OMRON

Summer 2006

technology&trends magazine

Sensing ingredients for a perfect pizza!

Never stop...

Trajexia in packaging industry

Omron's fully integrated platform packs 50,000 bottles per hour!

More on page 24

Junma "tuning-less" servo...

New standard in compactness and simplicity

More on page 22

Never fail...

Preventive maintenance...

Key to increasing machine availability
Program-less and just in minutes...

More on page 10

RENO-TEC goes for safety network

Never fail... DeviceNet safety

More on page 8

Just create...

Papelera Brandia relies on CX-One

CX-One software keeps paper mill rolling at a paper factory in Spain

More on page 16

"Lean Thinking"

Keeps European manufacturing competitive

More on page 26

Faouzi Grebici
European Marketing Manager

Sensing tomorrow with "never fail" today...

Sensing tomorrow is Omron's motto that outlines our vision in sensing technology in industrial automation. The domination of Omron in compact photoelectric sensors has been established through relentless innovation in optical miniaturization.

The popular E3Z series is the first sensor ever to have integrated ASIC optics and electronics and is available for over a decade now. As a result the E3Z is the most reliable and rugged sensor in the market place.

However, Omron's "Never fail" concept looks beyond device reliability. The whole chain of machine control and management should be able to diagnose a potential malfunction and alert the operator while production continues.

In this issue we will share with you the benefit of sensor robustness for your processes and give you an insight on how to incorporate preventive maintenance in your production using the Smart Platform concept without prohibitive cost and of course in... minutes. ■

Content

Main topics

News & Trends

Product News

Information

Roberto Maietti
President & CEO
of Omron Europe

European CEO for Omron Europe

The appointment of Roberto Maietti as President & CEO of Omron Europe – the first-ever European in this position – reflects the importance that Omron Corporation is placing on moving even closer to its European customer base.

It represents a major opportunity for the region to voice local customer interests, raise understanding of their needs, and influence corporate strategy from a European perspective. "That means not only taking the strategic view from Japan and localizing it for Europe," Maietti said, "but also bringing a European perspective to corporate strategy."

The result, he feels, will be that customers will get more attention. "Omron is extremely keen to increase its understanding of the real needs of customers, and what is behind those needs. This is a marvellous opportunity for me to continue what I started within my sales role – to deliver on the promise that next to our innovations, which help customers to differentiate – we are committed to making our solutions easier to install and use, which raises customer efficiency and speeds their time to market." ■

"COMMUNICATION COOPERATION COMMITMENT"

About Roberto Maietti

Mr. Maietti is 50 years old, married, has two children and lives in Milan. He studied Electronic Engineering at "Politecnico di Milano". After his studies he gained some experience in sales and worked as a design engineer before starting his career at Omron. Next to his new job at Omron, he is also president of Assoautomazione - the Italian Industrial Automation Association member of ANIE.

Career & Milestones

April 2006	President & CEO of Omron Europe B.V.
2004-2006	European Sales Director Omron Europe B.V.
2000-2003	Sensor Business Unit Manager Omron Europe Stuttgart
2001	Omron Electronic Italy was recognized by "The Great Place To Work Institute Inc." for the excellent working climate within the company
1999	General Manager Omron Electronics Italy
1995-1998	Deputy General Manager Omron Electronics Italy
1994	Commercial Manager Omron Electronics Italy
1991-1993	Marketing Manager for Omron Electronics Italy
1987-1990	Product Manager FA products for Omron Electronics Italy
1984-1986	Started as system Engineer Gavazzi Group

Interesting to know – Omron Italy

Omron Electronics Italy has been serving the Italian market for over 30 years, has 3 regional offices with over 200 employees and an entrusted network with 160 distributors. In 2005/2006 Omron Electronics Italy achieved a turnover of 141 Million Euros.

...is a famous phrase coined by Elvis Presley but probably he was unaware that Omron's photoelectric sensor family E3Z is just the sensor to ensure non-stop production of continuously high-quality pizza from growing the ingredients right up to when a frozen pizza Hawaii is purchased in the supermarket.

A pizza without tomato is not a real pizza, so to start with, the tomatoes have to be grown and harvested. Today, many vegetables are grown in fully automated greenhouses where plants grow on trays and are transported along automated conveying systems for harvesting. In the horticulture area, the total production facilities and logistics are completely integrated at a high level of industrial automation.

