

THE ART OF MANUFACTURING

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monozukuri

ISSUE 2

Mitsubishi Electric Factory Automation Customer Magazine



**THE CHANGING FACE
OF MANUFACTURING**
A special report on society
and automation's evolution

CASE STUDY
Error-free manual
workstations

FORBES DIGITAL 100
Mitsubishi Electric
recognized among top 100
global leaders

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Challenge the future

Welcome to our second edition of the Art of Manufacturing magazine. We are expanding our support for more languages in this edition, reflecting our Factory Automation family is both wide and encompassing.

In this edition we will introduce the idea of balance in all things whether that be work-life or the challenges of technology vs social change. These are areas that we need to consider for the future.

The topic takes on even more relevance now as our global society has had to adapt rapidly to a set of very challenging conditions brought on by the COVID-19 pandemic. New work

practices, often remote working, is for many of us something we have had to come to terms with in a short space of time. However, we have seen the strength of the human spirit shine through, and become redefined again in terms of flexibility, ingenuity and compassion – especially from the healthcare workers on which we all rely. But having said that, the manufacturing sector has also risen to the challenge, with many companies switching

production at short notice to produce Personal Protective Equipment (PPE) - many thanks to all concerned and their valuable contributions. So now we look forward to a different future, one where there is even greater emphasis on digital technologies and collaborative systems to support and protect both people and manufacturing across industries, countries and society. Let's meet that challenge together and live our slogan "Changes for the better". ■



Satoshi Takeda
Group Vice President
Overseas Marketing Division

The changing face of manufacturing



Change is happening all the time and the Industrial world is no exception. Often when 'change' is being executed it is accompanied by 'fear' of the consequential unknown results. For manufacturing the current catalysts of change are the Robots, AI and Digitalization – what worries people is the potential impact on jobs, manufacturing and society as a whole.

Adding Robots and AI to the manufacturing mix is not like simply adding salt and pepper to a culinary delight – the results reach far into the future and can impact in more direct ways.



When the automobile was first introduced in the UK a man had to walk ahead of it with a red flag as a safety precaution – today, just over 150 years later we have cars that drive themselves. It's an exciting prospect to imagine what Robots and AI will be like in 20 years time.

The debate is not new, but has gained momentum thanks to increased awareness, prompting the Japanese Government to create its own vision going beyond Industry 4.0, with an all-encompassing policy called Society 5.0, which calls for a socially responsible approach to application of technology.

Robots and AI are not new; the concepts have been around for decades, but technology is now catching up rapidly to make them a reality. According to the Edelman AI Survey 2019, public awareness and comprehension of these subjects is at a similar level to that of the experts, as also awareness of what constitutes AI and its potential applications. So it is puzzling that there still exists a popular perception that by just 'adding AI' to a situation, everything will improve magically, like adding seasoning to a culinary creation. Unfortunately, it does not work like that in cooking, nor in applying technology.

The robot has numerous tasks and challenges – from determining its position, understanding parts location to managing gripper operation, creating optimal travel paths, and avoiding people and machine parts. Unlike humans who have five senses, an 'out of the box' robot is basically pretty dumb having none – no vision, touch, smell, etc. To equip this robot with such 'senses' one needs to add sensors that provide the required information. But more critical is the need to integrate all those inputs into a coherent picture of the operating environment, where the AI ecosystem could potentially help.



*To see a truly amazing video please take a look here
www.youtube.com/watch?v=C6FrMznGl1s*

Another challenge is the lack of common rules and processes for implementing AI. Also there are more types and designs of AI and AI components than one can imagine – from neural nets to Bayesian inference, decision trees to Occam's razor and everything in between. Each has its strengths, weaknesses and purposes so combining them is how new and stronger AI processes evolve. In the final analysis, it is basically an attempt to replicate 2000 years of evolution, which has equipped humans with the ability to make rational decisions with minimal input. And the result? Just like humans, it is not infallible.

Not as easy as it looks

On 23rd March 2016, Microsoft released a new AI chat-bot called Tay, which had to be turned off 16 hours and 96,000 tweets later, because some mischievous netizens realized they could train Tay with politically incorrect and offensive phrases. More recently some reports have suggested that the critical failure of Boeing's 737 Max8 is a result of human-machine disagreement. Similarly, it has been reported that IBM's Watson had to step back from diagnosing cancer patients as it was prone to errors. These examples are quoted not to criticize or spread panic, but to highlight how difficult is the application of autonomous decision making and machine control. While the companies in question have either solved the issues or are working on it, it is better to proceed with an element of caution. History is a great teacher; if one looks back in time, the first automobile on the roads of England required a man bearing a red flag to walk in front. Some 150 years later, companies are now experimenting with autonomous cars.

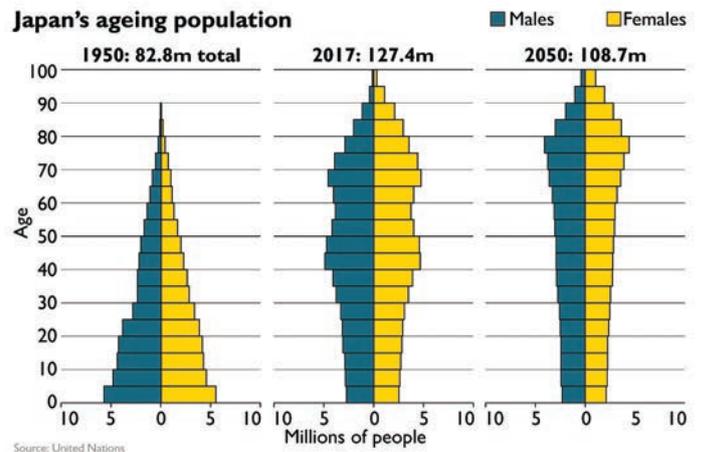
The success of AI applications is influenced by the complexity of the problem, i.e., the more complex a problem, the more computing power, energy, training, data and inputs are needed to achieve stable, reliable operation.

Coming back to the robot, one of the challenges is the ability to 'see'. It is easy to think that adding a camera will solve the problem, but sometimes seeing is not believing as appearances can be deceptive! The perception of depth remains a critical challenge. For humans, it is unremarkable to pick up a glass of water, because they can determine the physical extremities of the glass, and relate the glass form to the hand/finger positions. Image a scenario where even a human was fooled, so what chance does a robot stand?

An example of hyper realistic drawings – it is difficult to tell which egg is a drawing and which is real. There are many such amazing drawing videos from artists such as Howard Lee available online. So instead of thinking of AI as an all-encompassing answer to a problem, maybe it is more practical to think of AI as a series of tools that could enhance the manufacturing situation whether that involves machines or humans.

What is the social impact?

As seen in the Tay example, AI is agnostic; it has no inherent ability to determine right or wrong, good or bad. AI is only as good as its training, which is effectively its programming.



The changing population is not just important to statisticians – all parts of society including manufacturers are impacted.

