technology also proves itself an exclusive environment and this synergy is what makes these humidors the perfect feel-good product for cigars.

GeTech Sensor-based check gauges



IES by
Checks position
of sliding pin

Y by
Checks locking
of flap

IES by
Checks locking
of flap

O8H by
Checks presence
of O-ring

IES by
Checks locking
of flap

Y by
Checks position
sliding pin

O8H by
Checks presence
of O-ring

Y by
Checks presence
of pin in flange

IES by
Checks locking
of flap

CR12

Perfectly bent?

Sensor-based check gauges for pipes

Pipelines are the lifelines of systems that provide planes or cars with oil, fuel, coolant or other fluids. They often have to be bent into complex three-dimensional shapes in order to fit into confined spaces and efficiently connect units and containers.

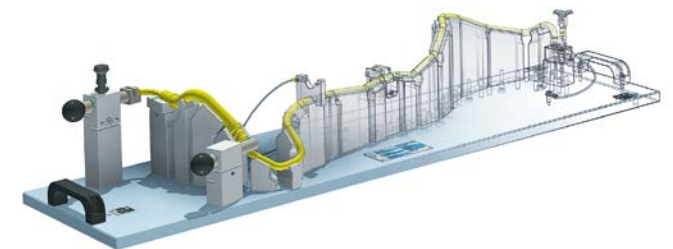
Effective quality control is essential to ensure that everything can be assembled cleanly and all connections fit perfectly. Prior to installation, special fixtures are used to check that the bends and lengths conform to the specifications. Only then can a smooth integration into the overall system and the durable efficient functioning of these complex pipes be guaranteed.

The three-dimensionally bent air conditioning tube is placed into the check fixture for quality inspection.

GeTech, a Dutch company based in Westerbork, specialises in the development, production and distribution of check fixtures, which are used to check such pipes for geometry. GeTech Managing Director **Alco Poppinga** explains: *"We manufacture check gauges for the automotive and aerospace industries. The tube to be checked is placed in our fixtures and mounted in the same way it will later be installed in a car, for example. "It's a quick and reliable way to check whether a product is within the tolerance limits."*

GeTech develops the check gauges in their own CAD laboratory. The robot-assisted production process using modern machine tools is also handled internally, as is the precise check on their in-house measuring system.

Alco Poppinga: *"We produce our gauges according to our customers' high expectations. Currently, we are in the process of automating our production with robots. This ensures a high output of our products."*



For this purpose, aluminium blocks are lined up and stacked on an aluminium base plate. The resulting "stilts" serve as support points for the product. Their height and orientation are calculated with accuracy to a fraction of a millimetre. The top of the blocks has a milled groove into which the pipes or tubes to be checked should fit perfectly without tension.

Optionally, the gauges can be integrated into the GeTech Product Inspection System (GPI) as a modular component. This system consists of sensors, a screen-based dialogue system and a control unit.



One of multiple optical sensors detects that the tube has been placed in the fixture. The lock is released once all steps of the quality check have been passed.



Alco Poppinga describes the GPI inspection process: "When the user has checked into the system via RFID chip, the right test sequence is automatically loaded and indicated on the display. The user is guided through every step of the process and is given instructions, for example, on how to insert the pipe into the check fixture and close the clamps."



ifm's contour sensor inspects the country-specific fill valve of the air conditioning tube.

Sensors monitor the process

The inspection process is monitored with the help of several products from the sensor specialist ifm. For example, their inductive sensors are installed on the toggle clamps to ensure that all required levers are closed correctly. Only then will this operating step be released. The inductive IY type sensors have an even smaller design. For example, they are embedded in the flaps which report the correctly seated position of the product to the controller. Thanks to their compact M5 design, they are particularly space-saving.

To detect the presence of certain parts, such as the O-rings at the tube ends, photoelectric sensors are used. In this application, the miniature diffuse reflection sensors of the O8H series score with their compact size and a precise light spot even at long distances.

The user is guided through every step of the process. This ensures an efficient and error-free test sequence and eliminates the need for lengthy preparation in case of changing check fixtures.



Another important sensor system is the O2D contour sensor, which detects the actual contour and compares it with the target contour defined in the test program. Values outside the tolerance limits are recognised as faults.

Alco Poppinga: *"We use the contour sensor from ifm to check the fill valves on air conditioning lines. These filler necks can differ from country to country. By checking their contour, the camera-based sensor verifies whether the correct country version has been installed."*

To confirm a successful product test, a label with a barcode is printed and affixed to a specific part of the test tube. A camera-based code reader from ifm checks whether the right label has been applied in the right place. The product is then approved and released for removal.

Modular concept

The sensor setup of the measurement system depends on the test requirements of the specific product.

Alco Poppinga: *"The GPI is a work station which allows users to easily exchange the check gauges via a plug-in connection. Most sensors are permanently installed on the levers and*

clamps. The contour sensor or the QR code reader remain at the work station because we can quickly adjust them to the application using the free and convenient software 'ifm Vision Assistant'. This also helps reduce the production costs of the gauges, which benefits our customers."

Partnership with ifm

GeTech relies on products from ifm, both in terms of sensors and dialogue displays.

Alco Poppinga explains why GeTech now also uses the industrial sensors for quality control: *"In 2016, one of our customers approached us because they had received complaints about the tubes missing certain parts. Together with this customer, we analysed the problem and had the idea to use sensors for support. In the same year, we met ifm at an exhibition. We brought up our customer's problem and quickly realised that we would be a good match. ifm provided us with some sensors and a programmable display to test our ideas. The products convinced us, which is how the GPI was born – a work station for easy connection and exchange of check gauges."*

Bottom line

Sensors from ifm help secure the manufacturing quality of complex pipes. They reliably detect defects that may be overlooked in a purely manual inspection process. An easy-to-use dialogue system ensures efficient inspections and highest product quality.



Grégoire

Autonomous line guidance
for grape harvesters



Automatic grape harvesting with ifm

Autonomous line guidance without GPS for mobile agricultural machines

With EasyPilot, the manufacturer of multi-equipment carriers and harvesters, Grégoire, has created a sensor-assisted automatic line guidance system that boasts a precision of 3 cm without needing a GPS position signal.

No other beverage holds so many secrets and divides so many opinions as wine. Wine: The Italians claim it as their national beverage, and the cup of the everlasting covenant of the Christian faith is filled with it – for in wine is truth: “in vino veritas”. One truth about wine is that it is necessary to harvest grapes to produce it. And in our days, which are marked by technological progress, the most important question is: man or machine? The romanticised image of the grape harvest, which we often see in movies and which will surely have inspired one or the other Hollywood star to buy their own vineyard, actually looks quite different in reality. Considering that in Germany alone the average citizen drinks about 20 litres of wine per year, it becomes quite obvious how much work has to be done in a

short space of time by about 80,000 German winemakers who cultivate and harvest wine on an area of about 102,000 hectares.