The greenhouses are built to allow maximum sunlight to reach the plants. But this positive aspect for plants can be a major cause of optical sensor malfunctions, creating interruptions of the automated conveying operations. In sunlight, basically all wavelengths of visible, IR and UV light are present, and the only real protection for photoelectric sensors is by mechanically blocking sunlight.

"...The E3Z family is designed to reduce the influence of sunlight..."

The E3Z family is designed to reduce the influence of sunlight to a minimal angle directly from the front. In addition, for maximum immunity against artificial light, the E3Z uses Omron's unique pulse synchronization method. In combination with the robust and watertight housing, the E3Z ensures non-stop conveying operations in automated greenhouses.

But not only vegetables are grown in greenhouses. A majority of flowers and plants are also grown there. So, while in the greenhouse, let's also pick up some flowers for our dinner for two. Pizza in company tastes better anyway.

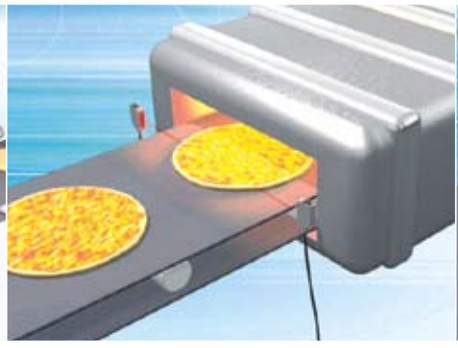
Other ingredients for Pizza Hawaii are cooked ham and, of course, cheese. To satisfy the demand of millions of today's consumers for fresh, high-quality meat and dairy products, the production processes are highly automated. In addition to the logistical challenges of processing, packaging and delivering high quantities of perishable goods in a short time, which requires maximum machine availability, there are basically two requirements these machines have to fulfil.

Gunnar Bischoff

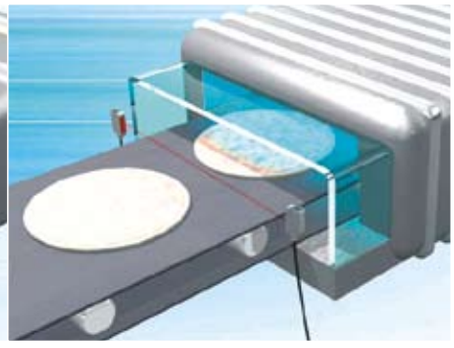
Product Marketing Manager at the Sensor Business Unit Omron Europe

"Bring Pizza Hawaii till I say stop..."

Positioning



Pre-baking



Freezing

No Tomatoes... No Pizza!

Tomatoes are key ingredients for making pizza. Which is why growers must 'get things right the first time'. And the job entails more than just using E3Z sensors in greenhouses. There's a whole series of logistical operations to consider. At every stage, Omron is there to help.

Next to our E3Z sensors, a lot of other Omron products support logistic solutions in greenhouses, such as: CJ1 PLC's with Compobus/S remote I/O and NS-terminals, J7, V7 and sometimes F7 inverters, power supplies, E2A proximity sensors, safety products and switch gear.

WPS Horti Systems & HAWE Systems Europe B.V. are good examples of valued Omron customers that use these products.

WPS HORTI SYSTEMS

WPS Horti Systems supplies high-grade logistic solutions for greenhouses. The "Walking Plant System" is used for the efficient production of potted plants. The Plant Order System is the family name for client-specific solutions in the order-picking process.

HAWE Systems Europe B.V.

HAWE Systems Europe B.V. develops, produces and delivers integrated logistic systems for international greenhouses.
HAWE delivers to greenhouses in need of a made-to-measure, automated, internal logistic system, or part of it. The most frequently used internal logistic systems and transport systems are roll-container systems, moving-gutter systems, delivery systems and control/management software. ■

Sensor recipe for a Never-fail pizza:

- Maximum immunity against artificial light and sunlight
- Metal body meeting extreme cleaning conditions
- Resistance against peak heat shocks
- Anti-fogging lenses
- Excellent optical performance under extreme conditions

Learn more about our E3Z sensors: www.omron-industrial.com/food

Maximum hygiene has to be ensured during the operation of the machines to avoid contamination of the food through bacteria, microbes or foreign bodies. The machines are designed according to hygienic guidelines that require, e.g. smooth surfaces, minimal gaps and indents, and easy access to all machine areas for complete cleaning. Areas where water or dirt can collect should be avoided.