One can also see similarities with self-driving cars, i.e., where does the legal responsibility lie? What happens in a runaway event – who steps in to stop it? Furthermore, as seen in the social media world, there will be questions around data ownership – who owns it? Tough questions, but it's best to leave the legal issues to the lawyers and take a look at the social-job aspect.

A 2018 United Nations report states there are now more people over 65 (705m) than under 4 years old (680m). Why is that important? In China the over 65 rate is 10.5%; across the European Union it is 19.7%, in Italy it is 23%, but in Japan it is almost one third of the population (27%). So it is hardly surprising that governments are debating the pensionable age and system viability. Compounding this, the average life expectancy in Japan is now 84 years; which means there are a lot of people living much longer. But the point is, even if one could work till 84, is it safe?

Japan has reacted by relaxing the laws around migrant workers. The result, according to its Ministry of Health, Labor and Welfare, is an increasing number of migrants, with the largest volume – 30% – in manufacturing jobs. That's good news. However, when they return to their home country, the investments in training and know-how acquisition will be lost. This hidden imperative suggests that manufacturing could possibly benefit from robotics and AI technologies.

Unfortunately this is actually a global problem. A recent report by Citigroup/World Bank states that developing nations have the highest risk of workers being replaced by automation. China is a case in point. As the initial numerous 'low-cost' workforce became more skilled, acquisitive and aspirational, labor costs began to rise as workers were prepared to change jobs for better salaries. This coupled with increasing quality issues related to lower worker motivation and less specialized training has led more and more companies to opt for greater automation. The more advanced countries are seeing less worker replacement by automation because they had already made those changes years earlier in order to remain competitive with China in the first instance.



Robots and AI may not be the threat that some people think and could even be essential in the future manufacturing environment.

So now the very technology, which seemed to threaten jobs, is actually instrumental in protecting them! This is especially true in today's internet driven world where consumers have more choice of products which they want faster. Traceability also becomes more important as manufacturers' have higher after sales risks due to shortened product lifecycles.

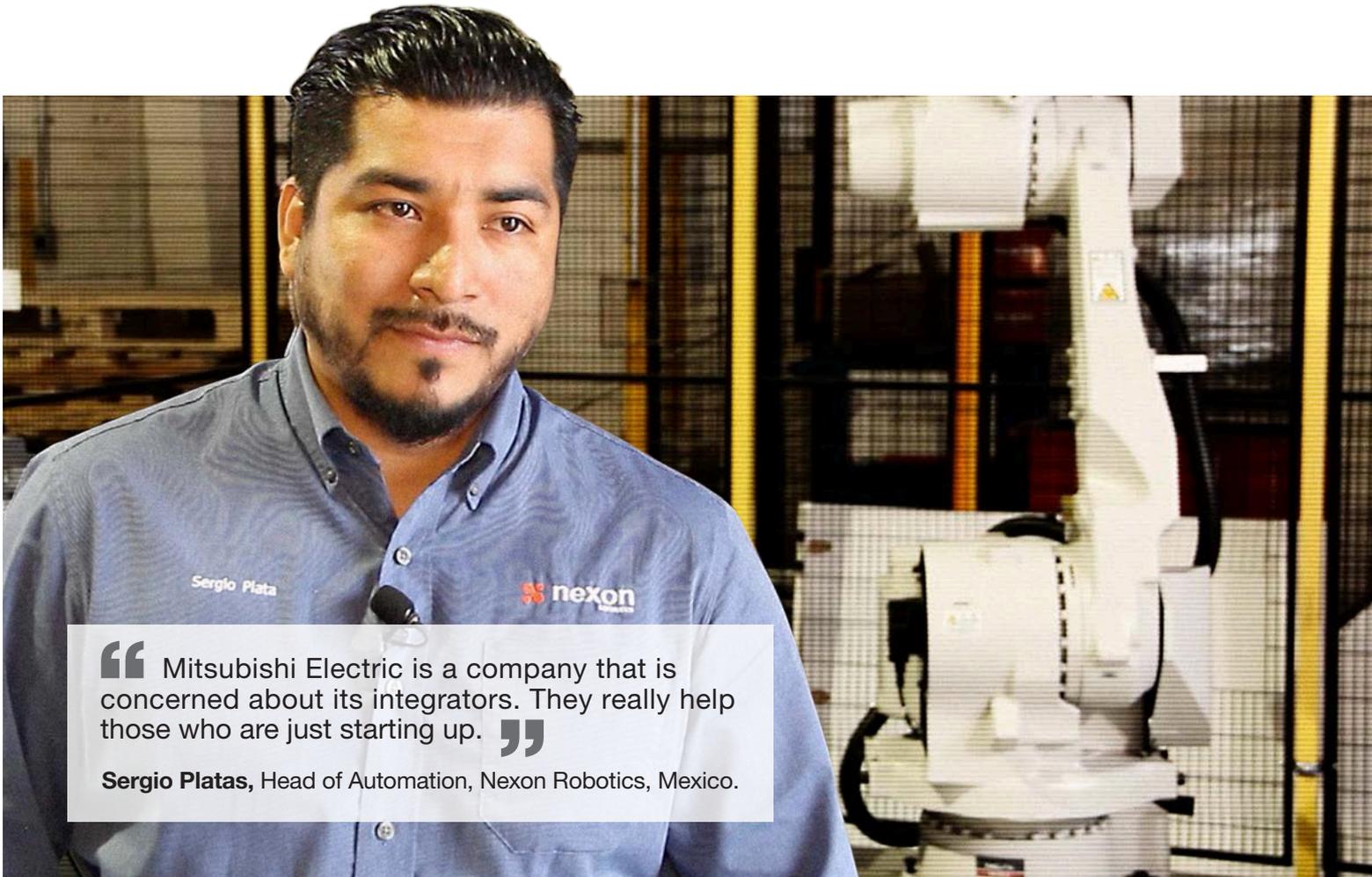
Tomorrow's automation landscape

The trend for digital home assistants provides a very good clue to the future. One can expect various platforms to utilize AI 'skills', each dedicated to solve different manufacturing problems, e.g., voice recognition to support security or the systems to augment new worker training, etc. Similarly, the perfect AI will be invisible just like an automated robotic room cleaner, which is bought to clean the floor not because it has AI. AI will be implemented at all levels of production process, from cloud systems to predict demand to device embedded diagnostics supporting fast decision making, reducing unnecessary network loads and strengthen system resilience.

But this is not the world of tomorrow – it's already happening. For example, robot augmented bearing insertion benefits from a 65% reduction in setup time; farmers operate plant nurseries with less staff and have faster product (plant) adoption; while robots that can perceive depth are 30% more successful to pick random parts from picking bins.

Mitsubishi Electric is excited about the prospects for the world of manufacturing, which is why the company is sharing the e-F@ctory concepts for digital manufacturing and applying its bespoke AI platform, MAISART, on a component level. Never has the company slogan been more prophetic, "Changes for the Better"! ■

It's really intuitive.



“ Mitsubishi Electric is a company that is concerned about its integrators. They really help those who are just starting up. ”

Sergio Platas, Head of Automation, Nexon Robotics, Mexico.