Given these figures, how is it possible to be successful?

Success through technology: Many winemakers use state-of-the-art harvesting machines like grape harvesters instead of manual labourers.

Grape harvesters offer various advantages. One hectare, for example, can be harvested in 3 to 5 hours. Achieving the same result with manual labour requires 40 to 60 workers.


How does an automatic grape harvester function?

The French company Grégoire is a manufacturer of grape harvesters. Their grape harvesters can additionally be equipped with an automatic line guidance system: the “EasyPilot”. This system boasts a precision of 3 cm without depending on satellite signals.

Grape harvester with the EasyPilot automatic line guidance system.

The 3D camera precisely detects the grape row in front of the vehicle.





The automatic line guidance system steers the vehicle precisely along the grape row.

The grape row is detected by a 3D camera sensor (type O3M) from ifm which measures the distance to the nearest surface for each pixel using time-of-flight technology, thus detecting the general properties of the vines. Inaccuracies caused by vine branches from the side or high grass can be excluded.

While the grape harvester moves over the vines, it creates a tunnel beneath the driver's cab. In this tunnel, shaking rods made of food-grade plastic fix and shake the trellises. These vibrations shake the vines, so that the grapes fall off. They tumble on a conveyor belt that transports them to stainless steel containers. Suckers remove unwanted elements such as leaves and twigs.

Another 3D sensor is mounted on top of the grape harvester's driver cab. This sensor is aimed at the ground and determines the height and thickness of the trellis. Once the sensor signal has been processed, a virtual guiding track is generated that visualises the grape row as a model. This model is used as a basis to calculate the ideal route for the harvester to take.



The driver only controls the operating speed, EasyPilot does the steering.

When the machine is in the grape row, the driver starts the EasyPilot via the screen in the cab. Once the system has been started, all the driver needs to do is have an eye on the operating speed and the tools – everything else is taken care of automatically by the system. At the end of the grape row, a visual and acoustic signal informs the driver that the harvester needs to be turned around to move along the next grape row. There were times when the time for the grape harvest was ordained by the government. Today, winemakers can decide for themselves, and with the grape harvesters from Grégoire, grapes can be harvested at any time – even at night. It remains to be said that innovation pays off: Grégoire have won the innovation award for their new automatic line guidance system EasyPilot, which is based on the O3M sensor from ifm.

Numerous advantages

Besides the absence of a GPS connection, Grégoire's system offers many other advantages: precise line guidance even in lots with uneven ground, increased quality of the grape harvest (improved ingress resistance, reduced loss, preservation of the vines), increased steadiness of processes beyond the grape harvest (crop spraying, pruning...), protection of the mechanics, convenience and productivity, application possibilities at day and night, operating speeds of up to 12 km/h.

EasyPilot is available as an option for the current GM7, GL7, GL8, GX8 and GX9 models. Most predecessor models equipped with a direction sensor can be retrofitted with the system.

Use of inclination sensors

The inclination sensors installed on the harvester play an indispensable role in ensuring that the machine is constantly aligned vertically, no matter how steep the slope. Only the perfect levelling of the grape harvester, regardless of the terrain, makes it possible to achieve maximum throughput and ensure the safety of the user. Besides, the machine can drive faster, saving valuable working time. The 1-axis inclination sensors (type EC2045) used have a CANopen interface which ensures easy integration into the machine controller.

Conclusion

Grégoire shows that traditional viticulture and modern harvesting machines complement each other perfectly. The EasyPilot, with its 3D camera, guarantees optimum, smooth line guidance. This ensures that no grape is lost during wine production.



Koedood

Hydrogen propulsion for inland waterway vessels



Emission-free inland shipping

Koedood equips the first inland vessel with hydrogen propulsion

The European goods transport chain could not be imagined without inland navigation. On the contrary: Aiming to become the world's first climate-neutral economy by 2050, the EU wants to promote inland shipping more actively as one of the most CO₂-efficient transport modes. In order to significantly reduce the still quite high emissions on the over 40,000 km of navigable inland waterways, the EU focuses on clean fuel through effective after-treatment of exhaust gases and new forms of propulsion.

In both areas, Koedood acts as a competent partner. The company, which is based in Hendrik-Ido-Ambacht near Rotterdam in the Netherlands, retrofits existing ships with diesel engines that comply with the strict EU Stage V emission regulations.

"By developing a proprietary after-treatment system we call Koedood Engine & Emission System, or KEES, we have been able to significantly reduce nitrogen oxide emissions," says **Sander Roosjen**, Research and Development Manager at Koedood.

First fully hydrogen-powered inland vessel

Koedood also partners with the shipbuilding company Kooiman to develop a completely new, clean propulsion technology: *"After the first hybrid models, we are now equipping an inland vessel with a fully hydrogen-powered and thus emission-free system for the first time,"* says **Roosjen**.

"The energy required by the ship is supplied by three modular fuel cell systems developed in-house, each with a maximum output of 300 kW," Roosjen explains.



The K2 hydrogen generator developed by Koedood and Kooiman is tested before installation.



The 32 low-temperature PEM fuel cells produce the energy for propulsion of the vessel.



The complex process is closely monitored with various sensors in order to achieve maximum efficiency.

Modular system in 20 ft format

The K2 – a reference to the two companies Koedood and Kooiman and the chemical hydrogen formula H_2 – is dimensioned to fit into a standard 20 ft container. It consists of 32 low-temperature PEM fuel cells, an air supply and a cooling water circuit. The required hydrogen is transported onboard the ship under low pressure.

Sensors ensure optimum efficiency

For monitoring and optimum operation of this system, Koedood uses various sensors from ifm, including the LMC100 point level sensor, the TA2405 temperature sensor, the PT5503 pressure sensor and the LR9020 level sensor.

“Because it is a completely new propulsion system, we do of course want to collect as much data as possible to ensure smooth operation of the system,” says Roosjen.

60 sensors monitor the fuel cell propulsion and transmit the data to the IT level for evaluation.

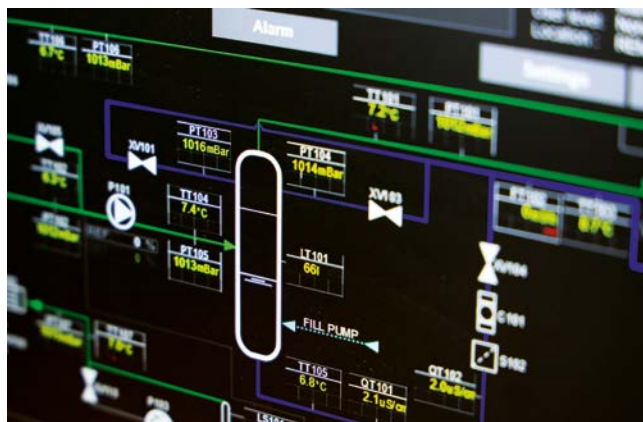


Precise continuous monitoring of pressure, level and temperature values is necessary to ensure efficient operation of the hydrogen propulsion system.

