

MYNNews

A magazine from Mycronic

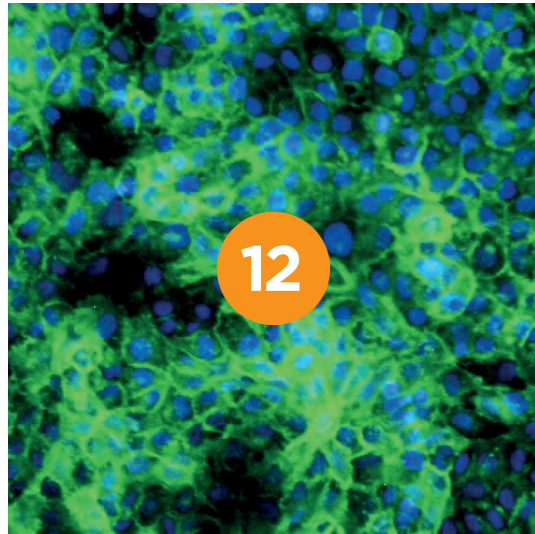
2020.01

A high-tech future down under

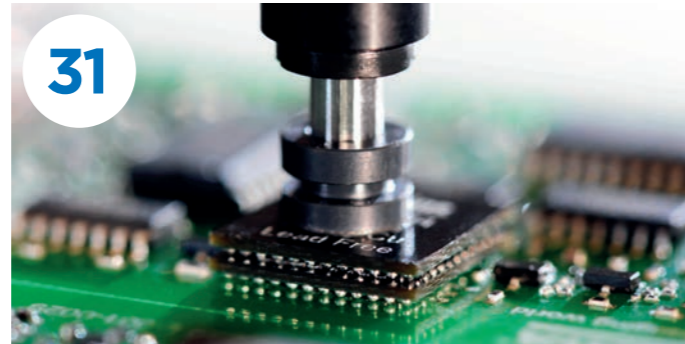
Building a smarter platform
for innovation in Australia

EMPOWERING PEOPLE
through automation

New communication standard
MACHINE-TO-MACHINE



12



31



14



20



25

Contents 2020.01

- 4 Trends in electronics production
- 8 New advances in machine learning
- 12 Printing skin with light!
- 14 Empowering people through automation
- 18 Material handling through robotics
- 20 Building a smarter platform for innovation in Australia
- 25 Evolution of a coater
- 31 New machine-to-machine communication standard
- 34 Product news

WE WILL GET THROUGH THIS TOGETHER. My heart goes out to all our customers, suppliers, partners and their families who are coping with the covid-19 pandemic. We feel for you and are doing everything in our power to support you.

As a global high-tech company, our top priority right now is on the health and well-being of our own employees and everyone in our extended network. The focus is on working safely, slowing down the spread of the virus and securing critical functions for deliveries, support and service.

Work aside, we feel a responsibility to help society, too. That is why we are making production equipment from our demo centers around the world available to essential industries such as healthcare — with quite some interest.

Despite this unprecedented situation, we remain optimistic about the future of electronic manufacturing. But expect substantial change within the industry. We are opening our eyes to new levels of efficiency and doing things differently, leading to increasing digitalization with smarter, more advanced electronics. Supported by government crises packages and lower interest rates, this means even stronger investments in infrastructure to support healthcare, education and more.

A more flexible and resourceful mindset is also emerging. Customers facing supply chain disruptions in Asia, for example, shifted order bookings to Europe, North America and elsewhere — and now it may come back full circle. A March IPC survey also indicated that while manufacturers are naturally concerned and expect order delays of 3–5 weeks, the will to invest remains strong. Most supply chains are expected to be back to normal in Q3 2020.

In all of this, the trend towards automating full-line solutions remains stronger than ever. It is supported by new M2M protocols like Hermes (now on our solutions), enhanced process control with closed-loop solutions, machine learning in our advanced 3D SPI and AOI systems and more. Increasingly, the customers I meet are more interested in total output, innovative applications and problem solving solutions rather than just adding individual production lines. We hear this loud and clear and are working to be more customer-centric — close at hand, listening and supporting you.

In a world that seems out of control, we are committed to bringing you hands-on solutions that put the future in your control. Don't hesitate to be in touch by phone, email, video chat or more. Stay healthy and keep moving forward!

// Clemens Jargon
Senior Vice President (acting),
Assembly Solutions High Flex



MYCRONIC

ADDRESS: Mycronic AB, Nytorpsvägen 9, PO Box 3141, SE-183 03 Täby, Sweden **TEL:** +46 8 638 52 00
INTERNET: www.mycronic.com

PUBLISHER: Simon Sandgren, responsible under Swedish law **EDITOR:** Jenny Ek Adrell **CONTRIBUTING WRITERS:** Grant Baldrige, David Gray, Mattias Jonsson, Liam Karlsson, Jeff Leal, Yan Manissadjian, Simon Sandgren, Cathrin Wisén **GRAPHIC DESIGN & LAYOUT:** EXPEDITION 46™ **PRINT:** TMG Sthlm, Sweden, 2020 **ISSN:** 1651-4882 P-001-0252/May 2020. This newsletter is produced with the intention of providing general information about Mycronic and our products.

Mycronic, MYDATA, MYDATA automation and MY: Mycronic 4.0; MYPro, MY100, MY100e, MY200, MY200HX, MY200DX, MY200SX, MY200LX, MY300, MY300DX, MY300SX, MY300LX, MY500, MY600, MY600JD, MY600JP, MY600JX, MY700, MY700JD, MY700JP, MY700JX and MYSynergy; Mycronic 4.0; MYSmart, MYC50, MYD10, MYD50, MYT10, MYT50; Mycronic SMD Tower; VI TECHNOLOGY, VIT; 5K, 5K3D, 8K, 8K3D, 9K, 9K3D; PI, PI Pico, PI Primo; SIGMA Link; HYDRA Speedmount, Midas, ISIC; Agilis, Agilis Linear Magazine (ALM), Agilis Linear Magazine Flex (ALM FLEX), Agilis Stick Magazine (ASM), Agilis Tray Magazine (ATM), Mycronic Tray Exchanger (TEX), Mycronic Tray Wagon Magazine (TWM); Mycronic Dip Unit (DPU); Mycronic Standard Vision System (SVS), Mycronic Dual Vision System (DVS), Mycronic Linescan Vision System (LVS), Mycronic HYDRA Vision System (HVS); Mycronic Assembly Process Management (APM) including; JPSys, TPSys, MYLabel, MYPlan, MYCenter, MYTrace, MYCam and FlowLine are registered trademarks or trademarks of Mycronic AB. Mycronic AB is ISO 9001:2015 and ISO 14001:2015 certified.

The most important trends in electronics production today

TEXT: DAVID GRAY PHOTO: SHUTTERSTOCK

New product mixes. New innovations. New perspectives. As electronics assembly grows more complex, Mycronic and its customers are expanding their visions for the future. It's all about leveraging bigger data and actionable insights to take broader control of fast-changing industry demands.

THESE ARE JUST A FEW trend observations (and one personal prediction) by Niklas Edling, Senior VP Corporate Development at Mycronic. Peering intently over a conference table at the company's head office in Stockholm, he shares insights into where the global SMT market is heading — and why customers should care.

Seeing into the future

Niklas is a man who would know. As chief strategist on the executive management team, he keeps his finger on the pulse of the SMT market by traveling extensively to trade shows, meeting customers, reading industry reports and analyzing market data. All this information is filtered through the eyes of a man who holds a Master's degree in Mechanical Engineering from Sweden's Royal Institute of Technology and an MBA from the Stockholm School of Economics. In other words, a smart tech guy with a nose for business.

"Trends are important because they influence how we do business today and tomorrow," says Niklas Edling. "We want to make sure our customers are always ahead of the curve, ready to adapt and thrive in the future SMT environment — which is why we monitor global mega trends, industry-specific ones and even regional trends."

Mega trends vs industry trends

When it comes to mega trends, they're pretty much what you'd expect: globalization, digital transformation, sustainability, connectivity, big data and more. No big surprises here. As for the SMT industry, it's all about the use of artificial intelligence, automation, robotics,

industrial internet of things (IIoT), Industry 4.0, a sharper focus on full-line solutions and total output and yield in the factory.

"All these buzzwords can easily become a blur," he says. "So it's important to dig deeper, look around corners and find insights we can both apply and share with our customers to help them stay more competitive. Software is rapidly becoming a key enabler of factory-wide connectivity. For example, being compatible with communication standards and adopting smarter full-line automation solutions or material flow technology can have a radical impact on productivity, opening the door for true Industry 4.0. In fact, knowing the implications of a trend could impact your entire new product pipeline or strategy."

Globalization patterns are changing

Take globalization, for example, an unstoppable force that he believes will continue, with the center of economic gravity shifting from West to East. At the same time, this trend is being tempered by the emergence of two distinct ecosystems in Asia and the West, fueled in part by regional political interests across the globe.

Two ecosystems in East and West

"We used to think of China mainly as 'the world's factory' — a hub of high-volume, low-cost electronics manufacturing," says Niklas. "But that is already old and China has big ambitions. China wants to build a technological independence and leadership with local manufacturing and product design. It also has the talent, networked suppliers, distributors and government backing to achieve this. Meanwhile, the SMT market in the West is largely mature, focusing more on optimizing processes for smaller volumes and more complex, high-value products."

"Broadly speaking, the Asian approach is more collective, long-term and fast-moving, driven by government policies, while Western businesses are more individualistic and transactional, fueled by digital innovation and engineering. You need to understand and have strategies for both worlds."

10 key SMT trends you need to know

1. Automation is exploding. Anything that can be automated in and around the SMT line will be, reducing the dependency on humans and minimizing errors. Under-automated areas in the pre-SMT and post-SMT processes will get more attention, as will PCBA material automation, with heightened productivity gains enabled by better M2M optimization.

2. Big Data requires memory. We can now capture and store massive amounts of both structured and unstructured data, but this will require greater processing capacity. Time to beef up your computer processing and data storage capabilities in the cloud?