The cleaning cycles between production processes involve aggressive detergents and high temperatures to kill and remove potential bacteria and microbes. In addition, high-pressure water is used to remove all food remains. These cleaning measures are very severe on the materials. Mechanical and temperature stress and aggressive chemicals reduce the lifetime of machines using ordinary materials drastically and therefore most machines use high-grade stainless-steel and highperformance plastics.

Omron's E3ZM metal-housing photoelectric sensors provide the same sensing performance as the E3Z series and fulfill both the requirements of hygienic design and maximum lifetime. The tested high detergent and water resistance (Ecolab and IP69k certified) of the smooth SUS 316L housing makes it last more than 20-times longer than standard metal-housing sensors.

When all ingredients are on the dough, the pizzas enter a pre-baking process followed by shock frosting before they are packaged and stored for delivery. These areas with high temperature changes between operation and, e.g. cleaning periods, can lead to condensation influencing the optical performance of the photoelectric sensors. Omron's optional anti-fogging lenses for photoelectric sensors prevent condensation and ensure 100% machine availability after power-up or cleaning procedures.

Today, the E3Z ensures that not only Elvis could demand a non-stop pizza supply.
The only place where the E3Z stops a pizza is in your local supermarket when you place it on the conveyor at the checkout. ■

New anti-microbial sensor

News for food processing&packaging

Creating added value for sensors that are used in food and packaging is the aim of a continuous cooperation between Omron and its specialized partners. The innovative use of anti-microbial material in food applications can extend the necessary cleaning cycles and improve the availability of production remarkably.
More about Omron's deep cooperation with Lumberg and ENSINGER leading to the new E2F-D proximity sensor will follow in our next issue of Technology & Trends. ■

If you cannot wait until the next magazine, please contact us for more information.

E2F-D Anti-microbial Inductive Sensor

- Special housing material actively reducing the number of microbes and bacteria on the sensor.
- Reduces the risk of food contamination through bacteria between cleaning cycles.

OMRONnews

Omron acquires STI safety group

Omron Corporation and Scientific Technologies Incorporated (STI) have reached a definitive agreement whereby Omron will acquire STI's safety products group. Omron, which already leads the Japanese safety devices market, will capture a key position in North America and become a major global player in safety solutions as a result of this acquisition. STI's portfolio of safety light curtains, laser scanners and other safety devices, and consultancy services will further enhance Omron's line-up of products, and accelerate the development of new products. European safety activities, located close to Stuttgart, benefit from this strong global safety network and contribute through local production, marketing and engineering of safety devices and solutions. ■