Global Partner. Local Friend.

Let me tell you my story: Nexon Robotics is a business unit of Nexon Automation here in Mexico. We are focused on the sale of closed-box robotic solutions with customers in a wide variety of industries from Automotive to Food & Beverage. We are committed to delivering projects and services on time to our customers; this is our promise and our slogan. So we need partners that share that ideal, that's why we work with Mitsubishi Electric. It is a company that is concerned about its partners and integrators. They really go out of their way to help those who are just starting up. Programming and using Mitsubishi Electric's MELFA robots is really intuitive and very simple – it's a big help not to have to worry about that when we are putting complex systems together.

www.mitsubishielectric.com/fa/cssty

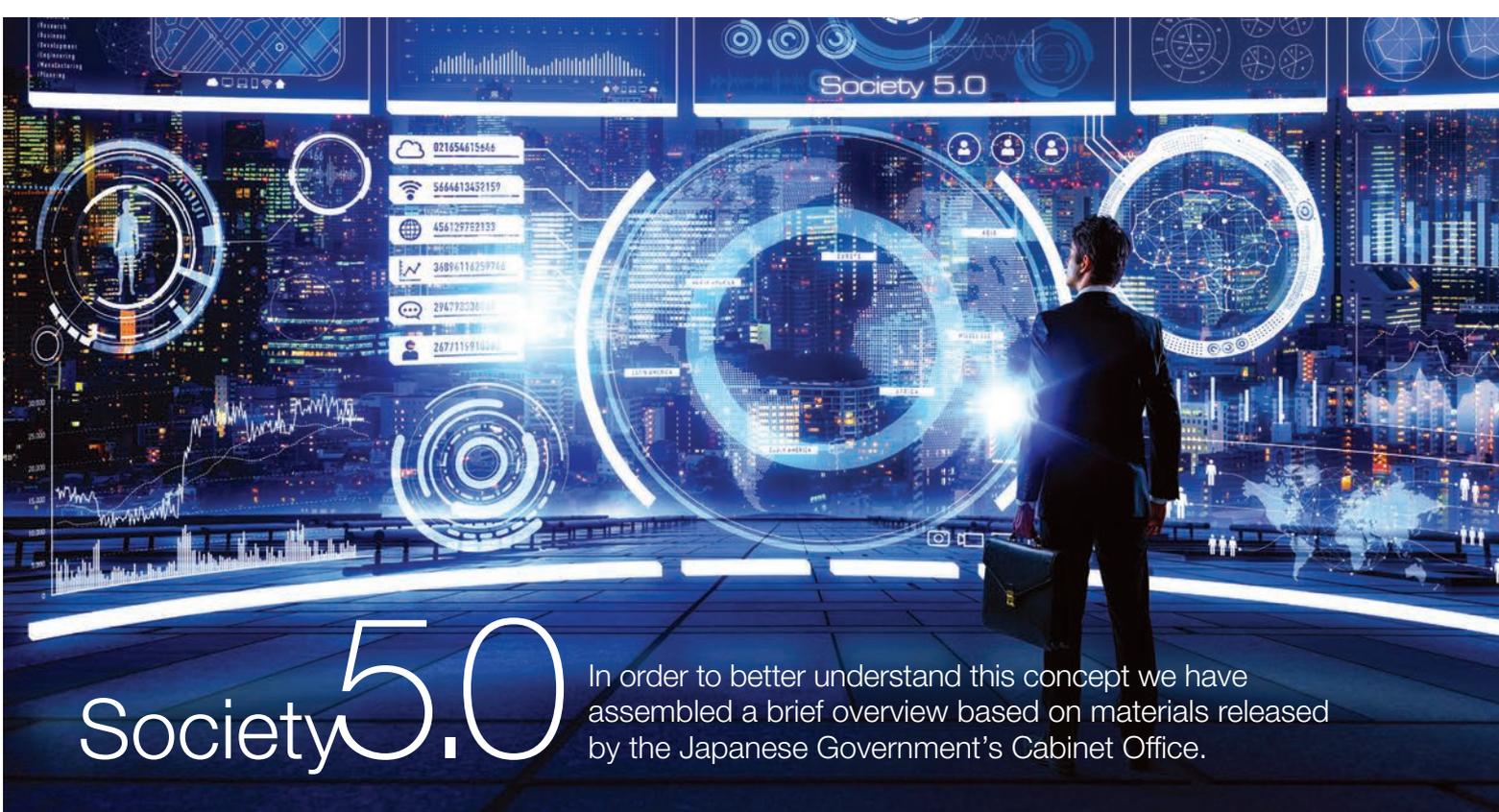
www.nexonrobotics.com



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ROBOTICS

powered by

 e-Factory



Society 5.0

In order to better understand this concept we have assembled a brief overview based on materials released by the Japanese Government's Cabinet Office.

Society 5.0 Balances Economic Development and Solves Social Issues

It can be said that the environment surrounding Japan and the world is in an era of drastic change. As the economy grows, life is becoming prosperous and convenient, the demand for energy and foodstuffs is increasing, lifespan is becoming longer, and the aging society is advancing. In addition, the globalization of the economy is progressing, international competition is becoming increasingly severe, and problems such as the concentration of wealth and regional inequality are growing. Social problems that must be solved in opposition (as a tradeoff) to such economic development have become increasingly complex. Here, a variety of

measures have become necessary such as the reduction of greenhouse gas (GHG) emissions, increased production and reduced loss of foodstuffs, mitigation of costs associated with the aging society, support of sustainable industrialization, redistribution of wealth, and correction of regional inequality, but achieving both economic development and solutions to social problems at the same time has proven to be difficult in the present social system.

In the face of such major changes in the world, new technologies such as IoT, robotics, AI, and big data, all of which can affect the course of a society, are continuing to progress. Japan seeks to make Society 5.0 a reality as a new society that incorporates these new technologies in all industries and social activities and achieves both economic development and solutions to social problems in parallel.

Society 5.0 Will Bring About a Human-centered Society

In society up to now, a priority has generally been placed on social, economic, and organizational systems with the result that gaps have arisen in products and services that individuals receive based on individual abilities and other reasons. In contrast, Society 5.0 achieves advanced convergence between cyberspace and physical space, enabling AI-based on big data and robots to perform or support as an agent the work and adjustments that humans have done up to now. This frees humans from everyday cumbersome work and tasks that they are not particularly good at, and through the creation of new value, it enables the provision of only those products and services that are needed to the people that need them at the time they are needed, thereby optimizing the entire social and organizational system. This is a society centered on each and every person and not a future controlled and monitored by AI and robots.

Achieving Society 5.0 with these attributes would enable not just Japan but the world as well to realize economic development while solving key social problems. ■

“ Society 5.0 represents the 5th form of society in our human history, chronologically following hunting, farming, industry, and information. The Fourth Industrial Revolution is creating new values and services one after another, bringing a richer life to all.