3. Artificial intelligence is coming. In the not-too-distant-future, machines will be programmed to think like humans and make decisions on their own as well as learn and solve problems. Basically, it means faster and smarter decision-making.

4. The robots are taking over. This is nothing new for factories with SMT machines that are, in effect, robots themselves. But they'll soon be made even smarter with AI and joined by new friends like AGVs, flying drones and other robotic tools to help optimize the process.

5. Two global ecosystems. The world of manufacturing is undergoing a transformation both globally and locally. Japan, South Korea, China and other Asia Pacific countries are pouring in money to R&D, leading to two separate ecosystems between East and West.

6. Shorter production cycles. The path from development to finished product is shortening, meaning the pressure is on to deliver speed and greater customization to customer needs with shorter production cycles.

7. Forget features, think throughput. The focus on individual machine features and specifications is diminishing as operators focus more on how well the total line is producing.

8. Make it sustainable. Heightened initiatives in this area now extend far beyond lead-free solder paste to include meeting EU directives like REACH, WEEE and RoHS for removing hazardous chemicals, securing recycling procedures and promoting safe, environmentally friendly SMT processes.

9. Factory-wide connectivity. Customers who have previously focused mainly on machines will need to embrace the growing importance of software in everything, to connect their processes.

10. Need for flexible, high-mix equipment. The trend towards customization and shorter batches will continue, driving a need for more flexible equipment and processes — even for high volume manufacturing.





Trends are important because they influence how we do business today and tomorrow.

NIKLAS EDLING
SENIOR VICE PRESIDENT, CORPORATE DEVELOPMENT

Automation will take off

Looking into his crystal ball, Niklas does not see any “mother of all trends”. But if he could pick one big trend it would be “automation”. But with a twist. “What’s new is the drive to automate pre-SMT and post-SMT processes, and to automate many of the planning, programming and optimization tasks to run the factory, with the help of integrated software and artificial intelligence,” he says.

He sees automation within SMT playing out in three key areas:

1. POST SMT AND BOX BUILD: Expect to see more robotic lines (and maybe even drones) helping out to speed up the mounting and preparation of pre-manufactured sub-assemblies into simple enclosures, such as frames or racks, for quicker shipping. This includes system integrations with thousands of sub-assemblies.

2. FULL LINE AUTOMATION SOLUTIONS: Instead of obsessing over specs on individual pick-and-place machines or printers, the trend is towards buying line throughput, and yield, at the end of the day. With better machine-to-machine (M2M) communication, operators will be able to control the entire line from a single screen rather than jumping back and forth to different control panels.

3. AUTOMATION OF MATERIAL FLOWS: Expect to see a greater focus on automating previously manual processes for transporting electronic components and PCBs to and from the SMT line. This means we will see novel storage systems and planning software for automatic inventory control and sorting. It will also necessitate an increased use of robots, such as automatic guided vehicles (AGVs). He personally envisions a factory environment where drones could carry material around, allowing for tighter spacing between machines and a lower factory footprint.

Digitalization opens possibilities

“All of these developments are being fueled by increasing digitalization across the entire electronic production chain.” says Niklas Edling. “Whether you are focused on high-precision PCB assembly, storage systems, die bonding or conformal coating, information is now available in larger and larger quantities. Our next step is to use artificial intelligence to interpret the data for better decision-making.”

Cost, quality and speed

“At the end of the day, it’s important not to stare yourself blind on trends. You need to be aware of them and tap into their potential where possible, but always remember that the underlying drivers are pretty basic – customers want to reduce costs, improve quality and speed up their deliveries,” he concludes.



The future is the speed of stencils with the quality of jet printing.”



Discover the MY700 3D SPI add-on solution

The future of high-volume jetting applications is here. The MY700 3D SPI add-on solution is a fully integrated 3D solder paste inspection and jet printing module that eliminates stencil printing compromises at any production volume. Let the 3D SPI scan and identify missing or damaged solder paste print, and the MY700 automatically fills them in with perfect placement and volume control. All so you can keep the highest throughput speeds, simplify your stencil designs and put the future back where it belongs: in your control.



New advances in machine learning raise the bar in inspection technology

TEXT: DAVID GRAY PHOTO: MYCRONIC

From Alexa and self-driving cars to individually curated playlists from Spotify, the benefits of Artificial Intelligence (AI) are no longer science fiction. And now, in the SMT industry, we're seeing how AI and machine learning (a subset of AI) are being applied to fields like automated optical inspection (AOI) to significantly increase first-pass yield, eliminate potential human errors and boost production.

JUST TEN YEARS AGO, the topic of Artificial Intelligence was an abstract notion in the minds of researchers at MIT, Google and, yes, forward-thinking software experts at Mycronic. Not surprisingly, the idea that machines could think like humans, learn and solve problems, was something of a mind-bender. Today, with the advent of machine learning, new machine-to-machine (M2M) protocols like Hermes, Big Data and Industry 4.0, that picture looks very different.

Wanted: more intelligent inspection

"We see huge potential in applying AI to help automate and optimize the entire SMT process—from storage and kitting to line utilization and inspection," says **Olivier Pirou**, Vice President at Vi TECHNOLOGY. "But we're also trying to pinpoint areas where machine learning can really make a difference right now. To avoid faulty solder joints, defects, false calls and costly rework, for example, we need easier 3D solder paste inspection as well as 3D AOI inspection. It all needs to be interlinked for real-time monitoring, diagnosis and full traceability of images and data. And, of course, the

solutions need to be adapted to the new Hermes protocol for M2M communication."

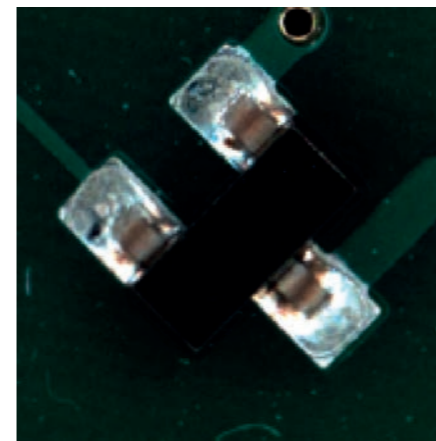
World-leading inspection expertise

This, in a nutshell, is the focus at Mycronic's France-based Vi TECHNOLOGY subsidiary. Early pioneers in advanced AOI and SPI inspection, their R&D team now collaborates closely with the Mycronic Group's AI center in Silicon Valley to bring the power of AI and machine learning to customers. This has led to new AI software platforms and algorithms, unique Z-referencing technology for accuracy and simpler auto-programming tools to eliminate potential human error and free up operators.

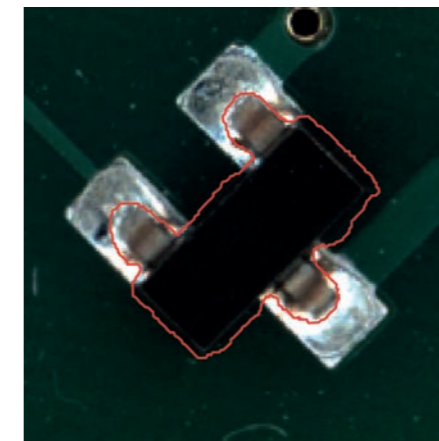
New NEO platform for 3D AOI

"Just look at this new board design" says **Yan Manissadjian**, Product Marketing Manager at Vi TECHNOLOGY, who holds up a high-value board for an aerospace company with thousands of components. "Machine learning reduces the programming time while maintaining the inspection

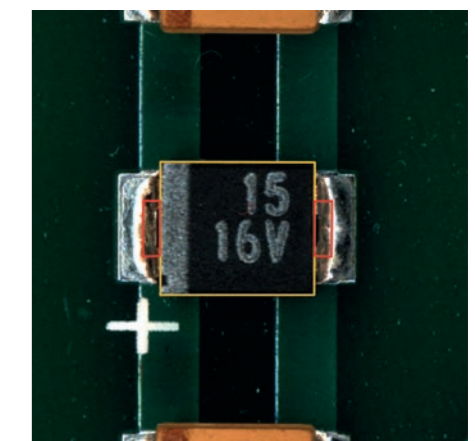
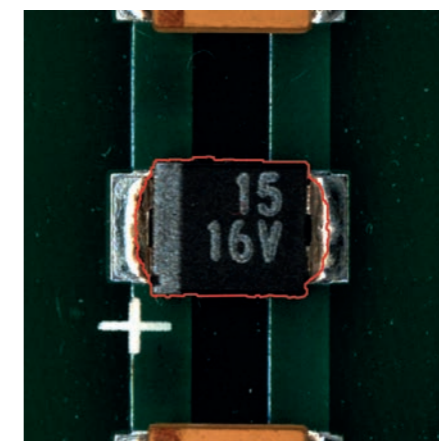
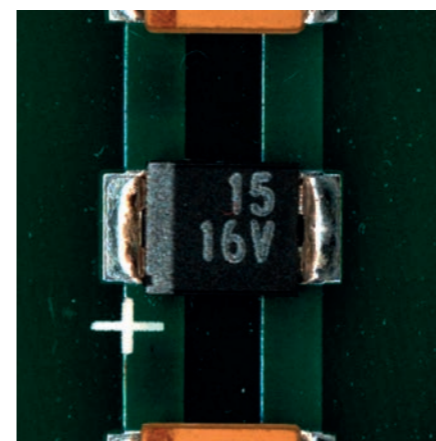
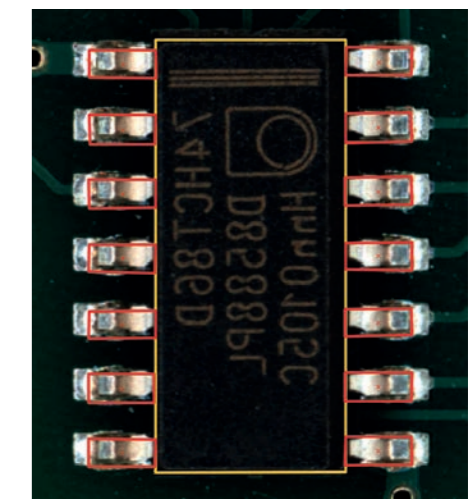
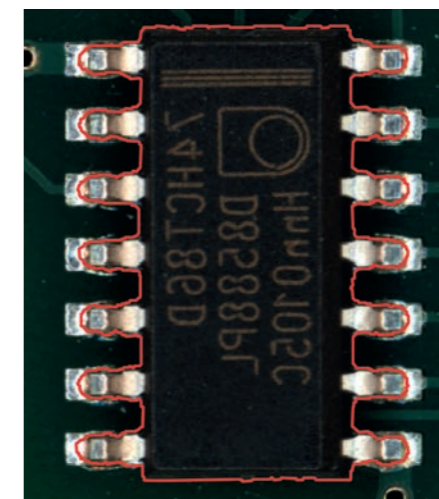
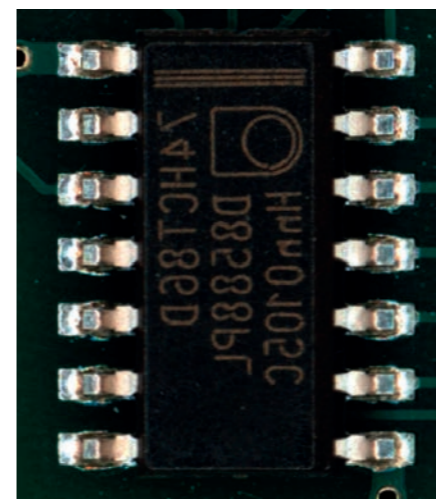
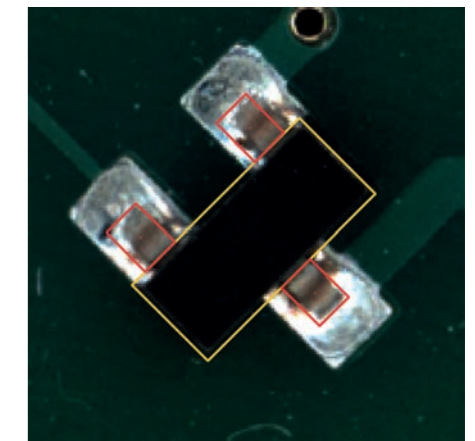
High resolution image from 3D reconstruction.