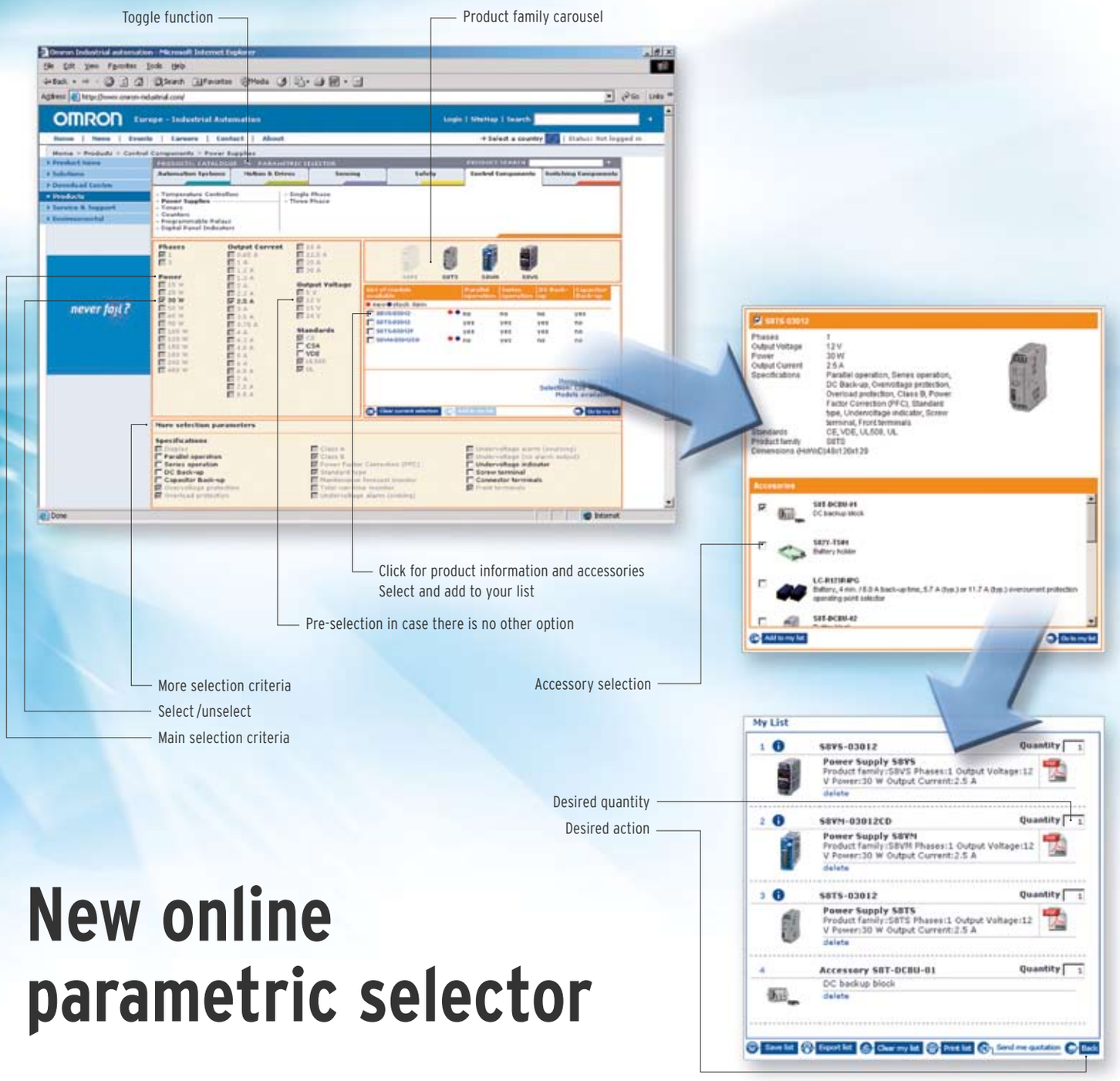
RENO-TEC goes for safety network

Frank Bauder
Product Marketing Manager at the Sensor Business Unit Omron Europe

RENO-TEC is a family business based in Troisdorf, Germany. Its prime area of expertise is combining classic machine building with modern innovation, thus allowing its customers a base to compete in a highly competitive industry. After five successful years in the repairing, renovating and building of plastics conversion machines, RENO-TEC presents its first machine for high-quality, self-adhesive document bags, the RENObag GS 850.6 Servo.

The new RENObag GS 850.6 Servo has been designed with future-proof technology in mind using Omron's DeviceNet safety-based controller, NE1A, and remote I/O, DST1-ID. These both support demands from the builders of new-generation machines for the highest availability and the flexibility to expand to meet future requirements.

"In highly complex machinery like our RENObag 850.6, the availability of a machine and the ease with which it can be expanded in the future are big issues for our customers," says Edmund Mundorf, Managing Director RENO-TEC. "The Safety Network Controller is programmable and therefore no additional wiring to the cabinet is necessary in case we decide to expand the system. Moreover, the decentralized I/O concept enabled us to radically reduce the safety-related hardware. An additional benefit of using a hybrid network system is that diagnosis for standard and safety functionality is now fully integrated in the machine control system. The preventive maintenance function and the advanced monitoring of the safety system makes our machine highly reliable and reduces start-up time remarkably." ■



New online parametric selector

You select!

Seconds to find. With the built-in intelligence you are able to very quickly find the product of your choice. As you proceed, the selector automatically disables impossible options and enables those options that are valid for all remaining products (pre-selection).