“To achieve optimum efficiency, all relevant process values must be precisely adhered to. So, it is important for us that the sensors are always reliable and accurate. Fresh air with a constant level of humidity must continuously be transported to the fuel cells. In addition, the operating temperature of the fuel cells must be kept at a constant level to ensure the best possible energy yield.”

In addition to the required energy for the ship's engines and on-board electronics, pure water is produced as a by-product of the conversion.

“We use some of it as cooling water in the process cycle and need to ensure its availability on a permanent basis. The excess water can simply be pumped out of the cycle.”



Process values at a glance: The sensor data is not only evaluated in the controller, but also at the IT level. Especially in the course of new developments, deviations and potential areas for optimisation can be quickly identified.

Koedood relies on ifm's innovative strength

Koedood's development of a zero-emission propulsion system for inland vessels can truly be called pioneering work.

“As an innovative company, we have recognised the potential of inland navigation to become an even greener mode of transport, and we want to do our part with clean propulsion solutions,” says **Sander Roosjen**.

“This is why we like working with ifm as a company that continuously drives the innovative development of its sensor technology forward. ifm really understands our needs and what we want to achieve, and provides us with the necessary automation solutions. Joining forces and combining strengths and competences gets you further. And that is exactly what ifm and Koedood are doing in the case of maritime fuel cell propulsion.”

Conclusion

With innovative developments, Koedood is driving the change towards clean propulsion solutions for inland navigation. The company relies on ifm's technical expertise and process sensor technology to achieve maximum efficiency in their hydrogen propulsion systems.

“ifm really understands our needs and what we want to achieve, and provides us with the necessary automation solutions.”



Köster Systemtechnik

Training on a smart factory model



Learning 4.0.

Training on a smart factory model

Industry 4.0 is becoming increasingly important in the occupational field of mechatronics and automation technology. Modern training models help to teach trainees, students and teachers about the relevant technologies. With components such as those, actually used in industrial production, automation solutions of varying complexity can be developed and tested.

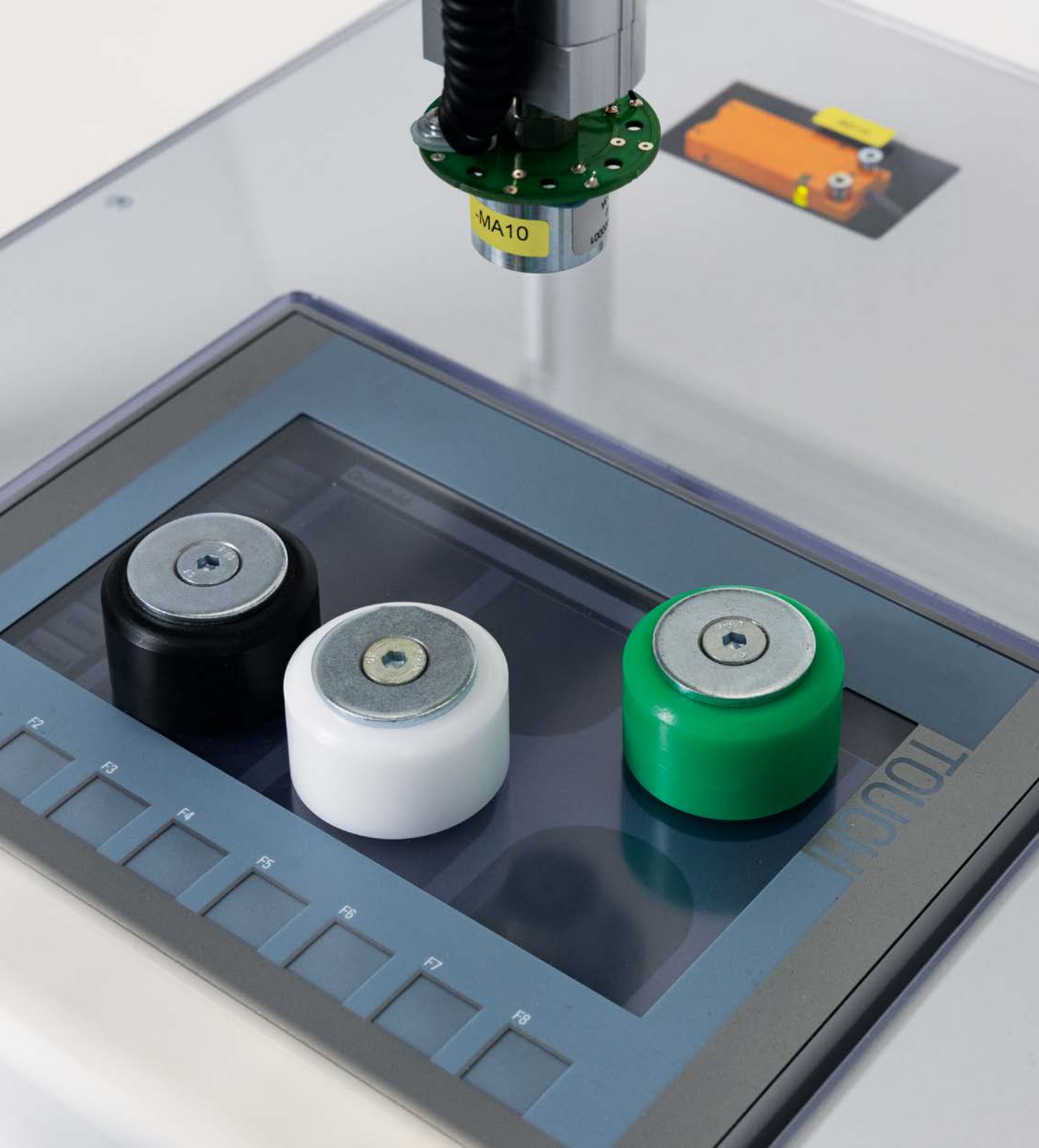
The compact smart factory model is used for training in the development and simulation of industrial processes according to the principles of Industry 4.0.

Nothing will remind you of the dusty training models you may have encountered during the physics lessons at school anymore. The Iserlohn-based company Köster Systemtechnik offers didactic models that use standard industrial PLCs, full graphic touch panels for display and operation, RFID technology and modern sensor technology with IO-Link data transmission. Their 3-axis gantry can be used to represent a wide variety of transport or machining situations, i.e. scenarios the trainees will also be confronted with later in their careers – albeit in a different dimension and complexity. The automation principle, however, is the same.

Peter Konegen, managing partner at Köster Systemtechnik, explains: *“We build model systems for didactic purposes. The scope ranges from small compact models to large training systems on which real products can be manufactured. The model shown here is called SFM, which stands for “smart factory model”. The training focus here is on Industry 4.0. This refers, for example, to technologies that allow efficient production with a “batch size of one”, enable a straightforward scaling of production and offer new ways in plant maintenance.*

” With our SFM models, data mining, connection to an ERP system or to the cloud can be simulated.