Identification of potential component elements by height segmentation.

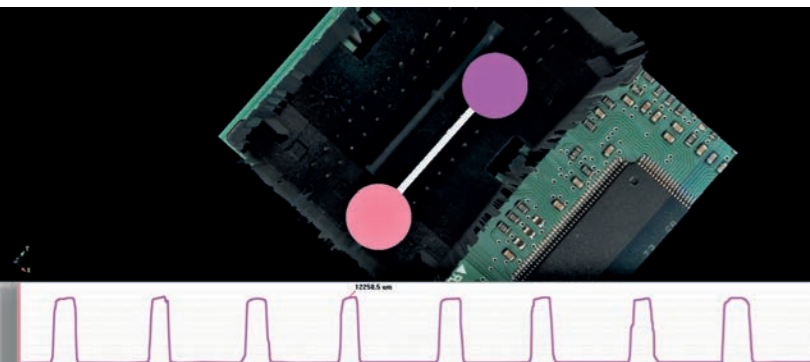


Automatic computation of the corresponding inspection model with all required tests.





→ High-resolution 3D images regardless of component height, material reflectivity, or PCB density.



→ Handling complex cases: Pin inspection in a deep custom connector from automotive PCB.

performance,” he says. “And with our new NEO platform for the K series 3D AOI, programming and fine-tuning such a sophisticated board can be twice as fast as with the pre-vious version.”

Available for K Series 3D AOI owners

Mycronic introduced the NEO operating platform at Productronica 2019 in Munich as part of its MYPro Line concept. According to Yan, it’s a key milestone now available as a software upgrade for all K Series 3D AOI customers. The K series 3D AOI system is preferred by demanding producers due to its high reliability, precision and repeatability, regardless of production volumes, he says.

Removing manual steps

“The new inspection system integrates a new generation of algorithms that achieve very high quality, remove manual steps and no longer depend on the skill level of the programmer. By automating programming tasks through autonomous component recognition and assisted model creation, programming time is cut by up to 50 percent,” he says.

Automating the inspection process

The NEO upgrade includes helpful features like Auto MatchMaker and Auto Teach. With the match-making function, all the components available in the library are automatically recognized by the new algorithm when creating the inspection program for a new board. There is no longer any need to do this search manually, one by one: the automatic component recognition takes care of it.

And for adding new components in the central library, the Auto Teach machine-learning algorithm recognizes the shapes of the body and leads, if any, and creates the reference model for inspection by associating the required AOI tests. This new model is then submitted to the operator for approval before being saved in the central library. Creating an inspection model for a new component is now a one-click process.

First pass yield of up to 99 percent

In addition to these great new machine learning features, the NEO platform also includes features to improve the FPY. By scanning each board and instantly adjusting to its actual topography and not to a theoretical or averaged one, operators get an outstanding

Frequently asked questions about AI

What exactly is Artificial Intelligence?

This is a field of computer science that refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. It can involve speech recognition, problem solving, learning and planning.

What are the main overall benefits of AI?

Used safely and wisely, it can eliminate human errors in decision-making and allow for a higher level of precision, accuracy and speed. AI can also be used on a 24/7 basis to support with repetitive tasks and even support predictive decision-making.

How does machine learning tie in to SMT?

Basically, this is a subset of AI aimed at automating programming tasks through autonomous component recognition and assisted model creation. In our business, it is being applied across the entire assembly line to vastly improve automation and support tomorrow’s smart factory.

What is the impact of machine learning on optical visual inspection?

Based on new algorithms, it will take only a few clicks to program the inspection of a completely new board containing hundreds or thousands of components — with perfect precision. So far, we’ve been able to cut programming times by a factor of two and the work continues.

analytical capability in real time. And with the system’s latest high-speed laser 3D scanning head coupled to a high-precision telecentric optics, the algorithm is fed with extremely accurate raw data and images, resulting in an exceptionally low false call rate. Test coverage has also been extended with the detection of foreign materials, a component overhang test according to IPC requirements, and a new powerful optical verification algorithm. It is this technical rigor and this refusal to compromise that enables our customers to consistently achieve FPY levels of over 95 percent and up to 99 percent in “high reliability” environment.

Machine learning simplifies 3D SPI

But the company’s 3D AOI inspection systems are not the only area where machine learning is being applied for the benefit of customers. Unique new algorithms are also being embedded into the company’s PI series solder paste inspection system. In a radical twist, this will mean only information that the system cannot detect or reconstruct by itself is requested from the operator — eliminating potential human errors and freeing up operators from certain tasks so they can focus on production.

Measuring the exact height of paste deposits

“The new algorithm allows the system to learn how to locate the paste deposits, without relying only on the location patterns, which are often insufficient due to the stretch or warpage of the board. It also measures the exact height of a paste deposit taking into account the geometry of the board at this specific location,” says Manissadjian.

Hermes-compatible inspection

“We are also making these systems compatible with the new IPC Hermes digital protocol for better machine-to-machine communication. This started with the PI series 3D SPI machines in Q1 of 2020, and will be followed by our K-Series 3D AOI machines for automated optical inspection in Q4. This is a crucial step in preparing our inspection systems for Industry 4.0,” he concludes.

Printing skin with light!

Bioprinting by light-sheet lithography

TEXT: CATHRIN WISÉN PHOTO: BRIGHTER

BRIGHTER is an EU-financed project that aims to develop a novel bioprinting technology that will be used to produce tissue samples that mimic biological tissue with embedded three-dimensional structures.

CURRENT BIOPRINTING methods are limited in their application space by both insufficient speed and spatial resolution. Long printing times decrease the proportion of healthy cells, while poor spatial resolution fails to accurately recreate the structure of biological tissues. The ability to produce engineered tissue samples is developing into an important technique for applications in regenerative medicine and pharmaceutical testing.

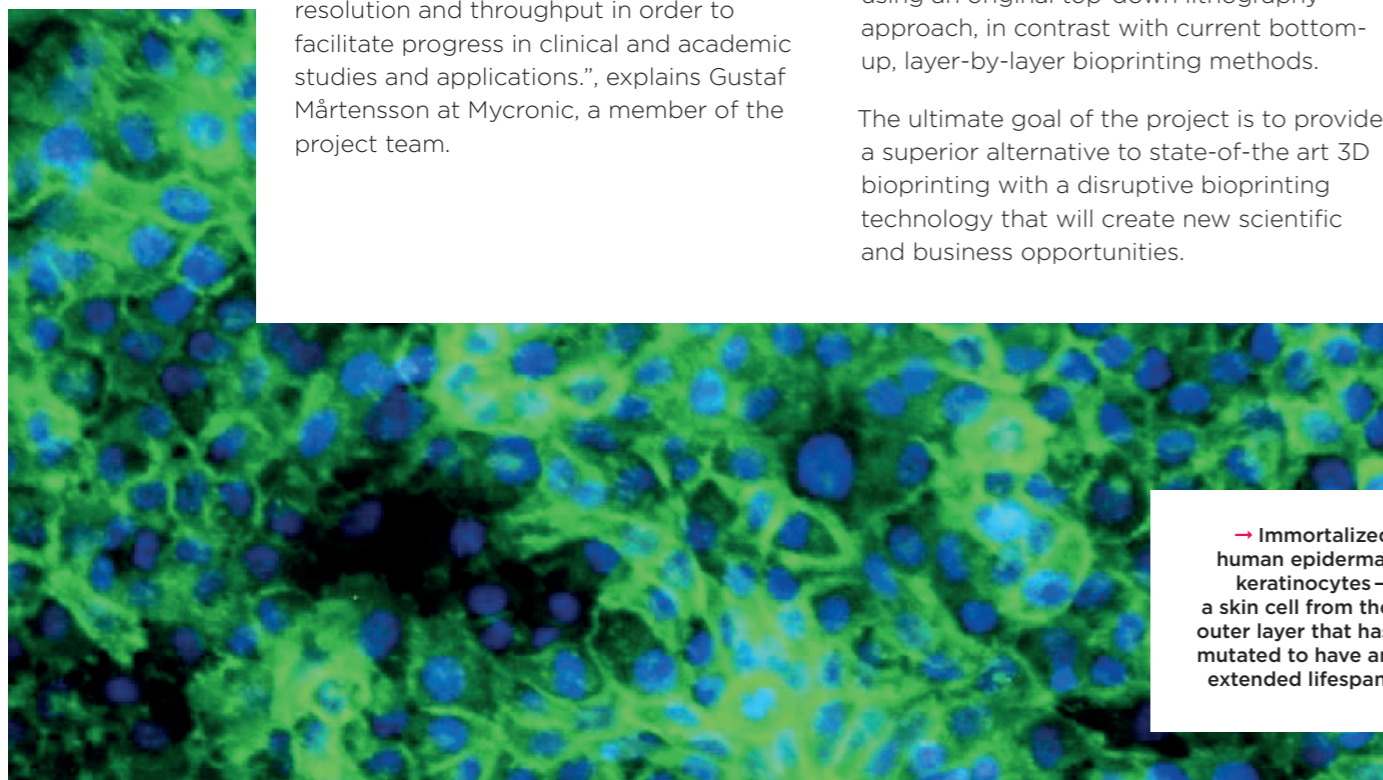
“The BRIGHTER project is attempting to push the limits of engineered tissue by enabling a combination of customization, resolution and throughput in order to facilitate progress in clinical and academic studies and applications.”, explains Gustaf Mårtensson at Mycronic, a member of the project team.