You will invariably end up with exactly one product when you have finished your selection. At any point you are able to add products to “My list”. From there you can export and print your list or ask for a quotation. You select at http://www.omron-industrial.com ■

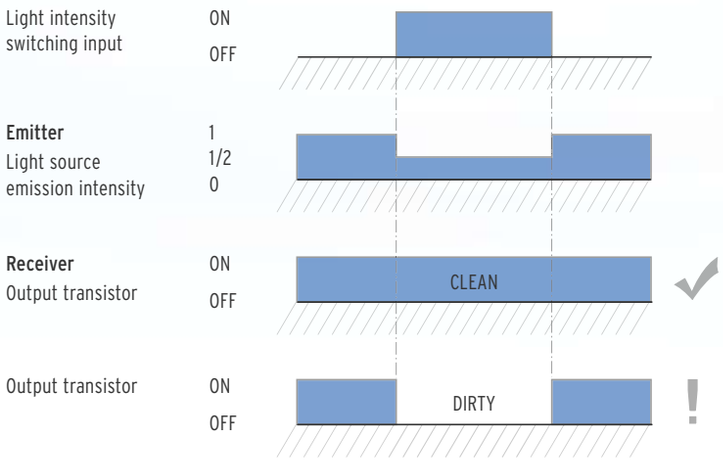
www.omron-industrial.com

I need cleaning soon...

It is a busy weekday, schedules are tight and you are operating above your normal capacity. Suddenly an alarm goes off on the flow wrapper at production cell number 4. Production stop is the last thing you want now. You hurry there and find your maintenance manager and supervisor trying to decipher the red blinking message on the HMI display "Error 401 – input 0311.01 not responding". "Yeah" says the supervisor "the maintenance module on this machine costs 10% more and takes 3 weeks of programming... we skipped it."

Unfortunately this is a common scenario in a number of plants. The drive for reducing manufacturing costs and the pressure to meet delivery schedules is stretching equipment and workers to their limit. Key to increasing machine availability is to incorporate preventive maintenance in your production process from the start. Omron's approach is to embed it in every control layer. We are going to describe the mechanism of how a sensor alarm input is translated into a meaningful message on a display terminal... in minutes.

Function test with E3Z-G2 light-intensity switching



Active prevention starts at sensor level

The E3Z compact photoelectric sensor has 2 distinctive "dirty lens" alarms:

- Passive dirty lens alarm: as soon as the emitter-receiver signal has dropped below a critical threshold, the sensor sets an alarm output.
- Proactive dirty lens alarm: unique to E3Z, this function is called upon at start-up or product change-over. Though the E3Z works well with full emitter light intensity, it is tested at a 50% reduction of emitter light emission. In case of severe contamination, detection fails.

For more information visit: www.omron-industrial.com/food
www.SmartSlice.info

Program-less preventive maintenance in... minutes

I/O level

Omron's SmartSlice family goes beyond just performing simple I/O tasks. They incorporate the following:

- Built-in routines to diagnose any mal-function within the field devices. It estimates the operation time of the sensor and checks it against a threshold.
- Built with Omron's Smart Platform it allows seamless integration with all CIP*-based networks and Profibus DPV1.

Transparent architecture at control level

Real preventive maintenance is a non-critical task that runs seamlessly in the background of machine control and management tasks. In this the field sensors/actuators have to "raise their hands" in case of any abnormalities. A proven and tested library of preventive maintenance function blocks can also be used.

*CIP stands for Common Industrial Protocol and is the protocol used in CompoNet, DeviceNet and EtherNet/IP.

At HMI level

Instead of spending hours building screens and building I/O tables, Omron offers a library of communication-ready objects that can be simply dragged and dropped into the HMI builder, NS designer. These are called Smart Active Parts (SAP's).

Once compiled and downloaded into the HMI, automatic communication is established directly from the HMI to the field device with no PLC programming needed.

Conclusion

Preventive maintenance can be built into your machine without heavy programming effort. Building smart maintenance features down to the sensor/actuator level and ensuring a transparent architecture coupled with intuitive and easy build-up of HMI screens makes preventive maintenance affordable, easy and effective. Abstract messages such as "Error 401 – input 0311.01 not responding" turn into "Sensor_1 in flow wrapper_cell4 needs cleaning within the next maintenance cycle". ■

Example of a Smart Active Part for E3Z maintenance

expertarea

Ask the expert

Heinrich Hoh

Product Engineer at Sensor Business Unit Omron Europe

René Heijma

Product Engineer at Control Business Unit Omron Europe

What is the difference between alarm output and light emission reduction?