Technologies such as data mining, connection to an ERP system or to the cloud can also be simulated with our SFM models. Ultimately, the curriculum of the respective educational institution determines how deeply these technological strategies are addressed. In any case, our SFM models are well equipped for these purposes.”



As it recognises the position of workpieces placed on it, the touch panel serves as an interactive storage surface.

What the hardware does

The centrepiece of the system is a Siemens PLC, on which trainees can load and test the application programme. Without actuators and sensors, however, a controller is pointless. The "executing component" in this model is a 3-axis gantry that is used to move a head in the X/Y/Z directions. A magnet on the head then allows to "grab" objects.

The icing on the cake is the arrangement of a touch panel. Integrated flush into the work surface, it not only serves for visualisation and operation, but also as an interactive storage surface. The position of objects placed on the touch-sensitive display can be detected and processed by the controller programme. This offers trainees creative scope, for example in the simulation of logistical processes.



The laser distance sensor transmits distance values, which are accurate to the nearest millimetre, to the PLC via IO-Link.

Intelligent sensors with IO-Link

The smart factory model's sensor equipment comes from the automation specialist ifm. It includes modern components that go far beyond the mere output of switching signals but offer transparency right into the sensor by means of IO-Link communication.

The O5D100 photoelectric distance sensor uses laser-based time-of-flight technology to provide distance values which are accurate to the nearest millimetre. It not only detects the presence of an object and reports it via a switching signal, it can also detect the height of an object. The measured value is transmitted digitally via the IO-Link communication protocol, which has established itself as a manufacturer-independent standard in the sensor world in recent years. And IO-Link offers

even more: the parameters of sensors can be set remotely using IO-Link. Switching values can be set from the PC, but also directly via the PLC's controller programme. They can also be changed during operation, if required. Speaking of "batch size one", individual adjustments in the production process can be implemented easily.

IO-Link also transmits diagnostic data. The photoelectric sensor e.g. detects the presence of dirt on its lens and automatically issues a warning message if, as a result, reliable detection is no longer guaranteed. This self-monitoring function makes it possible to implement effective maintenance concepts such as real-time maintenance.

Generally, the sensors communicate via an AL1100 IO-Link master from ifm. While providing a connection for sensors and actuators via an M12 screw connection, this field module handles all communication with the PLC via Profinet protocol. In real plants, these decentralised modules offer the benefit of greatly simplified wiring. And due to the addressing of individual IO-Link sensors, wiring faults or mix-ups are ruled out when connecting or replacing devices.

The IO-Link master serves as a gateway between the sensors and the PLC, which is connected via Profinet in this case.



Identification by means of RFID

Identification solutions have become indispensable in real production processes, as they play a decisive role in product tracking or product processing. For this reason, the smart factory model is also equipped with an RFID read/write head. The DTI515 has a flat design and is mounted below the working surface. The workpieces of the model have an ID tag on their bottom side. Data can be written to it and read when the workpieces are above the RFID read/write head. Like the other sensors, the latter communicates with the master module via IO-Link.

Cooperation with educational institutes

Despite its apparently rather small dimensions, the technological depth of the smart factory model is enormous. Trainees can develop and simulate countless processes on the model in a very small space. The federal state of Lower Saxony, too, has discovered this potential and equipped 23 schools with up to twelve smart factory models each.

Knowledge transfer is also of particular importance in this context. Because all models are identically equipped, learning content and projects can be exchanged via networks. This has created a real community around the "SFM".

At some schools, several models have actually been placed right next to each other. Workpieces are moved from one platform to the next where they are then further "processed",



The RFID read/write head operates with the tags on the bottom side of the workpieces. The data is transmitted to the PLC via IO-Link.

as is common practice in industrial production. Groups of trainees programme different processing steps for each station. This kind of co-working prepares the trainees perfectly for the demands of later working life.

Peter Konegen also perceives another advantage of the SFM: *"Thanks to the connectivity, trainees were able to access the smart factory model at school remotely from their home PCs at the time of online teaching during the pandemic, allowing them to test and present their application to others. This way, practice lessons could also take place online."*

Conclusion

The latest automation technology cleverly combined in the smallest space – this is how educational institutes succeed in introducing and training their trainees, students and teachers with varying degrees of technological depth to modern production development according to the principles of Industry 4.0. The automation components that the prospective technicians and engineers will find later in their jobs are also included. For both sides, this is a worthwhile investment in the future.



New Logic Research

Efficient construction and operation of filtration systems



Filtering water permanently and more efficiently

New Logic Research relies on vibration and ifm for its VSEP technology

Filtration is the simplest way to separate solids from a liquid. Basically, all you need is a filter – usually a membrane in the industrial sector – and pressure to press the mixture onto the membrane surface. The size of the pores in the membrane determines which solids in the liquid are retained by the membrane. The problem: Over time, these solids foul and plug the pores, thus preventing any liquid from passing. It is then high time to replace the membrane.

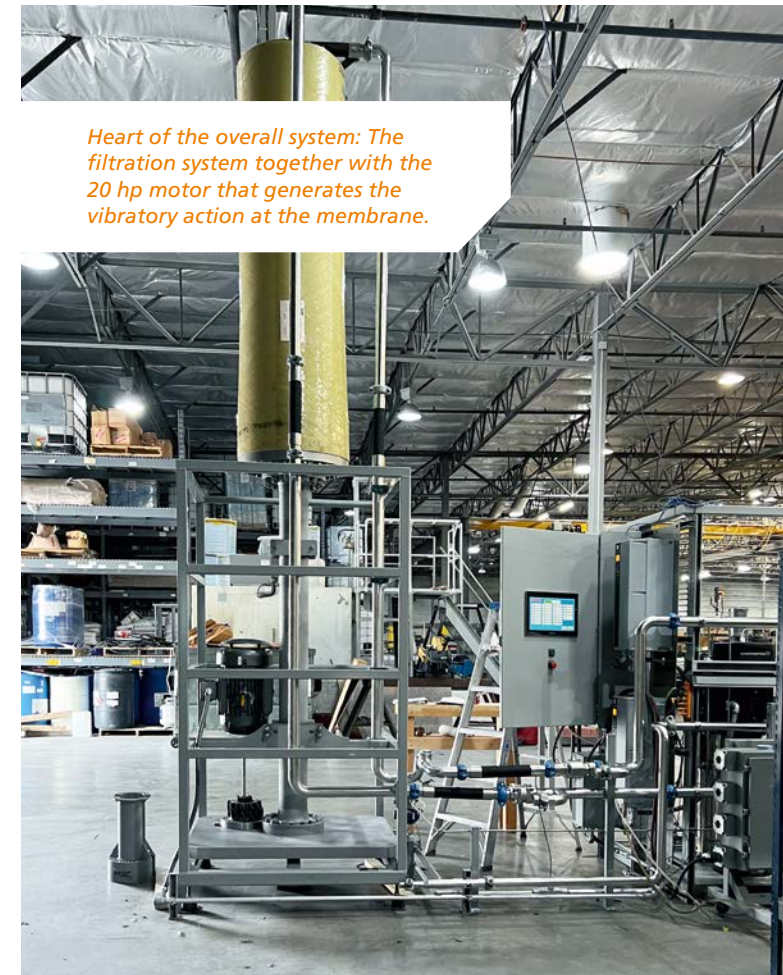
Vibration prevents membrane fouling

The founders of New Logic Research also realised that this is sometimes quite an expensive undertaking. With Vibratory Shear Enhanced Processing (VSEP), they offer a filtration technique that, according to the company, significantly increases the service life of the membrane and also allows up to ten times higher filtration rates. **Chip Johnson**, COO of New Logic