Designing a light-based printing technology for biological tissue

The optical 3D printing methodology being developed is based on Mycronic’s high-resolution, high-speed, lithographic printing technology used for its advanced mask writers. The new printing technology will be able to address details the size of individual biological cells.

With this new technology it will be possible to produce tissue surrogates with high spatial resolution at high printing speeds using an original top-down lithography approach, in contrast with current bottom-up, layer-by-layer bioprinting methods.

The ultimate goal of the project is to provide a superior alternative to state-of-the-art 3D bioprinting with a disruptive bioprinting technology that will create new scientific and business opportunities.



→ Immortalized human epidermal keratinocytes — a skin cell from the outer layer that has mutated to have an extended lifespan.



Take inspection to another dimension

The smartest way to the perfect PCB

Ensure comprehensive test coverage. Minimize false calls. And drill down into powerful image library tools with advanced algorithmic assistance. With the K Series 3D automated optical inspection system, there’s virtually nowhere for defects to hide. Thanks to industry-leading inspection software and high-precision metrology, you can continuously improve yield and quality on even the most complex product geometries. It’s one more part of Mycronic 4.0, and one step closer to perfection.



Empowering people through automation

— how smarter human-machine collaboration is making your people more valuable than ever

TEXT: GRANT BALDRIDGE PHOTO: MYCRONIC, SHUTTERSTOCK

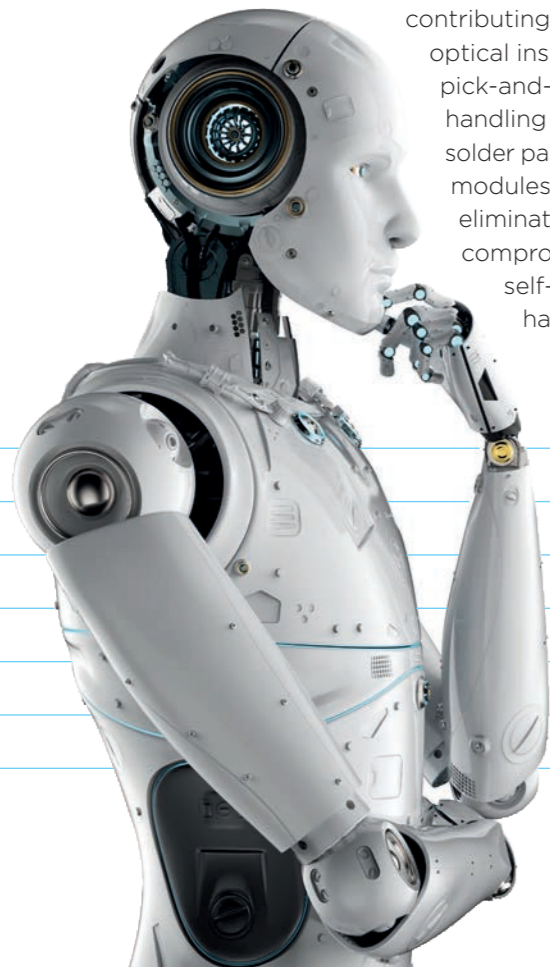
Even with all your resources running at full capacity, there are still significant gains to be made. Through enhanced interfaces and smarter interactions, your people can focus on the higher-value tasks that make your factory more agile and more productive.

IN RECENT YEARS, factory-wide productivity has been boosted significantly by smarter production solutions, with Mycronic contributing increasingly integrated optical inspection, jet printing, pick-and-place and material handling systems. Automated solder paste repair and inspection modules have essentially eliminated screen printing compromises. Intelligent, self-replenishing material handling systems have

rapidly reduced kitting and changeover times and enabled one hundred percent stock accuracy. And the fully integrated MYPro Line is constantly introducing new capabilities and process insights. Each of these advances has helped customers achieve higher throughput with the same installed base at lower costs.

Now, thanks to rising volumes of real-time process data, Mycronic is unlocking new ways to help people and machines work better together.

Where quality control was once seen as an end verification, it's now about producing fewer defects in the first place.



From unrefined data to accurate results

Handled properly, inspection data holds enormous potential for future quality and productivity gains. Made available to other machines, it can create closed-loop systems to enable auto-correcting processes. Connected to robotic systems, it can request autonomous assistance. Communicated to process engineers, it can assist deeper root cause analyses and preventive action. And on the highest levels of process control, it can be used to simulate the quality of a

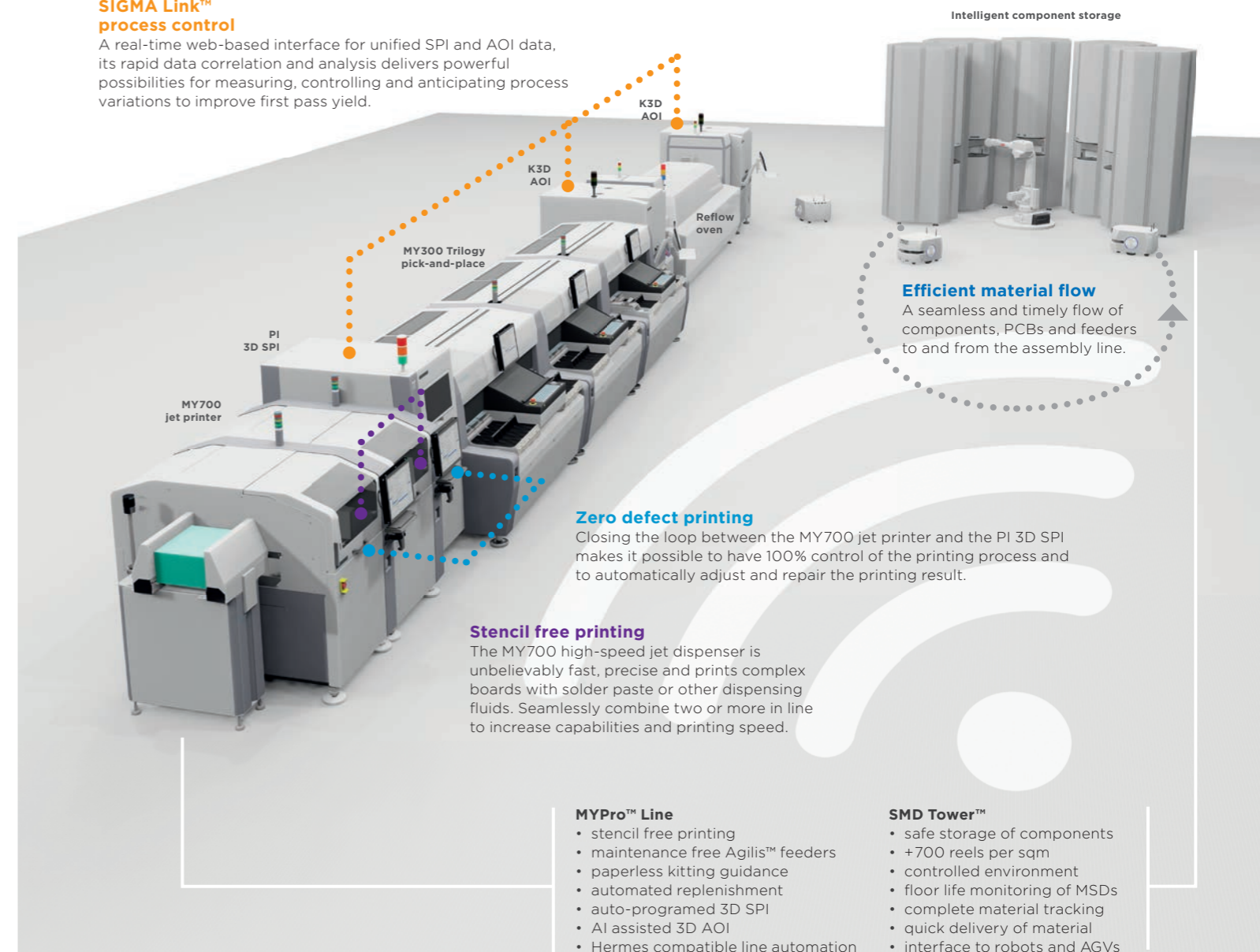
new product before the first batch is even produced. Where quality control was once seen as an end verification, it's now about producing fewer defects in the first place.

Next-generation machine learning through AI

Thanks to advances in deep learning, production staff are already benefiting from rapidly improving software capabilities. Most recently, research at the Center for

SIGMA Link™ process control

A real-time web-based interface for unified SPI and AOI data, its rapid data correlation and analysis delivers powerful possibilities for measuring, controlling and anticipating process variations to improve first pass yield.