Cabinet Office Government of Japan ”



There are several sources of information from the business community to the Japanese Government. Watch the video here: www.gov-online.go.jp/cam/s5/eng/#motiongraphicsModal

News from around the world

JAPAN

Manufacturing showcase

IIFES exhibition

IIFES or Innovative Industry Fair for E x E Solutions is the new name of the biannual SCF exhibition, Tokyo, Japan.

This exhibition is the most important for Japanese factory automation, with all big players taking time to explain not only today's solutions but up and coming technology that will influence manufacturing long into the future.

Its influence spreads beyond Japan with many visitors coming visiting from China, Korea, Taiwan and surrounding areas. Again Mitsubishi Electric had one of the largest booths spanning well over 500sqm (which is the limit placed by the organizers on any exhibitor).

FR-E800 Inverters, MR-J5 Servos, MELIPC Industrial PCs and a whole range of TSN enabled devices demonstrated Mitsubishi Electric's technical leadership and flexible solution building approach.

Why not pencil in the dates of the next exhibition in 2021 now while it's fresh in your mind!

ISRAEL

Taking the story home

Leading technical editor visits Nagoya Works

Our doors are always open to requests from industry/ technical media wishing to learn more about what Mitsubishi Electric does and what its e-F@ctory concept answers the digital manufacturing, challenge. The latest visit was from Mr. Hanan Baron, a 20 year plus veteran journalist and editor of telecommunications and factory automation media in Israel. His tour of Nagoya Works revealed how Mitsubishi Electric uses the very same solutions it proposes to customers in the manufacture of our own factory automation products; as colleagues in the US might say we "walk the walk not just talk the talk".

SPAIN

New adverts!

Promoting e-F@ctory

The colleagues in Spain have been expanding their marketing activities with the creation of new advertising materials, social media campaigns and attendance at various exhibitions and fairs. All this comes after they have also built a new showroom/ training room.

For sure this is not an isolated activity and there are lots of hard work, investments and innovations being made globally. If you want to share your activities with us we will happily put your story here next time!



SOUTH KOREA

SMIC demo line

Spreading the e-F@ctory philosophy

Following on from the successful implementation of demo or model lines in several Asian countries as well as active participation in strategic international working groups in the US through the Industrial Internet Consortium and in Europe the Industry 4.0 WG1 and globally the 5G-ACIA initiative, we have now completed another strategic mile-stone. Our team in South Korea have completed the installation of a model line for the SMIC (Smart Manufacturing Innovation Center).



The SMIC model line is now 'open' You can find out more at www.demo-factory.kr/SMIC_ENG_index.php

GLOBAL

MECA starts to roll out

Education program

Mitsubishi Electric, through its various sales offices, has long been active with higher education facilities such as Universities and technical colleges. For example in Thailand there is a PLC competition that has been running for over 15 years and in China they are celebrating more than 13 years. However, to try to unite these activities and to build international bridges for the students we are now rolling out a common branding and process, called MECA, globally. The MECA name reflects the Motivation, Execution, Communication and Achievement that every participant goes through so is a rather appropriate title to remind us all the core value of the action.



The new MECA education program branding

GLOBAL PARTNER. LOCAL FRIEND.

Our stories

Customer voice

Have you seen our promotion of your successes? Over the past few months we have been developing our "Global Partner. Local Friend." message by sharing customer case studies from around the world – especially those stories where customers have a strong opinion about the value and support they have received from their interaction with Mitsubishi Electric and our local representatives.

If you have not seen these already, please visit mitsubishielectric.com/fa/cssty



Celebrating your successes all over the world – **if you have a story you want to share please contact us!**

Would you like to be featured in the next edition of monozukuri – The Art of Manufacturing? **Get in touch and share your success story.**

case study

The perfect pick!

Error-free manual workstations
for the automotive industry at
Martinshof Werkstatt

In spite of advancing digitalisation, the following still applies: Manual workstations are indispensable, because automation is not always profitable with small batch quantities or complex processes. Such workstations are preferred at the Martinshof Werkstatt Bremen, a sheltered workshop for a mixed workforce including people with handicaps, as they are ideally suited for integrating persons with physical or cognitive handicaps into working life. The Japanese Poka Yoke principle, which aims at the systematic elimination of human errors, coupled with Mitsubishi Electric's 'Guided Operator Solutions', ensures high quality for Martinshof's customers, which include well-known automakers in the region.

With some 2,200 employees, Werkstatt Bremen is one of city's largest employers as well as Germany's oldest and largest workshops for people with and without handicaps. Apart from job order and contract production in the fields of metal and woodworking, electrical assembly, filling, and packaging, Werkstatt Bremen employs 500 workers alone in the automotive business sector, and has been supplying local automakers for more than 30 years.

Handke Industrie-Technik, a long-standing supplier to Werkstatt Bremen of manual workstations, and a premium solution partner of Mitsubishi Electric, recognised the unique opportunity. Together with Mitsubishi Electric, Handke developed a Poka Yoke solution for adapted working. The prototype of the error-free workstation convinced the customer, and was installed in the production line. Since May of 2018, a total of four identical zero-error workstations are in use for automotive parts production.

Consistent operator guidance eliminates mistakes

In a three-shift system, large quantities of up to five different torsion bars (vehicle suspension components) are pre-assembled, transferred to a buffer store, and then delivered 'just in time' to the automakers assembly line. During assembly, small stabilisers, which are very similar but must not be mixed up, are bolted to the left and right hand sides of the torsion bar.

Process overview

Each of the new manual workstations consist of an aluminium profile frame fitted with hydraulic height adjustment for adapting to different ergonomic needs, plus illumination and workpiece holder. Delivered in pallet cages, the torsion bars are individually placed in the workpiece holder, where their barcode is scanned by an intelligent, WiFi-linked torque wrench. Subsequently, the holder is locked.

In the next step, a parts bin is opened, which contains the components for the right hand side. A physical access barrier to the parts bin is provided by means of an intelligent door flap mechanism. Simultaneously, an illuminated push button on the bin prompts the operator to remove one of the parts and acknowledge this by pressing the button (pick to light).



*The Poka Yoke success story
on YouTube*

case study



Thanks to the Poka Yoke controller, existing technology, like a digital torque wrench in this case, can easily be integrated into the error-free process with instructions fed to the operator via the GOT HMI.



Subsequently, the removed part is held in front of a camera to verify it again. In this way, possible labelling errors by the supplier are reliably detected, thereby preventing assembly errors. After release by the camera, the part can be installed.

An additional check is then carried out by inserting a sensor. Only if this check is OK, will the torque wrench be enabled, so that the bolted joint can be tightened to exactly 100 Nm. Every individual step must be carried out, and the tightening torque must be correct, before the second parts bin is opened, and the process can be repeated for the left hand side. When the entire procedure has been completed successfully, the holder releases the finished workpiece for transfer to the buffer store.