Research, explains: *“As the name suggests, we use vibration, which is specifically applied to the membrane, during the filtration process. This helps to keep the membrane surface cleaner and ensures the cycles between cleaning or replacing a membrane are significantly longer than those of competing filtration techniques. At the same time, we achieve an extremely high level of throughput with less power consumption.”*

All relevant values of the system at a glance

To ensure the filtration process runs as efficiently as possible, New Logic Research today relies on numerous ifm sensors to permanently monitor the parameters vibration, flow rate, pressure, temperature and the conductivity of the water as indicators of the filtration quality. *“In the beginning, we supplied filtration systems without comprehensive sensor technology to our customers, who were then responsible for their operation. However, we soon realised that our system can only achieve*



Heart of the overall system: The filtration system together with the 20 hp motor that generates the vibratory action at the membrane.



The IO-Link masters receive the data from the sensors in a decentralised manner and forward it as a bundled package. This reduces cable routes, saves time and eliminates sources of error.

Instead of routing the cables of all sensors of the filtration system to a central controller, IO-Link masters receive the data in a decentralised manner and forward it as a bundled package. This reduces cable routes, saves time and eliminates sources of error.

the desired and expected efficiency and longevity if it is handled correctly, and that correct handling is intrinsically linked to specific know-how that we cannot always expect customers to have. That's why we decided to offer filtration as a service," says Chip Johnson.

Automation creates maximum efficiency

Since changing the corporate approach, relevant values are now monitored by sensors – which provides a range of benefits for both customers and New Logic Research: "Thanks to full-scale automation and continuous monitoring of the filtration system, we're always able to get a clear picture of a system's condition for ourselves and our customers. This is how we prevent the expensive membranes from being excessively stressed. In most cases, we can perform the regular system checks remotely – saving us and our customers a lot of time and money, as our experts only have to be on site in case of an emergency," says Johnson.

Reliable sensor makes a lasting impression

The fact that New Logic Research relies primarily on ifm for monitoring and controlling its filtration systems has to do with Johnson's initial experience with a pressure sensor from the automation specialist: "I don't remember exactly when I first came into contact with ifm," says Johnson. "What I do remember very clearly though is that the first pressure sensor

” Because ifm offers a wide range of sensors that we can actually use, the company is our first choice in these cases.

I bought from ifm was simply indestructible. It ran and ran and ran – I wouldn't be surprised if it's still busy at work in some system somewhere. This level of reliability, this excellent price-performance ratio, quickly convinced all of us at New Logic Research. And because ifm offers a wide range of sensors that we can actually use, the company is our first choice in these cases.”

IO-Link infrastructure speeds up cabling

In addition to the sensor technology, New Logic Research also relies on ifm's IO-Link portfolio.

Engineering Manager **Matt Ayers** describes the advantages of the system: *“Thanks to the IO-Link masters and standard M12 cabling, we've been able to speed up the wiring of our filtration systems considerably. Instead of having to label hundreds of metres of cables, pulling them through the system to the central controller and making sure they're all connected correctly, we can now connect the sensors to the masters in a decentralised manner. And thanks to the standard M12 connection, this is achieved without errors and without having to constantly think about what you're doing. What took us a few weeks in the past, can now be implemented in just a few days. This provides a considerable time buffer, especially in the high-pressure phase shortly before delivery to our customers.”*

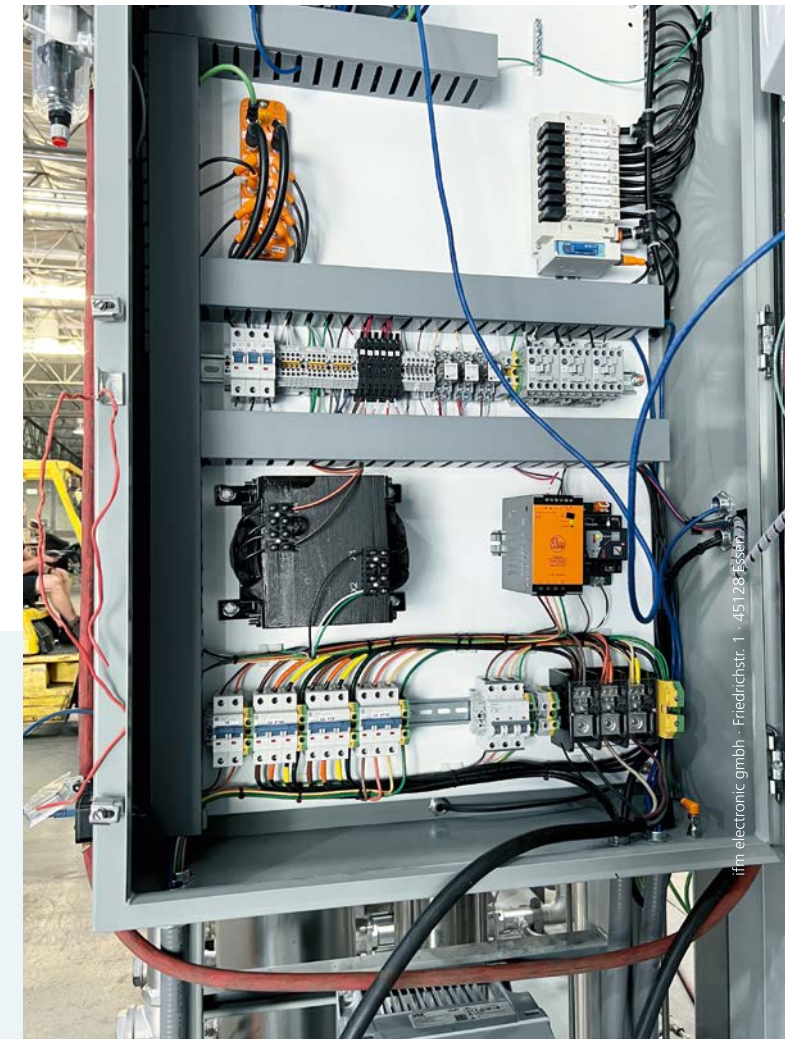
Separating the precious from the valuable

Customers who rely on New Logic Research's filtration systems include, for example, mine operators and manufacturers of catalytic converters for the automotive market. *“The reasons why our customers turn to our systems are the same, no matter what industry they're from. They want to separate water from valuable solids as efficiently as possible in order to use them either for the first time or again. Other customers use our systems to treat their industrial process water before returning it to the regular cycle. The more efficiently our customers achieve their goals, the more attractive our filtration method becomes. And the more water of sufficient quality is returned to the global cycle. So, in many cases we separate the precious from the valuable. As water is set to become the new oil; and the only thing that can be done today and in the future is to conserve as much of this increasingly rare resource as possible. And we want to contribute to this with our solutions.”*

Conclusion

With the help of ifm's reliable sensors, New Logic Research can offer its customers a holistic service consisting of efficient filtration and condition monitoring. And IO-Link takes efficiency to the next level by enabling automation. Thanks to fast, guaranteed error-free cabling.