Deep Learning in Electronics Manufacturing has been focused on training deep learning algorithms with thousands of sets of real production data. The aim is to develop new adaptive methods of automated production, image processing and auto-programming throughout the SMT line. For example, new functionality based on machine learning has recently been released on Mycronic's range of 3D AOI systems. Based on an automatic component recognition algorithm and automatic teach functionality, the new software tools assist process engineers in creating new 3D inspection programs in as little as half the previous programming time.

We are training deep learning algorithms with thousands of sets of real production data.

Unlocking the potential of people

The advent of AI — when combined with advanced robotics and software capabilities — represents a huge opportunity to upskill production staff and implement new agile manufacturing strategies. “It’s easy to see automation as only about reducing manual labor,” says Göran Frank, Product Manager Industry 4.0 at Mycronic. “But the real question is: How can we all use these new tools to make our work more engaging and more productive? Our philosophy has always been to find new ways for machines and humans to collaborate better. Ways to simplify programming, shorten change-over times and eliminate manual rework. Ways to make people more valuable — not less. Even hard-to-automate tasks like reel handling, kitting and distribution can now be vastly reduced thanks to collaborative robotics systems we’re beginning to implement. These are the kinds of future bottlenecks we’re starting to eliminate, and it’s really empowering the people on the factory floor.”



The future is
a fully software
controlled line with
the highest utilization
and zero defects.”



.....●●●●●●●●●● Meet the new MYPro Line™

The future just got smarter. With the MYPro Line, you can jet print perfect solder joints at the highest speeds. Ensure non-stop production with intelligent storage and proactive replenishment. And eliminate defects with 3D inspection systems that monitor and improve your process over time. It’s the best of Mycronic in a single integrated manufacturing solution. Now with more intuitive process controls, Hermes support and new dashboard and analysis software to simplify production scheduling and improve line efficiency. All to put the future back where it belongs: in your control.

Say hello to Leo the robot!

Automating material handling through robotics

TEXT: LIAM KARLSSON PHOTO: CATHRIN WISÉN

Stock accuracy, traceability, and timely delivery of parts are key aspects of a material handling system. Today, most factories still rely on manual handling of electronic components. In the best case with the support of unique barcodes for parts and a tight software integration to a MES or ERP system. To further increase factory productivity, improving the business, a higher degree of automation is required. This is a trend already ongoing among electronic manufacturers worldwide.



Products used in the Productronica demonstration

- SMD Tower
- Universal Robots Robotic Arm UR10
- Omron AGV, also known as Leo

IT IS NOTHING NEW for factories to make use of robotics, however the industry is still expecting a greater focus on automation, and automating what, until now, have been manual process steps in manufacturing. This includes moving electronic components and PCBs efficiently to and from the SMT assembly line. A process improvement that will require more novel storage systems and planning software for automatic inventory control and material tracking together with an increased use of robotics, such as automated guided vehicles (AGVs) and collaborative robots.

Last year at the tradeshow Productronica Mycronic showcased what a fully automated material handling system can look like. The solution encompassed the intelligent storage solution SMD Tower, AGVs and a robotic arm delivering higher efficiency with less human intervention.

Mycronic believe in a smarter material flow through intelligent material handling. In high-mix SMT assembly, the time in between jobs is significant and should be as short as possible. Having an automated material flow can greatly reduce the overall kitting time and thereby minimize changeover cost.

Through the integration of a robotic arm and an AGV, electronics manufacturers can load and unload reels from the SMD Tower, and distribute them to their respective kitting areas without human intervention.

The solution—how it works

A single carrier (reel) or a list of carriers for a complete job is requested from one or more SMD Towers. The towers start to unload reels and the robotic arm will pick reels from the tower terminals and place them into bins in the correct kitting order on the AGV. When the bins are fully kitted with reels, the AGV transports the bins to the kitting area. In the kitting area, the bins are placed into magazines and are then ready to be used on the SMT assembly line.

The robotic arm has a special gripper that allows it to pick all sizes of reels and the AGV has been programmed to always be waiting in the same location. A vision system on the robotic arm is used to accurately locate the position of the AGV relative to the robotic arm. This ensures that the reels are placed accurately in the bins at a high speed.

Reaping the benefits of automation

A key objective for manufacturers automating the PCB assembly process, is to improve both productivity and equipment utilization. As an example, automating material handling results in fewer operators required to manage the flow of electronic components and circuit boards to and from the SMT lines. This makes it possible for operators to focus their work on more value adding tasks in the factory — a process improvement leading to a more optimized material flow as well as lower operational costs.

Another aspect of this process improvement is that it reduces bottlenecks, as this automated solution constantly loads reels into the SMD, preparing for upcoming jobs. This means material is ready on time when you need it at the kitting station. It also reduces material handling errors, such as misplaced reels or retrieving the incorrect reel from stock.

In addition it greatly improves the retrieval time for reels when kitting. All in all, the benefits are manifold and cost savings great.

Automated material handling will help manufacturers capture and create more value in tomorrow's demanding production environments.



A high-tech future down under

Building a smarter platform for innovation in Australia

TEXT: GRANT BALDRIDGE PHOTO: ELEXON ELECTRONICS

At its headquarters in a high-tech industry hub in Brisbane, Australia, Elexon Electronics is investing in the future of advanced local manufacturing. For CEO Frank Faller, this means finding new solutions to turn ideas into products faster, smarter and with very high quality.



Made in Queensland

Made in Queensland supports small to medium manufacturers to increase international competitiveness, productivity and innovation via the adoption of new technologies.

To date, through Rounds 1 and 2, the MiQ program has supported 75 advanced manufacturing projects across the State, generating 930 new jobs over the next five years and approximately AU\$92 million in private sector investment.

Building some of the most challenging electronic products in Australia

Elexon has engineered and manufactured a diverse array of sophisticated products since the company's founding in 2006. Together with its sister companies, it has carved out successful niches in advanced monitoring systems for mines, water quality instrumentation and devices for monitoring the ultrasonic echolocation calls of bats, along with a wide range of products developed for direct customers.

"We're a high-mix, low- to mid-volume company with around a hundred active products", says Frank. "We strive to be the best manufacturer for our sister companies, and for other businesses around the world."

Continuous improvement

In-house engineering and manufacturing have long been a key competitive advantage for Elexon. With a team of inhouse design engineers, each new product is the result of a tight feedback loop geared toward

continuous improvement. This also ensures faster prototype turnaround and faster time-to-market than with alternative offshore production strategies.

To keep business thriving in Queensland, Elexon needs its equipment to remain at the leading edge. "As part of our ambitious growth plan, we decided to invest heavily in the latest technologies from Mycronic," Frank explains. "To double our output and reduce our transition to manufacturing time and costs by 30 percent — all of this requires state-of-the-art intelligent factory solutions."

Frank and his team greatly appreciate the funding assistance from the Queensland Government through the Made in Queensland (MiQ) grant program that has allowed them to buy some of the best equipment available in the world: a MY700 jet printer with two MY300 pick-and-place machines, SMD Tower storage solutions, a vapor phase vacuum reflow oven, X-ray inspection system and a set of highly automated conveyors as part of an integrated Mycronic 4.0 solution.

A major leap forward

Remarkably, most of the company's business goals have been achieved after fewer than six months of the new equipment being in operation. "One of our primary goals was to double our output by the end of 2019, and we've achieved this," says Frank. "And in the last three months our delivery has been perfect, with 100 percent of our boards delivered in full and on time. The key to achieving this productivity leap was to reduce machine downtime by 60 percent by using MYPlan's optimization tools and smart setup solutions, combined with the increased feeder capacity on the machines and the easy-to-use Agilis feeders."

Perfecting quality management

Elexon's management team was especially keen on ensuring that the new line enabled the highest standards in quality management. "My background is from Siemens and Bosch," says Frank, "and our managing director is a former Boeing Chief Engineer, so we're very familiar with quality management systems. Every product we manufacture here has to pass specific quality gates in its process flow, and now we can collect more refined quality data, improve our monthly reviews and address any issues. On one of our recent production runs, a complex CPU board that has been in production for over seven years had a first-pass yield of 100 percent – something we have never been able to achieve before."

According to Frank, the major key to this improvement comes down to the MY700 jet printer. "The optimized size, shape and repeatability of the solder deposits is crucial," he explains. "Getting the solder paste right is the difference between okay quality and excellent quality. The jet printer has been a game changer. It's a quantum leap for us."



Our primary goal was to double our output by the end of 2019, and we've achieved this.

FRANK FALLER
CEO, ELEXON ELECTRONICS

Real-time stock accuracy

When it comes to stock accuracy, the new SMD Tower setup has already improved reliability and reduced downtime. "We have an ERP system that gives real-time information on inventory holding of components, but sometimes they would be wrong or reels would be misplaced. A single missing reel or component can stop everything, which is a disaster. Now, if the SMD Tower says it's there, it's there. It's a more reliable real-time component count, so we can schedule everything accordingly. Unique carrier IDs of each individual component reel, combined with the PCB ID-number, gives us component-level traceability, which is very important to defense and medical customers."

Enhanced capabilities

In addition to improvements in New Product Introduction (NPI) turnaround times, Ball Grid Array (BGA) capabilities and production planning, what Frank is most thrilled about is the extensive possibilities enabled by the new production line.

A prototype build can now be set up and run in parallel to normal production. The jet printer eliminates the need for stencils and enables pin-in-paste assemblies, which before had to be manually soldered. Elexon can now offer more high-value design-for-manufacturing services for complex assemblies with fast turnarounds. Customers appreciate the fact that the

pick-and-place machines' built-in verifier adds another safety layer to the assembly process. While the smart feeders avoid the wrong reel being loaded into the feeder, the verifier can measure the electrical value of the components. To take advantage of all these advances, assemblers are currently being upskilled to program the line as part of their daily operation.

The complete package

"The most exciting thing is that we really have the complete package, not just a lot of islands and machines," Frank explains. "It's a complete solution where everything fits together — the communication between the towers, the proactive replenishments, the scheduling. You can scan the product's bar code and it loads the program for the whole line without risk for human error. We can even run two or three products simultaneously on the line, down to batch size of one — it's not common now, but before this would have been impossible!"