Integrating on-site technology and visualisation

"The main challenge of this project involved the integration of existing technology into the new error-free workstations. However, thanks to the interfacing features of our Poka Yoke controller, this was not a problem", says Nils Knepper, Senior Product Manager Modular PLC/ Software at Mitsubishi Electric Germany. The MELSEC iQ-F series PLC, installed on-site in a small control cabinet, is the intelligent, individually configurable and expandable heart of the solution that controls the picking and assembly sequences. Apart from Mitsubishi's own components, the system can also handle third-party sensors and actuators. In this case this included the digital torque wrench and a system for industrial image processing. The connection of a barcode printer is being implemented, and thanks to existing conventional interfaces, this can be done easily by the PLC.

"During the design of the user interface, Mitsubishi was highly flexible, and took all our requirements into account. Because many of our employees cannot read very well, we make use of smileys and other symbols", explains Miriam Berger. "In addition to process reliability, the Poka Yoke workstations have the great advantage for us, unlike the past situation, as practically any employee can now do the job." The supporting visualisation mentioned uses a 10-inch touchscreen terminal connected in the background to the Poka Yoke controller.

The hardware and software solution from Handke and Mitsubishi Electric deliver simple scalability, convenient configuration, programming and commissioning as well as comprehensive connection possibilities (including MES and ERP). And as soon as freedom from errors is achieved, and the technical potential is available, Werkstatt Bremen will investigate whether the buffer store can be dispensed with in the future, so that after assembly is completed the parts can be directly shipped 'in time' to the automaker.

Wide range of components for individualisation

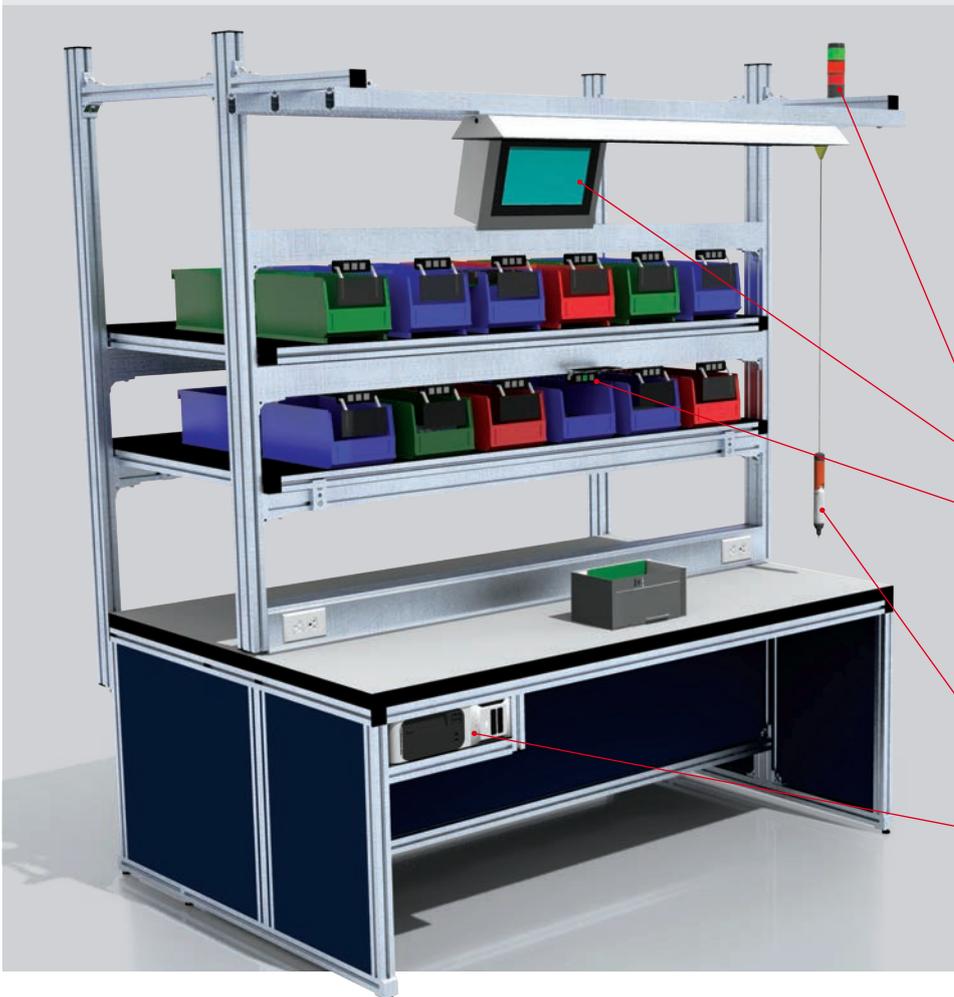
"The need to prevent errors exists everywhere during production and assembly. What is most important is the quick and flexible adaptation to the needs of the persons working there, and to the requirements of the process", remarks Andreas Kebbel, Managing Director of Handke Industrie-Technik.

That is why Mitsubishi Electric and Handke offer their solution in the form of a modular system with a wide range of components and interfaces for operator guidance. Amongst others, these include mechanisms to ensure the correct picking of parts, e.g. light barriers, pick-to-light push buttons (alternatively: pick-to-voice), barcode scanners, and proprietary pick-to-door devices with stroke switches. Moreover, there are monitoring devices such as electric screwdrivers with torque & angle detection, plus vision systems as well as

opportunities for robot integration. HMIs (Human Machine Interfaces) from Mitsubishi Electric's GOT2000 series are used for displaying the individual process steps, offering direct connectivity to the Poka Yoke controller, and meeting every display requirement from text through graphical symbols up to animations and augmented reality. Depending on requirements, the latest generation iQ-R or iQ-F PLCs can be used as controllers for the guided manufacturing solutions. Mitsubishi Electric's Guided Operator Solutions can be integrated in to production systems, so that workstations can be networked and resources controlled and monitored in realtime.

"Werkstatt Bremen is a full-fledged supplier to industry, able to ensure zero errors and meet schedules, and so the new workstations are a tremendous help", confirms Miriam Berger. News about the positive results in Bremen spread quickly. According to Andreas Kebbel, inquiries have come in country-wide from other mixed employee workshops. ■

What is Poka Yoke?



Also known as Guided Operator Solutions, Mitsubishi Electric's integrated manual picking system is based on the principles of Poka Yoke, a Japanese term that means 'mistake prevention'. Poka Yoke is a method of eliminating mistakes in a manufacturing or logistics operation at source before they can occur and can comprise of various component options.

Indicator light.

GOT2000 for easy visualization and diagnostics.

Terminals with opening/closing doors provide a physical barrier to selecting the wrong part, a highly effective method to eliminate mistakes. Additionally some devices are fitted with a display to identify how many pieces should be picked from any bin, again increasing operator effectiveness.

Support for electrical screwdrivers as well as additional tools such as barcode readers or vision systems that enhance quality control.

Programmable sequencer.

Early detection gives you time to plan and act

A machine running at optimum efficiency can be a thing of beauty but unplanned downtime due to catastrophic failure can destroy all the good work you've done to boost your productivity. However, if you look for the warning signs, you can give yourself much more time to plan and act, long before it all goes wrong.