More clarity in the control cabinet: Thanks to IO-Link, the number of incoming cables is reduced considerably. And the standard M12 connection ensures error-free wiring.





Refresco

Digitised bottling plant
with IO-Link and AS-i



Modern, efficient, transparent: bottling plant 4.0

ifm has supported Refresco and Tetra Pak in a “greenfield” digitisation project

Refresco Group is the leading soft drinks bottler in Europe. As co-packer, the company fills non-alcoholic beverages from numerous well-known brand manufacturers in bottles and carton packs. In France alone, the company operates four bottling plants, including one at the Le Quesnoy site. In order to meet the growing demand for both types of containers even more efficiently, Refresco decided to build a new factory here in the north of France with a capacity to fill up to 30,000 PET bottles and 8,000 cartons per hour.

” For us, AS-i offers the advantage of simple, well-prepared planning and an equally trouble-free implementation.

Digitisation project accompanied from the outset

“It was clear to us from the very beginning that we wanted a new building that was state of the art and, above all, that we also wanted to benefit from the advantages of digitisation,” says **Joseph Kerdo**, project manager at Refresco France and responsible for planning the new plant.

To realise the networked factory, the company worked closely with ifm as their digitisation partner, and also with Tetra Pak, who were responsible for constructing the filling lines.

“ifm supported us in the project from the very beginning, proposing the right solutions and answering all our questions,” explains **Grégory Croizier**, Automation Team Leader at Tetra Pak.

Using insulation displacement technology, the individual valves can be reliably and accurately connected to the AS-i infrastructure via the hygienic AS-i flat cable insulation displacement connectors made of stainless steel.





Field-compatible IO-Link masters and AS-i modules enable a decentralised connection of the sensors and thus considerably reduce the wiring complexity.

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AS-i and IO-Link for digital data transmission

An infrastructure of IO-Link and AS-Interface was designed for reliable digital data exchange. The advantage of IO-Link over analogue wiring is the decentralised bundling of sensor information via IO-Link masters installed in the field, to which the sensors are connected via unscreened, standardised 5-pole cables. This simplifies wiring and reduces the error potential in the sensor connection. Since data transmission is digital only, measurement data is not distorted by conversion processes. EMC effects, too, cannot affect the information.

“IO-Link and AS-i greatly simplify data architecture,” confirms **Grégory Croizier**. *“The data is consistently available and the customer benefits from easy, reliable maintenance because the diagnostic options are much better than before. Another advantage is that components can be easily replaced without having to be reprogrammed.”*

Simple, flexible, versatile

AS-i is used to connect the valves and for the process level. **Grégory Croizier** explains the reasons: *“For us, AS-i offers the advantage of simple, well-prepared planning and an equally trouble-free implementation.”* AS-i shows its advantages especially when widely distributed data points are connected. Only a two-wire flat cable is required for data transmission and power supply to the connected sensors.

The cable length can be up to 1,000 metres when using standard cables and repeaters. Longer distances of up to 3,000 metres can also be bridged using fibre optic cables. Sensors and masters can be connected to the AS-i cable flexibly and precisely at any point using the insulation displacement technology. Another advantage: AS-i can be combined with IO-Link – as has been the case in the Refresco project. The decentralised sensors on the individual plant components are bundled via AS-i-compatible IO-Link masters and then transmitted to the PLC and the IT level via the AS-i infrastructure. Even safety-related applications, such as the monitoring of manholes, can be implemented using AS-i thanks to the safety portfolio.

Conclusion

Given the flexible possibilities and easy handling of IO-Link and AS-Interface, Tetra Pak was able to plan and implement the bottling plant digitisation for the Refresco Bluebird project quickly and easily. Refresco itself also enjoys various benefits: more accurate sensor information, better diagnostic options and easy maintenance.

RFID-coded safety sensors monitor the condition of the manholes, thus ensuring a safe operation of the system.





Steffen Hartmann
Recyclingtechnologien
Vacuum evaporator



Cleanly evaporated

Efficient industrial water treatment using IO-Link

Vacuum evaporation is a suitable method for treating industrial wastewater such as coolants. Vacuum evaporators separate water from contaminants and treat it for reuse. Intelligent sensors ensure low-maintenance, cost-effective operation.

In many industrial processes, liquids are treated to be reused, ensuring a low carbon footprint and reducing disposal costs. A common example is the treatment of coolant emulsions used in machine tools. In addition to mechanical cleaning, the waste oil must also be separated from the water. The company Steffen Hartmann Recyclingtechnologien GmbH from Thale in the German Harz region specialises in the development and manufacture of wastewater treatment plants, including vacuum evaporators.

In the boiling chamber, the polluted medium evaporates at around 40 °C under vacuum, and is thus separated into clean distillate and concentrate. LMT sensors monitor the level in the chamber at different heights.



Managing Director **Sascha Holthusen** explains: “Our vacuum evaporator has been specifically developed for treating this kind of industrial wastewater. The consumed coolant emulsion is fed in, and out comes a small amount of concentrate as well as a clean distillate, the pure water, which can be used for other processes or discharged to the sewer system, eliminating cost-intensive disposal.”

In vacuum conditions

The operating principle of the vacuum evaporator consists of “boiling” the polluted medium in a boiling chamber. Similar to a kitchen stove, heat is supplied to the lower part of the container, resulting in clean water vapour, which is condensed in the boiling chamber and discharged. The contaminated concentrate remains at the bottom. But why is the process conducted under vacuum?

Sascha Holthusen explains: “In vacuum conditions, water boils at lower temperatures, in this case already at 40 °C. At this temperature, we can even evaporate more aggressive media such as acids or alkalis without damaging the stainless steel walls, as would happen at higher temperatures. Also, certain substances remain in the concentrate at this relatively low temperature and do not separate. Another advantage of vacuum evaporation is that we need less energy for heating. For this purpose, we use an efficient refrigerant compressor. The way it works is similar to a heat pump, and it is more energy-efficient than direct electric heating, for example. The same refrigerant allows the water vapour to be condensed. Alternatively, we can also use the existing process heat of our customers, which we then feed to our vacuum evaporator via a heat exchanger.”