For Frank, these capabilities represent a new era in advanced manufacturing. In addition to improving quality and productivity, enhanced in-house manufacturing helps to strengthen the link between design engineers, manufacturing and evolving customer demands. "One of our aims is to help reverse the trend of manufacturing being outsourced to overseas countries and to grow the manufacturing industry in Australia. We employ outstanding people who are keen to learn and be a part of the future of manufacturing. All these innovations are really appreciated by the engineers who are there when the board is being manufactured and by the operators who've worked on SMD lines all their lives."

Data-driven innovation

Thanks to the latest intelligent factory solutions, Frank feels the company is now better equipped than ever to bring unique value to local and export-based customers throughout Australia. "The world is becoming more data-driven," he concludes, "and that's the beauty with this system. We can convert CAD data straight into solder paste and pick-and-place programs. Through the web interface, anyone in the business can get access to quality and performance data. There is much more data available to refine the performance of the machines and to visualize and share the increases in productivity with the production team. This whole environment with design engineers, skilled operators and the right data all working together — it really makes a difference when it comes to accelerating our customer's innovation cycles and time-to-market."



Evolution of a coater

— from high volume coating machine to flexible, full featured, easy to program coating system.

TEXT: JEFF LEAL PHOTO: ARJEN KOPPENS, AXxon

MYCRONIC INTRODUCED the MYC50 conformal coating system to the global market in November 2017. The system was designed to work in the demanding high running factories of China and Asia. Entering new markets required different capabilities, the quality was there, but the demands in Europe and the Americas required adapting the system to a new marketplace. A multidisciplinary team working on three continents was formed to

obtain direct customer input as well as competitive offerings. An aggressive timeline was set to obtain the minimal viable product (MVP) and subsequent enhancement of the new functionalities to be on par with the leaders in these regions. A new R&D approach was implemented where both Mycronic sales and applications worked hand in hand with R&D to jointly bring to market a solution capable to address any coating requirement.

Two critical developments to become on-par with market leaders

A third coating valve for gel applications was the most critical item to develop. Gel valves apply a thicker version of the coating material with a needle to prevent the coating material from entering into connectors and other restricted areas on a PCB where interconnection and conductivity are critical. For many of today's coating applications this is a must have valve. Developing the gel valve allowed to perfectly coat even the most critical (densely populated) PCB's.

Customers have highlighted its versatility and ease of use compared to their previous experiences.

Offline programming is a critical software feature for conformal coating customers. In a medium volume high mix production environment it is important to be able to prepare the next program while the first batch of a different product is being produced. Furthermore conformal coating is not a digital process, it is an analogue process where material viscosity, flow, atomization and surface energy will define your coating results. When the design requirements were complete, we understood that to offer this function we had to re-define our online software as well. In 12 months both a new online software and offline programming software were released. Giving the MYC50 a more intuitive interface online and an easy to program offline function. Customers have

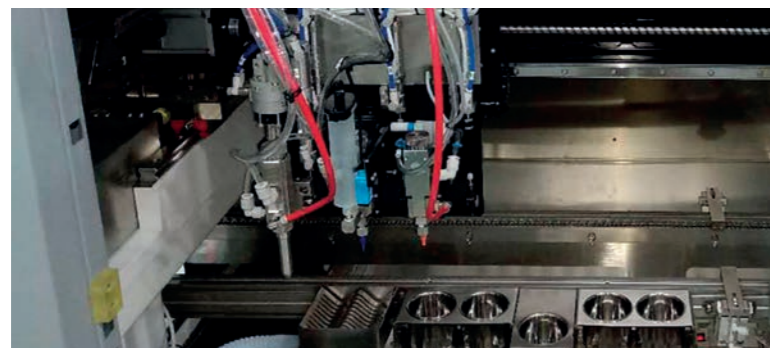
highlighted its versatility and ease of use compared to their previous experiences. Now we were on-par with the industry, **but we strive to be the leaders.** Our focus has switched to process control, ease of use and new capabilities.

The steps to a full process control, flexible, precision coating system

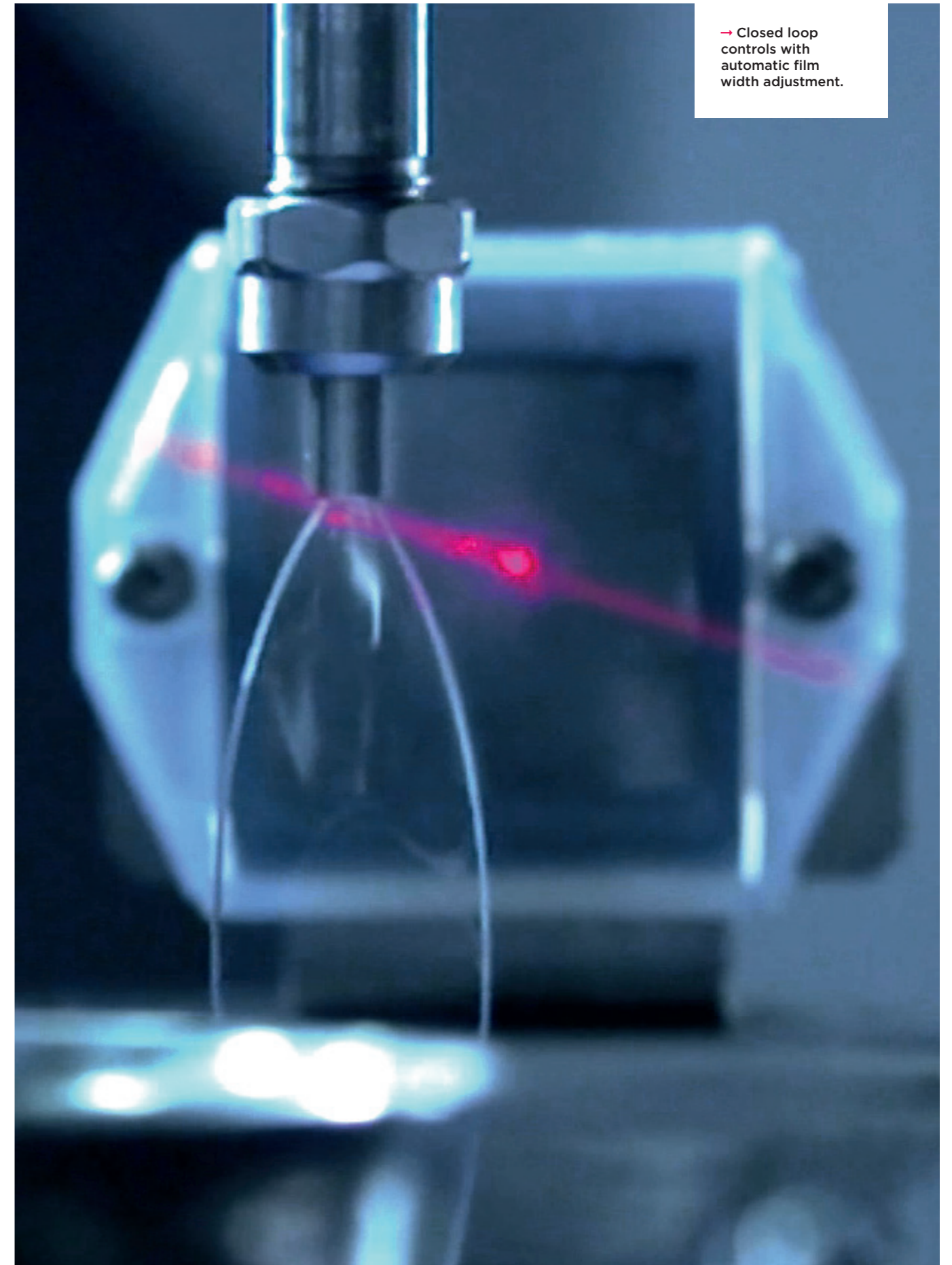
Spray coating is one of the most widely used methods for conformal coating. Compared to film coating it can handle from low to mid-range viscosity materials and also the PCB layout is hardly given any restriction. The drawback is edge definition. **How to have both a fast process with good edge definition using a spray valve?** We tackled this challenge and developed the V-5800 valve. When baselined against film coating valves that can only be operated with low viscosity materials and cannot be used when there are many tall components on a PCB, the V-5800 performed as well and at similar speeds. The V-5800 gave our customers greater flexibility with a single valve than available before. This is now our go-to valve for most applications.

As mentioned, coating is a very analogue process and material flow is important to understand if a process is robust and repeatable. By understanding this principal **an active flow monitoring system was developed.**

This system monitors the material flow during coating in real time, the flow range is determined during process programming to tie the output of a good part to the flow of the system when coating that part. The process window is defined by the user for each product. This way board-to-board repeatability can be guaranteed, but also overcome issues like flow variation due to



→ Typical three valve conformal coating setup:
1- Gel valve
2- Needle jet
3- Precise spray



→ Closed loop controls with automatic film width adjustment.

viscosity changes over time. The flow system can also be used to determine and adjust the material flow per valve. For traceability requirements, we can register the applied amount of material for each PCB in a log-file.

In order to coat and dispense into critical angles, the valve's nozzle stand-off distance and entry angle are important concepts to understand. **To make the processes more repeatable the nozzle finding system was developed**, to detect all valves working at any angle. This results in repeatable processing of all parts when tied to a laser height sensor, removing the normal variation from operator to operator setups.

As processes get integrated into larger production lines, it is important **to be able to work with MES systems**. For this a new software package that ties into our new software was developed and allows for the customization required to meet different end

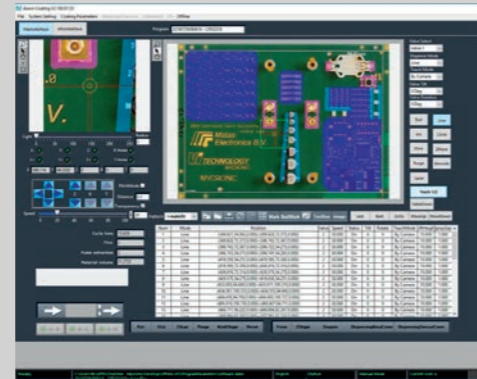
user expectations and mandates for each of their individual MES systems. Now we are able to offer into the Tier 1 (automotive) suppliers with much stricter process controls and MES requirements.