If the machine has already stopped, you're already in the worst case scenario. Perhaps minutes before, you'll have noticed smoke, but by then you'll still only have minutes left before catastrophic failure. A day before, though, you might have noticed increased heat being generated by the key component, heralding imminent failure.

In the preceding week, you might have noticed increased noise, another precursor of component failure. That week might have given you the time you needed to investigate the problem and address it before it resulted in unplanned downtime.

But we can look further back in time at the initial change in condition; most often this will be characterised by an increase in vibration. Detect the problem at this point, and you can have a month or so pre-warning of failure – plenty of time to plan and act, to fix the problem when it best fits your own schedule and eliminating costly unplanned downtime completely.

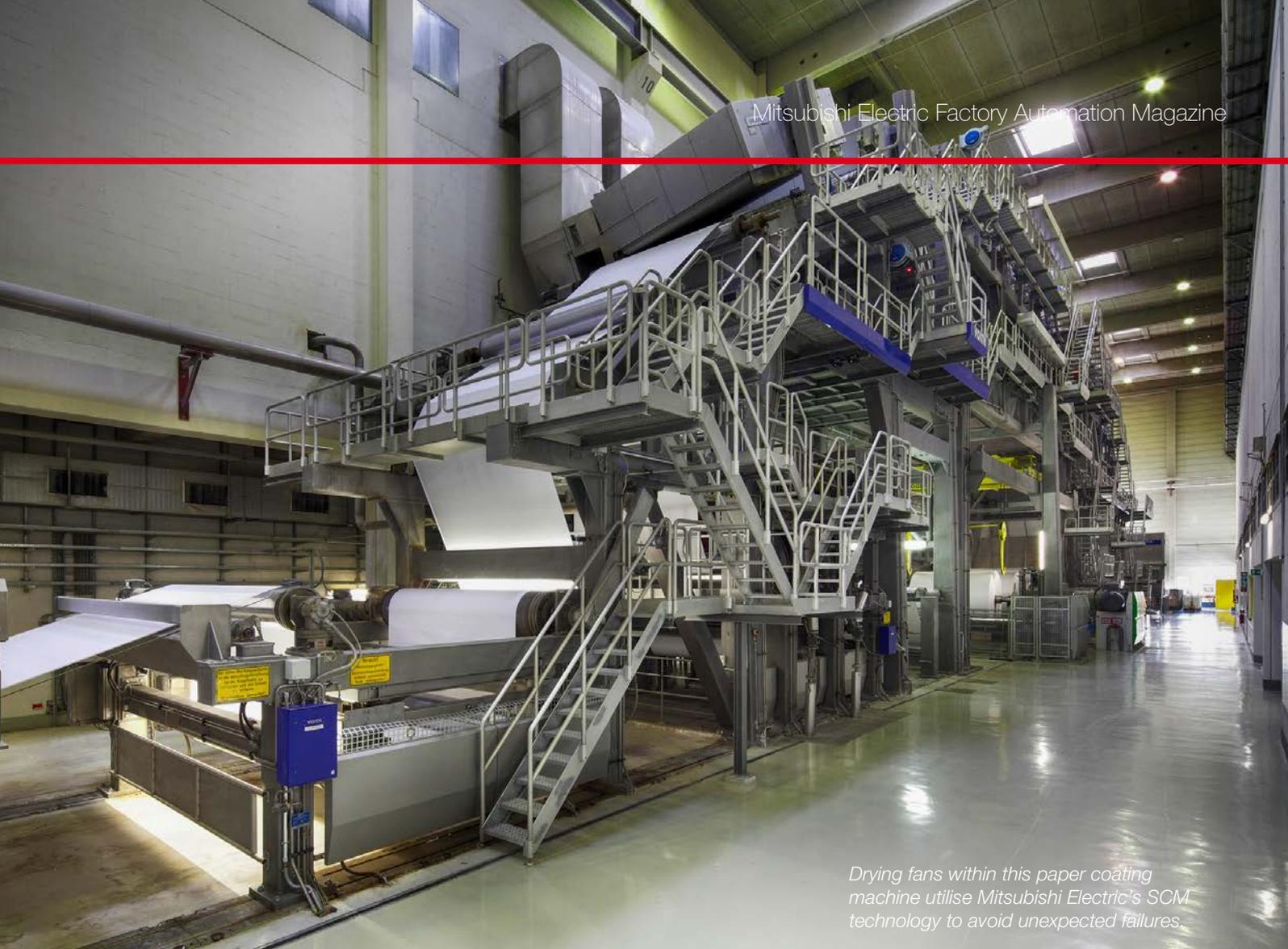
Working with Schaeffler, Mitsubishi Electric has made this early detection possible through Smart Condition Monitoring (SCM) technology. SCM combines manufacturing data and environmental data with real-time machine process and condition monitoring data (vibration, temperature, pressure, voltage, current, etc).

The SCM kit provides a plug-and-play solution for machine condition monitoring. Sensors can be added to machines as and when required, with a simple teach function allowing the sensor and controller to learn the normal operating state of the machine, generating a memory map of key parameters. Once set up, SCM provides 24/7 monitoring of each asset.

SCM offers... vastly improved predictive maintenance and optimised asset lifecycle management

Widely applicable across a host of different industries, and readily scalable, the intelligent solution builds on the capabilities of add-on SmartCheck sensors from Schaeffler, and integrates these with Mitsubishi Electric PLCs for a more holistic approach to condition monitoring. The SCM solution complements 'traffic light' alerts with detailed diagnostics, in-depth analysis and recommended actions to minimise unscheduled downtime and maximise asset availability.

Linking multiple sensors into the control system enables the controller to analyse patterns of operation that are outside the norm, with a series of alarm conditions that can provide alerts that attention is needed. SCM analysis provides detailed diagnostics, offers suggestions for where additional measurements should be taken, and provides maintenance staff more precise error identification and even recommendations as to what rectification actions should be taken, with



Drying fans within this paper coating machine utilise Mitsubishi Electric's SCM technology to avoid unexpected failures.

clear text messages presented to personnel. Further, this information can be networked to higher-level systems for ongoing trend analysis across all of the assets around the plant.

Mitsubishi Electric can point to a number of applications where the technology is already helping to eliminate unplanned downtime. A four-storey high paper coating machine has held a world speed record since 2007, coating around 300 tons of thermal paper every day at a speed of some 1730 metres per minute. Twenty-six fan units ensure contactless drying of the coated paper. Since 2014, a Mitsubishi Electric SCM based on a MELSEC L-series PLC and using FAG SmartCheck sensors has been monitoring vibration on the fans.

The system proved its worth almost from day one, detecting a high imbalance combined with damage to an outer ring bearing, and enabling the problem to be resolved in good time during scheduled maintenance.

At another application in a sewage treatment plant in Germany, SCM technology has been applied in the sludge recirculation pumping station. By monitoring vibration, the company was able to obtain early warnings on any deviations from normal values which could lead to damage of the machine. The exact cause could be determined depending on the type of deviation, and the problem could be quickly targeted and corrected, avoiding a costly and time consuming breakdown. Four months after installation, a gearwheel defect was detected, and the problem rectified during scheduled maintenance.