The LDL101 conductivity sensor monitors the purity of the distillate.

Process parameters at a glance

As part of process monitoring, key parameters such as pressure and temperature are monitored. ifm sensors continuously monitor these parameters to optimally manage the evaporation process. They control both the heat supply and the vacuum pump.

Another decisive factor is the level in the boiling chamber, which is precisely monitored by LMT level sensors installed in the tank wall at different heights. The medium supply is stopped as soon as the upper level sensor reacts, and resumed when the level drops to the lower sensor.

Further LMT sensors are installed in the coolant supply tank of the vacuum pump for level monitoring at three different positions. Yet another LMT sensor is installed in the distillate collection tank. As soon as its maximum capacity is reached, the sensor provides a switching signal, which causes the distillate to be pumped out.

LMT level sensors are distinguished by their hygienic design. Their high-quality housing materials such as PEEK and stainless steel (316L / 1.4404) are highly resistant to aggressive media.

Specially designed for aggressive ultra-pure water, the SU flow sensor measures the amount of distillate.

Foam and other potential deposits are automatically suppressed and cannot affect the sensor performance, ensuring continuous and reliable level detection.

Water quality measurement

Continuous water quality monitoring is essential, especially when it comes to ensuring the purity of the distillate. For this task, an LDL101 conductivity sensor is used. Its measured value secures the quality of the entire evaporation process and of the pure water obtained from it.

The ultrasonic flow meter "SU Puresonic" has been optimised specifically for applications in pure and ultra-pure water. This sensor can precisely determine the amount of distillate. Its component-free measuring pipe is made of high-grade stainless steel, providing excellent resistance to aggressive media. It is important to note that "pure" or distilled water, while it may sound harmless, can be aggressive toward metal materials and requires special stainless steel alloys. Interestingly, this sensor is often used in plastic pipes, as they are not affected by pure water.

Pump monitoring prevents damage

A central unit of the system is the vacuum pump. If it is not adequately cooled or if the vacuum becomes too strong, unwanted cavitation can occur on the impellers, which can lead to material wear. Cavitation produces extraordinary vibrations. A vibration sensor installed in the housing of the vacuum pump detects any unusual vibration patterns and transmits them to the controller. As a result, an unloading valve will open automatically and secondary air will be supplied to bring the pump operation back to its normal state. This effectively prevents expensive pump damage.

Digitisation with IO-Link

All of the sensors used are IO-Link compatible, offering a real added value that goes far beyond the simple transmission of measured values or switching signals: IO-Link enables users to access the sensors remotely, read data and diagnostic values and configure the devices in various ways.

Sascha Holthusen explains the use of IO-Link as follows: *"If a customer has a problem with their system, we can connect to it remotely via a VPN connection. In the past, without IO-Link,*



*All sensors are connected via IO-Link.
This reduces set-up times, facilitates
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” *With IO-Link, we can now see the status of the system right down to each sensor.*

we only got as far as the PLC, but not down to the sensor level. With IO-Link, we can now see the status of the system right down to each sensor. We can see whether a sensor delivers measured values or whether a specific error occurred in the IO card of the PLC or in the cabling. We can also read the sensor's diagnostic values and adjust its parameters remotely if necessary. If the customer has replaced a sensor, we can configure it remotely. Thus, IO-Link offers us and our customers a considerable advantage in terms of remote maintenance. Another important benefit is the scalability of the measured sensor values, which we can configure via IO-Link. We use pressure sensors with a measuring range from -1 to 10 bar. We can scale them in such a way that the measuring range covers -1 to 1 bar at full resolution. It's impossible to achieve this with conventional sensors with analogue current output. What's more, IO-Link sensors can transmit multiple measured values. For example, the flow meter and the pressure sensor also provide temperature values via IO-Link. This reduces the number of required sensors and mounting locations.”

Cost savings through IO-Link

The IO-Link sensors are connected to decentralised IO-Link master modules, which communicate with the PLC via a field-bus such as PROFINET. This type of cabling has many benefits during installation, as **Sascha Holthusen** explains: *“Especially with large systems that are dismantled for delivery, this cabling proves to be extremely beneficial. The mechanic who reassembles the system at the customer's site only needs to connect the plugs. We don't need an electrician to reconnect wires or route them to the control cabinet. In times where skilled workers are scarce, reducing the time spent on site offers considerable cost saving potential. Another benefit is that the I/O check during system set-up can be done much faster, as no wiring errors or terminal problems occur. While the initial cost of IO-Link may be higher than that of conventional wiring, the time saved during installation and the extended diagnostic and remote maintenance capabilities mentioned earlier ultimately lead to substantial cost savings.”*

Conclusion

Cost-efficient water treatment is achieved through two key factors: energy-efficient vacuum evaporation and implementation of a digitalised control concept down to the sensor level. This concept considerably minimises installation and maintenance costs and keeps the boiling point at a low level, which is beneficial both economically as well as ecologically.



Veltins

Smart valve monitoring for
the secondary circuit



Making valve monitoring enjoyable

The C. & A. Veltins brewery relies on MVQ valve sensors supplied by ifm

Transitioning tradition into the modern age – that is one way to describe the history and development of the German C. & A. Veltins brewery, headquartered in Grevenstein, over nearly two-hundred years. What started as a country brewery has become one of Europe's largest and most modern private breweries, producing over 3.36 million hectolitres annually at the last count.

Whether it concerns electricity, innovative brewing and bottling technology or its own waste disposal plant: Time and again, C. & A. Veltins has trodden new paths, set sector standards and devoted itself to sustainable use of natural resources – especially the spring water that emerges right next to the brewery.

Exactly controlling the temperature

C. & A. Veltins' CEO, **Peter Peschmann**, explains that this spring water is not only used for brewing, but also as a means of heating and cooling. *"Whenever our products need to be*

heated or cooled during the process, we do that by means of water. Brought to the right temperature, the water is available via the secondary circuit. Inflow and outflow are controlled by valves. To ensure uniformly high product quality and keep wastage to a minimum, we need to control the flow of water exactly and reliably all the time. This, in turn, means that it is very important that the valves function without a hitch."

Easy to use, solid quality, precise data

Previously, the valve flaps were monitored with the aid of two proximity switches per valve that determined the flap position. These sent a switching signal to the controller, either 'valve open' or 'valve closed'.

Technology CEO **Peter Peschmann** explains: *"Quite apart from the need for dual cabling, this method was especially prone to failure in the hot water pipes, because the inductive sensors supplied previously by another company could not cope with the temperatures over long periods of time."*

The MVQ valve sensor is a reliable and also easy-to-use alternative, and it is successively being implemented by ifm's automation specialists.