The evolution continues

Our 18 month journey toward an evolved MYC50 conformal coating system will never be complete. We are constantly improving to offer the best product in the industry. We are already in the works to enhance flow monitoring, online/offline software, coating inspection and other new coating process enhancements. Our approach in MYSmart is customer centric development and this has resulted in new business gains across all regions. As a result of our customer centric approach to development we have developed a new product for industrial dispensing!

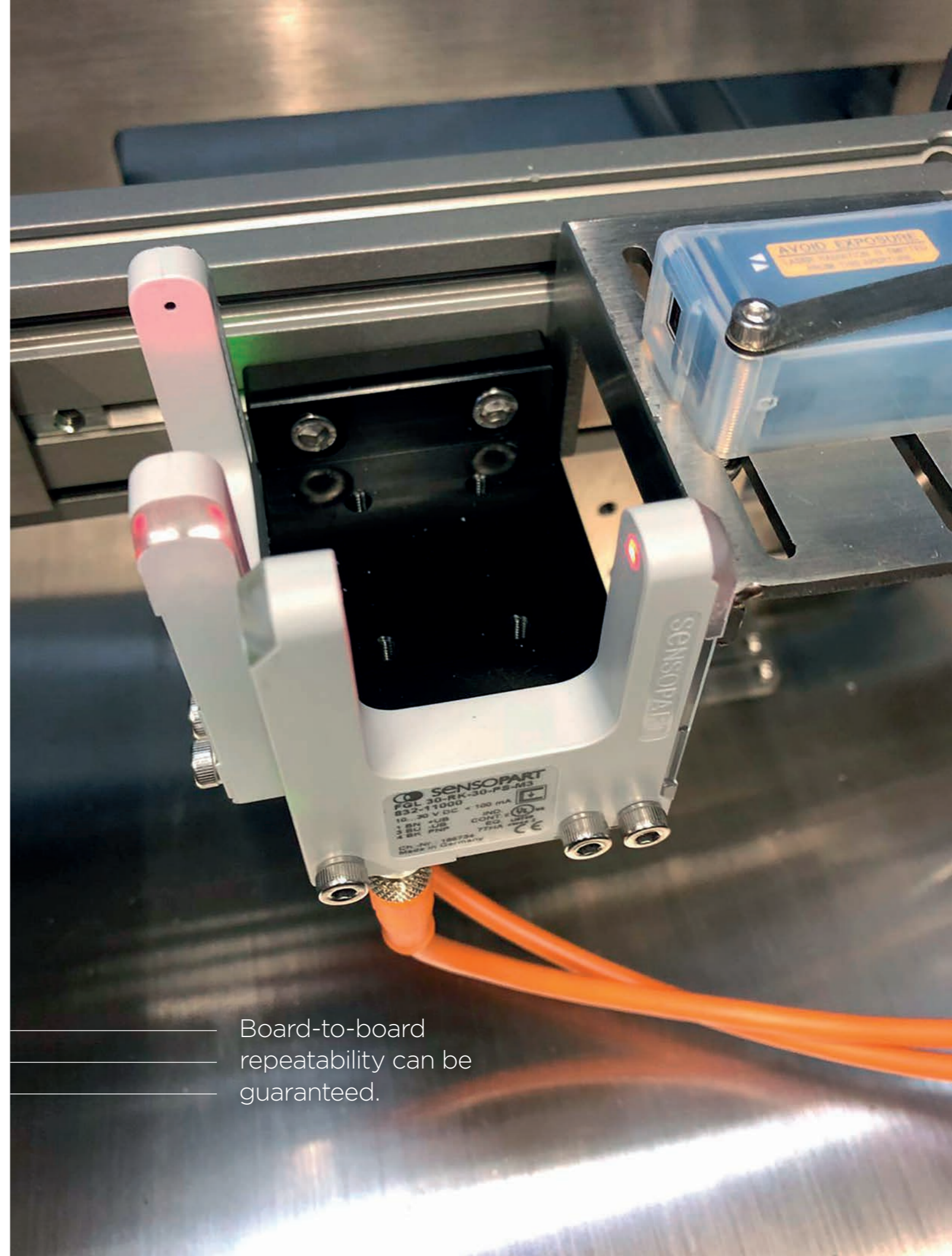
Offline programming

A NEW **STREAMLINE** interface is the crown jewel of the MYC50 conformal coating system. An intuitive graphical user interface with a wide range of customized functions enable fast and accurate programming from a high quality picture — as can be taken from most modern mobile devices.



Some highlights are:

- Each valve application is selectable by color (above right). The width of the pass is defined by the user and area coating is simple by teaching the diagonally opposite angles — the software calculates the rest!
- Avoiding collision to raised components is critical, for this we have both valve nozzle inner diameter and outer diameter (ID/OD) visible while you teach (above left) to ensure that when you teach on the board the nozzle will not contact any raised components.
- Transparent coloring allows for easy to view component coating to ensure that the coverage past critical components are acceptable to your process.
- Cycle time is calculated offline when programming to ensure you can optimize your coating process without the need of executing on a machine.
- Material volume calculations will show the user the projected amount of material per board based on their program, this also serves to indicate if the program complies with process quality metrics of required materials.



Board-to-board repeatability can be guaranteed.

Meet the new MYSmart series

If you
can create it,
we can coat it.

The MYC50 has you covered.

In a connected world, electronics everywhere demand protection. And with precise deposition of conformal coating materials, you can produce more rugged electronics while reducing material waste and operational costs. But are your production lines ready for the next challenge? The MYSmart series MYC50 is a high-performance conformal coating system that ensures non-stop throughput across a range of complex applications. Thanks to a robust frame, an advanced motion control system and a broad range of coating valves, we combine speed and precision to help you meet an endless variety of coating demands. Find out how you can prepare your electronics for tomorrow's challenges at mycronic.com

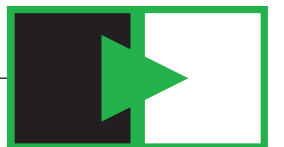


MYCRONIC
When passion meets innovation ●

New machine-to-machine communication standard opens the door to Industry 4.0

Mycronic to chair initiative and roll out Hermes-compatible equipment in 2020

TEXT: DAVID GRAY PHOTO: MAGNUS ELGQVIST



IPC-HERMES-9852

There's a new messenger in town and it's called Hermes. Named after the Greek messenger of the gods, it brings good tidings to the SMT industry. The good news is that around 60 leading equipment suppliers have unified around a modern protocol to replace the dated SMEMA standard. And Mycronic will now chair this initiative.

"I'M HONORED to be entrusted to continue the good efforts of this global initiative" says Håkan Sandell, Director of Industry 4.0 platform solutions at Mycronic, who was passed the baton of Chairman of Hermes by ASM's Thomas Bliem at last year's Productronica Show. "The new standard will provide a modern backbone for board-flow data management in tomorrow's smart factory."

A grassroots initiative

Uniquely, the Hermes standard is an industry-driven initiative that grew out of a need for more affordable machine-to-machine (M2M) automation. Even more remarkably, it got started when two SMT vendors, ASM and ASYS, initiated a dialog on how to find a better digital standard for the various types of software being used on the SMT line.

"From day one, there was industry-wide interest in finding a more affordable way to make SMT software more compatible," recalls Håkan. "Naturally every vendor could

have developed their own future proprietary protocols, but the costs would be huge. Most importantly, it would not have been in the best interest of our customers. Now we have a vendor-independent standard that offers a win-win solution for all."



Basically, this is a way
to make automation
more affordable for all.

MATTIAS JONSSON
PRODUCT MANAGER, MYCRONIC

Approved by IPC organization

Founded in March of 2017, the Hermes Standard has quickly gained momentum in the SMT industry. It also soon caught the eye of the Institute of Printed Circuits (IPC), the global institute responsible for setting standards for electronics assembly and production. Today, the IPC has approved Hermes as one of its standards, with the latest designation of IPC-HERMES-9852.

From signal-based to digital protocol

The big difference with the new standard is that instead of being “signal based”, Hermes is a modern protocol based on TCP/IP and XML. This eliminates the need for special cables, plug-ins and other hassles, plus it enables a new level of consistency and scalability.

Integrating with CFX for Industry 4.0

“In my work as Chairman, my colleagues and I will now focus on two key areas going forward. First, we want to make sure the plug-in experience is truly seamless for all vendors. Secondly, and very importantly, we are making sure that Hermes is fully compatible with the CFX Standard now approved by the IPC for factory-wide SMT automation. By ensuring that Hermes can be deeply embedded into CFX, we open up the possibility for Industry 4.0 and the smart factory of the future.”

Unleashing new potential

Mattias Jonsson, a product manager at Mycronic, sees huge potential for the new standard. It will open up new possibilities for SMT producers to reduce the number of costly sensors and barcode scanners on the equipment and eliminates the need for operators to manually enter process parameters.

A modern digital protocol

“This is a huge leap into the future,” says Jonsson, who adds: “Everyone knew that SMEMA had seen its better days. Basically, the 35-year-old standard allowed one machine to tell another there is a board ready. That’s it. Now, with the new digital protocol, machines get much more information about the size, weight, serial number and more. This level of information and compatibility is a huge advantage.”