Thus SCM offers comprehensive analysis on the health of individual machines as well as a holistic overview on the health of the wider plant. The result is vastly improved predictive maintenance and optimised asset lifecycle management. With maintenance able to be planned in advance, there is far less unplanned downtime and significant reductions in short notice loss of service. ■



Delivering 300 tonnes of paper each day, unplanned downtime represents a considerable risk to this manufacturer.

launch pad

Mitsubishi Electric is not only a designer and manufacturer of advanced automation products but is also a key user of them as well! That means we take great care that they are both robust, flexible and easy to design into any automation system that may present itself because we also want to use the best solutions possible.



FR-E800

A general purpose inverter for the digital era

The FR-E800 series inverters are the latest in a long line of advanced, general purpose, compact frequency inverters. But don't be misled not only are they ready to support your digital manufacturing needs but they also pack in safety and lots of other great technology to improve the total cost of ownership.

Key Features

- To help realize digital manufacturing, support for TSN is already available via CC-Link IE TSN, a next-generation open industrial network, in addition to support for various other standard factory networks.
- For users who need safety on their machines and processes, the FR-E800 has safety functionality meeting IEC61508 standards.
- In a world's first, a newly designed corrosion sensor by Mitsubishi Electric is mounted directly on the circuit boards offering early warning of any damaging effects from the atmosphere.
- For enhanced operation and preventative smart diagnostics, AI functions have been employed for the first time in the companion software.

With over 120 models planned the phased roll out of the different units/capabilities will commence from April 2020.

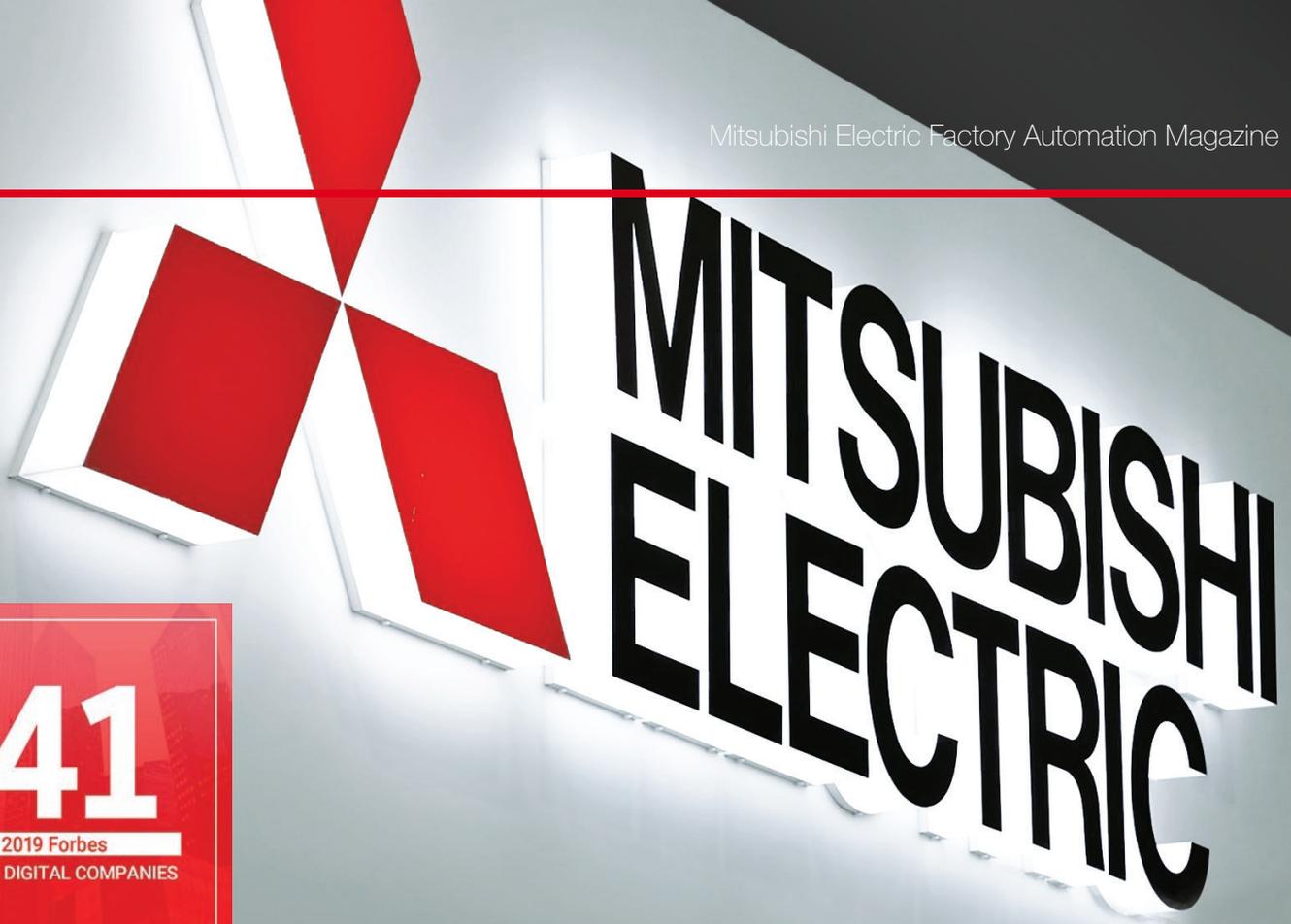
Iconics join the family

Corporate Acquisitions

ICONICS, the global automation software provider and six-time winner of the Microsoft Partner of the Year award, now officially become a Group Company of Mitsubishi Electric Corporation. Their experience and success in a wide range of industries as well as their advanced software solutions spanning SCADA, IoT, Mobile, analytics and cloud applications will all be utilized to enrich the e-F@ctory digital manufacturing concept as it continues to evolve.

First launched by Mitsubishi Electric almost 17 years ago in 2003 e-F@ctory's Kaizen approach enables it to stay relevant and indeed ahead of many other strategies to achieve digital manufacturing and with the contribution from ICONICS it will continue that tradition.





Mitsubishi Electric ranked #41 in 2020 Forbes Digital Top 100

Mitsubishi Electric has been recognized as being among the world's most influential corporations with a listing in the new Forbes Top 100 Digital companies list.

To produce the list, Forbes ranked the world's tech, media, retail and communications companies operating within the digital space, according to strict criteria. Mitsubishi Electric came in at #41, being included alongside many of the world's best known and best loved corporations.

The new Digital Top 100 list is timely, coming as it does amid rapid digital advances which continue to help transform the global economy, most notably in retailing, media, travel and payments.

Based on a global list of the world's largest publicly traded companies, the process of creating the new list was all-encompassing. Forbes began by identifying the digital companies which had made the 2019 edition of its Global 2000 – its list of the world's largest publicly traded companies, compiled every year for the past 17 years. Then it took into account the most recent sales, profits and asset figures as well as market capitalizations as of September 27, 2019.