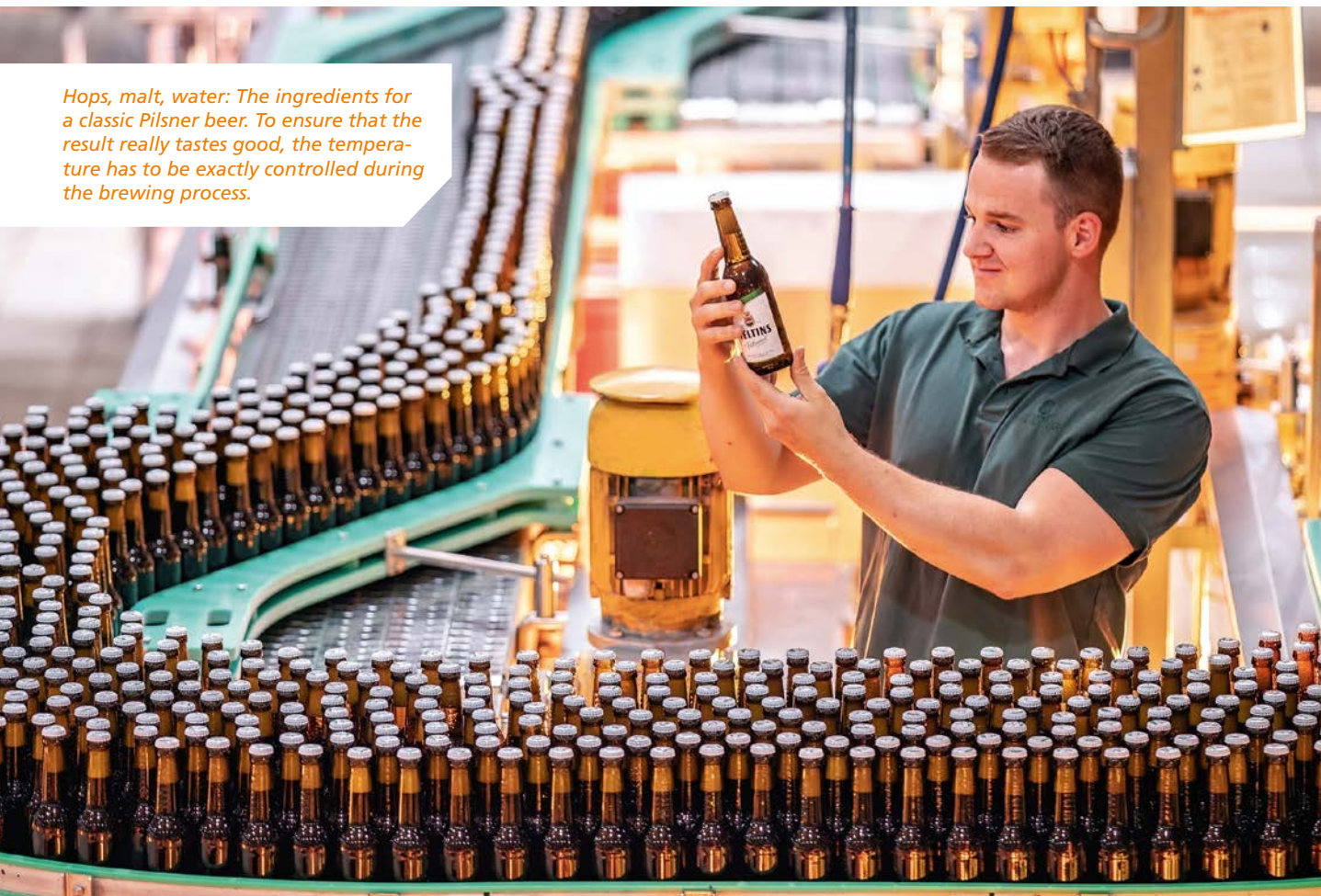
It is mounted on the axis of rotation of the swivel valve. From there, it registers the position of the valve flap – continuously and with an accuracy to the nearest degree – and transmits the

” For C. & A. Veltins, the MVQ represents real progress on our way towards reducing water losses as much as possible.”

The hot water needed during the production process is kept in a separate pipe system. Inflow and outflow are controlled via valves. The green LED on the MVQs shows: The valves are open.



Hops, malt, water: The ingredients for a classic Pilsner beer. To ensure that the result really tastes good, the temperature has to be exactly controlled during the brewing process.



The position of each individual valve is visible from afar thanks to the MVQ's informative LEDs. In the Veltins brewery, permanent red means: valve closed. Altogether, the MVQ provides seven colours for coding status.

data via analogue signal to the controller. It can also transmit the data via the digital IO-Link communication protocol, with even more detailed diagnostic information. For instance, slower-than-expected flap movements or failure to reach the exact end position on account of wear or deposits are registered by the sensor, and the results are sent to the PLC for further processing as well as being displayed locally via LED. Switching points can be set freely so as to allow for simple integration into the control program.

Fewer losses – genuine benefits

“Thanks to the exact registration of the angle and the movement times via IO-Link, we are able to detect deposits at an early stage and plan the flap maintenance in the best possible way,” explains Peter Peschmann.

A case has already arisen in which the capacity to detect even very small flap openings was a great help to the company.



Veltins already has around 40 MVQs in its heating and cooling systems. Data is transmitted either via digital IO-Link communication, or analogue.

"We were losing water in the circuit, and we couldn't localize the cause because there are no inspection visors installed in our large pipes. The MVQ then enabled us to find out that one of the valves was not closing completely. The valve was then rendered serviceable again at short notice, putting an end to the water losses. This demonstrates the potential and options that precise valve monitoring open up. For C. & A. Veltins, the MVQ represents real progress on our way towards reducing water losses as much as possible."

The status: clear as daylight

The MVQ's display showing the current valve status by means of easily visible, multi-colour status LEDs was another decisive factor influencing Veltins' decision to install the sensor successfully on all swivel valves in the cooling and heating circuits of the brewing and bottling processes.

"The main plus-points in favour of the sensor are the clear status display, the closed housing, the ease of installation that only requires a standard unshielded M12 cable, as well as the capability to gather all the data supplied by the sensors at the central IT level," says Veltins' technology CEO **Peter Peschmann**.

Over ten years of cooperation in mutual confidence

To date, around 40 ifm valve sensors are now in operation in the C. & A. Veltins brewery, of which some operate in analogue mode, and some have an IO-Link connection.

"We are convinced that the IO-Link brings added value regarding plant availability," says **Peter Peschmann**. Initial projects involving vibration monitoring were also successfully implemented prior to the use of the MVQ.

"Altogether, we have already been working with ifm for over ten years. Starting with the quality and usability of the prod-

ucts all the way to the competent, collegial support and advice with regard to further development of our automation solutions, we are very convinced of the value of this cooperation."

Conclusion

With high-quality products and expert support from ifm, the C. & A. Veltins brewery can ensure reliable functioning of the heating and cooling circuits, and set up the automation solutions in a forward-looking and resource-saving way.



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