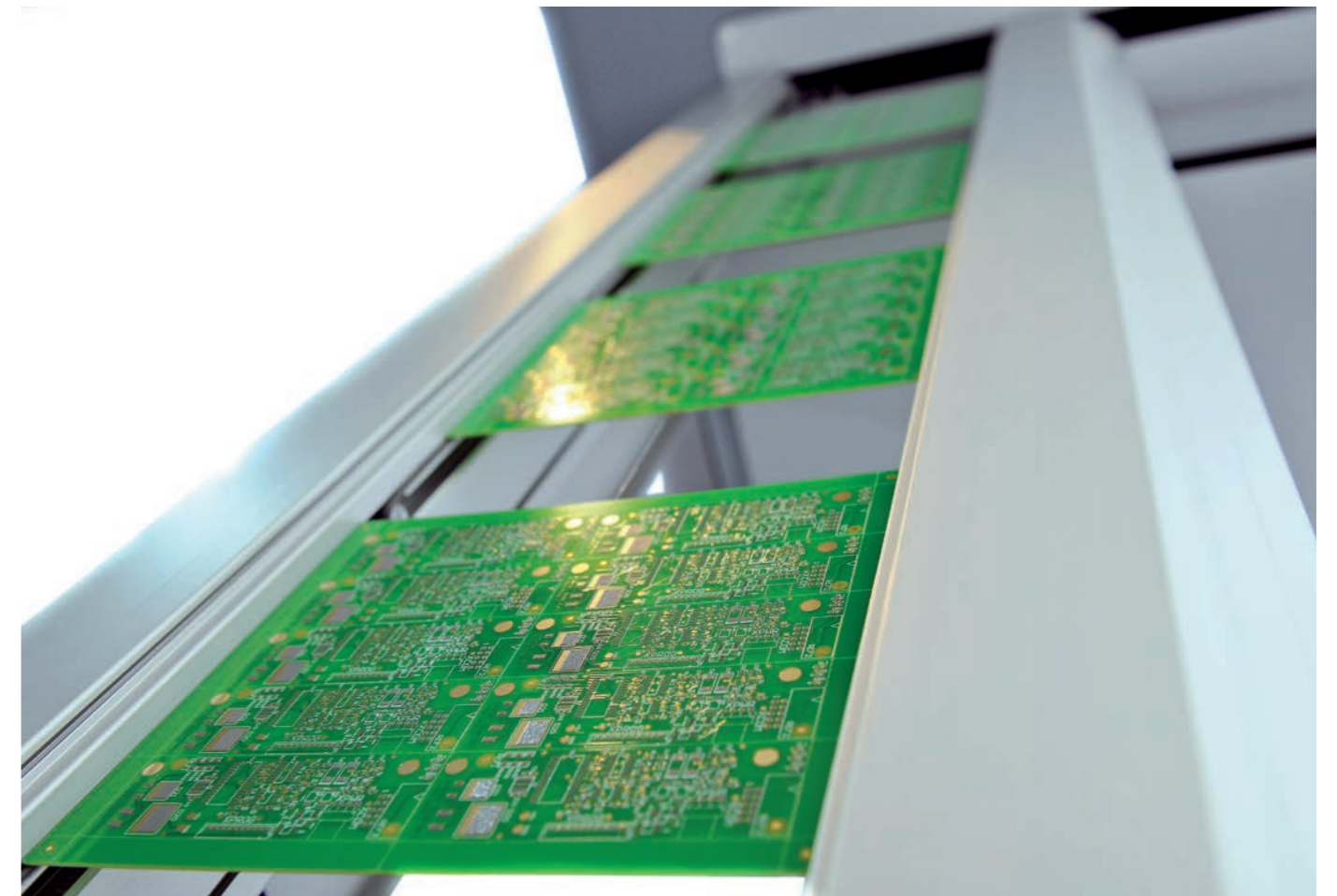
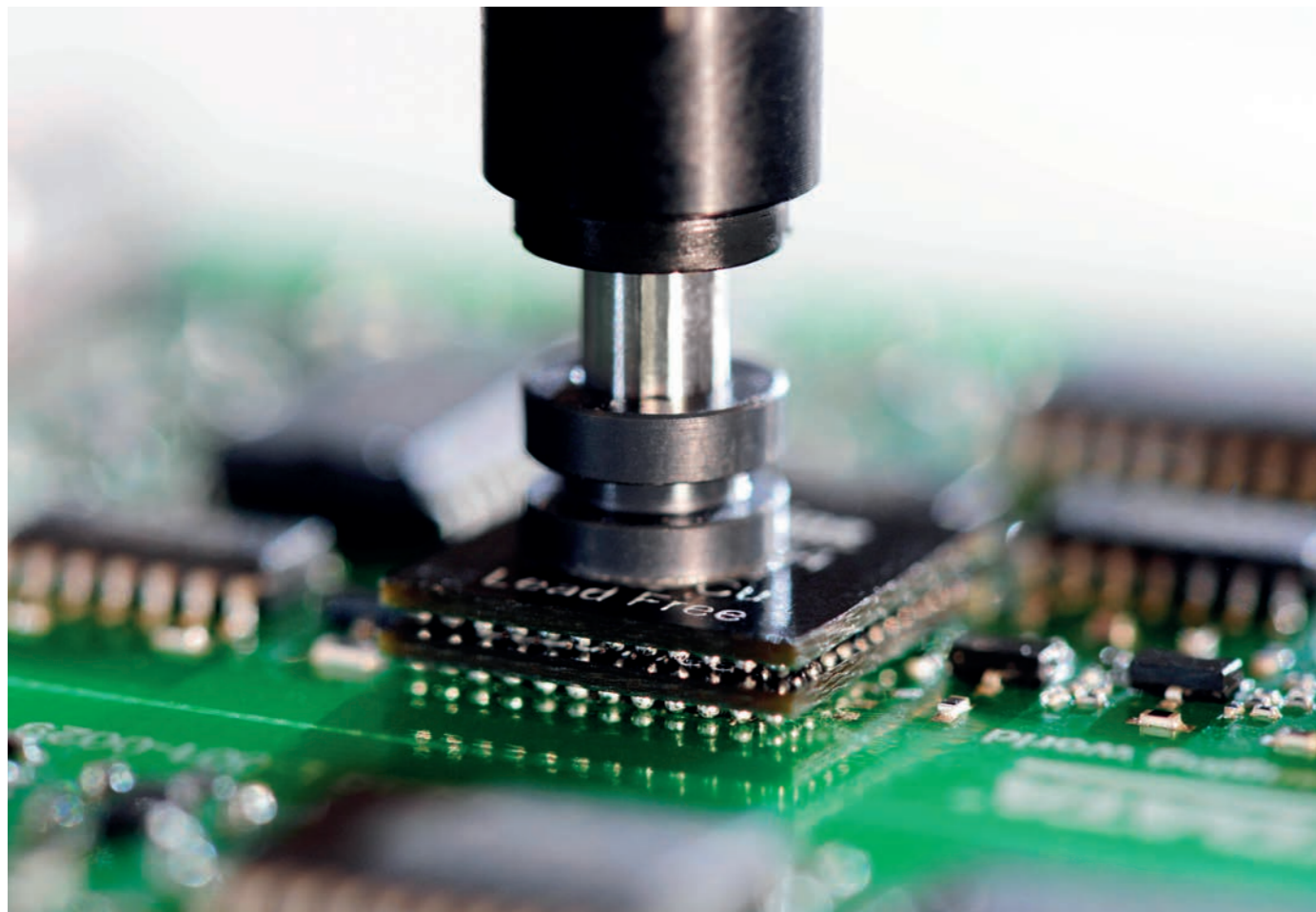
Part of the Industry 4.0 movement

According to Mattias, the adoption of Hermes is going faster than expected. “Not surprisingly, everyone wants to be part of the new Industry 4.0 movement. And if it can significantly reduce the cost of automation, it’s a no-brainer. To prepare our customers for the future Smart Factory, we will be introducing Hermes-compatible equipment across our range in 2020,” he concludes.

2020 Roll-out of Hermes Standard (IPC-HERMES-9852) on the Mycronic platforms

- Q1:** PI series 3D SPI machines for solder paste inspection.
- Q2:** MY300 series pick-and-place machines. MY700 series jet printers for solder paste.
- Q3:** K series AOI machines for automated optical 3D and 2D inspection.

Hermes is a huge leap into the future of smarter board-flow data management.



MYCenter™ Analysis

– new pick-and-place dashboard

THE NEW PICK-AND-PLACE dashboard and statistics software MYCenter Analysis will soon be released, giving Mycronic users a great tool for improving utilization and uptime, and reducing operator intervention.

The new dashboard software includes the following main views:

- Live view — showing the current state of the line, number of boards produced, cycle time, efficiency, and workload balance.
- Component mis-pick and reject analysis — helping process engineers to fine-tune component handling parameters and finding the root cause for mis-picks and vision rejects.
- Utilization analysis — showing the historical usage of the machines aggregated to a daily, weekly or monthly view.

The utilization data can be exported to a spreadsheet for further analysis and reporting. MYCenter Analysis supports MY100/200/300 machines and requires TPSys 5.1 or later. //

New post-cure test system (PCT)

– optimizing automotive camera assembly lines



WITH THE NEXT GENERATION of sensing cameras, automotive parts manufacturers are looking to test and measure 100 percent of their cameras to avoid any quality issues and collect camera parameters (intrinsic). Placed after the complete cure of the camera unit, PCT offers a wide range of essential tests and geometrical calibration that meets the new desired standards, including:

- MTF through focus curve measurement
- Depth of focus measurement
- Best Focus, Centration, Rotation, Tip/Tilt, Boresight
- FOV measurement, TV distortion
- Intrinsic Parameter Calibration
- Color and sensor tests

Compact and fast (up to 2 million units per year) the PCT system meets the productivity requirements of all automotive Tier 1 players. Being able to test and qualify cameras upstream in the manufacturing line enables cost savings on defective parts and allows customers to perform process control to improve their yield.

PCT is the cornerstone of customers' test strategy to reach the industry's highest quality standards. //

Rapidly evolving, enhancing functionality and flexibility

IN THE PAST 18 months the MYC50 has evolved from a basic 2-valve conformal coating solution with online software only, into a Top Tier system that is continuously enhancing capabilities both in hardware and software.

- 3-valve configuration created to compete in more demanding applications with the development of new Gel valve.
- New offline programming and online interface created to simplify programming and ease of use.
- New nozzle calibration system developed to ensure more accurate positioning of all valves and nozzles including tilted valves.
- More process controls through flow monitoring, closed loop film width control, low pressure sensing, barcode and RFID readers.
- New precise spray valve provides clean edge definition for both low and higher viscosity coating materials.
- New modified V8000 valve for fast drying coating materials released to prevent cob-webbing.
- Base MES interface created to simplify integration into global MES systems. //



Put tomorrow's workflow **in your control**



MYCRONIC

When passion meets innovation ●