As with Global 2000, the Digital Top 100 companies were scored according to all four of these metrics, with composite scores being ranked. The higher the composite score, the higher the ranking.

Not surprisingly, the Digital Top 100 results were broadly in line with a recent survey of the world's most digital countries by IMD World Competitiveness Ranking in which USA gained the No.1 spot. Also, unsurprisingly, China, with the world's largest number of mobile phone and internet users and a huge consumer market, made a quantum leap – from No.30 to No.22.

While humbling for Mitsubishi Electric, the Digital Top 100 ranking is also an accurate reflection of its role as a leading global manufacturer of electrical and electronic products and systems – and a reminder of the continuing impact of its breakthrough technology right around the world.

You can view the full list here: www.forbes.com/top-digital-companies/list/#tab:rank_header:industry

Taste_{of} Japan

The all-encompassing Mitsubishi Electric family includes those who know quite a bit about Japan and those whose knowledge is possibly limited to geisha, samurai and Mount Fuji. So here, for the education and enjoyment of all, are some examples of the culture and art of Japan.



Support that's woven into the country's fabric

Almost everywhere in Japan you will notice particular textured yellow lines on the ground. These lines, composed of a hard, rubber material and incorporating dots or lines, are known as 'tactile ground surface indicators' and have been designed and installed to make life easier for blind people when they are out and about, walking the streets, encountering intersections, crossing roads, climbing stairs and accessing public transport. This is all part of a broad and ongoing social commitment to ensuring that every public place in the country is accessible to everyone, including those with impaired vision or reduced mobility.



Embracing the future

When a Japanese hotel chain recently installed humanoid robot concierges, it fuelled a wider debate about the increasing integration of robotics into the fabric of everyday living. But why is it that generally speaking, people in Japan are more relaxed about the growing social role of artificial intelligence than many in the West?

Rather than feeling threatened by artificial intelligence, in Japan there is more of a sense of 'extended intelligence' – whereby robots may actually help people develop the ability to dialogue with all things around them.



A unique service culture

When people describe Japan as 'the world's most polite country', they are almost always referring to the nation's unique spirit of welcoming and service; a concept summed up in the word *omotenashi*, translated literally as 'the art of hospitality'.

This is something which lies at the very core of Japanese culture and which is evidenced in the minutia of everyday living through consistent, small acts of kindness. People suffering from colds

wearing masks to avoid infecting others, neighbours delivering gift-wrapped boxes of washing powder before their dust-raising building work begins and cleaners bowing to an arriving bullet train.

When someone is kind to you, you are kind back, and when someone is rude to you, you are still kind back. It's a simple philosophy that helps embed, sustain and nurture the spirit of *omotenashi*.

Did you know?

Mitsubishi Electric has just released its new range of FR-E800 series inverters. As you probably know inverters are ideal for controlling motors in applications ranging from fans, pumps and hoists to winding and conveying. But underpinning it all is our reputation for very high quality, but what does that mean in reality?

1000V is an average lightning surge. 
We test **5500V**

 Accumulatively we have sold over
27,000,000 inverters

14G is not a superfast network 
but the **IMPACT** force we test

 **WE TEST 100%** of the inverters during the manufacturing stages

When we make the high temperature test the inverter casing

MELTS 

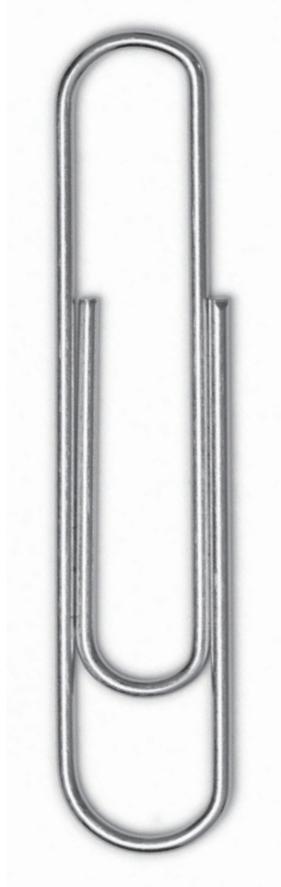
but the inverter keeps working without catching fire

Starting in 1981, we have over **38 years** 
experience, designing, producing and selling inverters

2017: Failure rate 
0.01% (100ppm)
AND DROPPING

For full details visit
www.mitsubishielectric.com

Simplicity by design



Some of the best designs in life are taken for granted because they do their job efficiently and without any fuss. The same is true when you use an A800 series inverter from Mitsubishi Electric. Its advanced design offers class-leading power management and motor control delivering eco-friendly energy savings. In addition, thoughtful solutions for energy recovery as well as diagnostic functions for preventative maintenance, integrated safety and acclaimed quality are just a few of the many benefits of this powerful inverter series. Whether you need an independent, standalone solution or one tightly integrated into your system, perhaps the answer is simpler than you think.

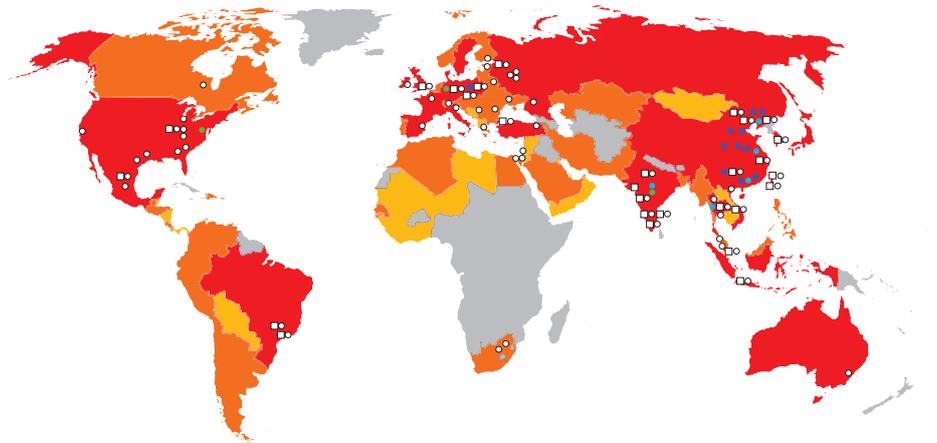


FREQROL-A800



[www.mitsubishielectric.com/fa/products/
drv/inv/pmerit/fr_a/fr_a800](http://www.mitsubishielectric.com/fa/products/drv/inv/pmerit/fr_a/fr_a800)

Global Partner. Local Friend.



- Sales office
- FA center
- FA center satellite
- Production center
- R&D center

Note: This is a map of our global sales and support coverage. It does not reflect any national borders.

- A region where there are direct Mitsubishi Electric FA offices (main/local and satellite).
- A region covered by primary sales partners (distributors) who have local sales offices.
- A region covered by our extended sales network which may or may not have local offices.

www.mitsubishielectric.com/fa