HH: The E3Z alarm output indicates if the signal is exceeding a critical threshold. This alert points out sensor instability. The light emission reduction is able to detect dropping sensor-power even earlier. Triggered by a PLC signal it reduces the intensity of transmitted light to 50%, and if the sensor signal is unstable it indicates the lenses need cleaning. Even though the sensor is likely to function perfectly with 100% transmitted intensity, it can be cleaned at the next scheduled machine-stop to prevent malfunction.

Is the E3Z-family the only sensor family with preventive maintenance functionality?

HH: The E3Z is the first photo-sensor with this feature. However, the next generation miniature sensors E3T will also include smart preventive functions.

How can SmartSlice help predict failure in an actuator?

RH: SmartSlice can monitor the time between one input turning OFF and another turning ON. This is the time it takes for an actuator to complete a cycle. Let's say it takes 600 ms for a pneumatic actuator to complete a cycle. Due to wear and contamination the actuator starts to move slower, so instead of 600 ms it now takes 700 ms. This is almost 20% slower than it was initially. If the SmartSlice is programmed to send an alarm when the time exceeds let's say 650 ms, then the operator is aware that this particular actuator needs attention at the next production stop. Also each unit remembers its last maintenance date; so maintenance personnel can check when a single unit has been replaced or repaired. A descriptive comment can be entered per node, unit or even per I/O point.

Does SmartSlice preventive maintenance only work within an Omron world?

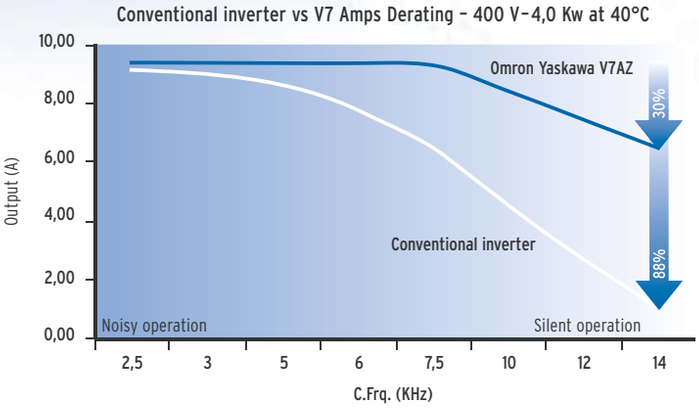
RH: Not at all – SmartSlice preventive maintenance is based on standard open networks like DeviceNet and PROFIBUS. The SmartSlice uses messaging communication to enable all configuration and monitoring possibilities. Most open networks support this messaging; therefore it will also work with third party controllers.

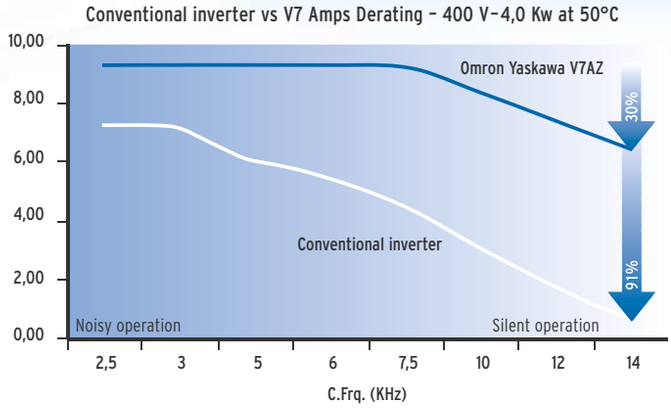
Is there really no programming required when using SAP's?

RH: There is no programming required when using Smart Active Parts. SAP's are objects in a library that can be used freely in an HMI application. They incorporate both the communication and function logic and the visualization. The only thing needed after placing the SAP's in the HMI application is correct configuration. And that takes only a matter of minutes. ■

Alberto Fuentes
Product Marketing Manager, Omron Yaskawa Motion Control

The secret of the leader





Omron Yaskawa has built a leading position in general-purpose inverters – with a 25% share of the market according to the IMS – thanks to the highest degree of reliability in the market place. Of course, it's easy for us to say we offer the highest reliability, but what do our customers say?

"At Goodwin Electronics we believe that reliability must follow integrity and quality. Our reputation depends on reliability, which is why we have chosen Omron for our motion control," says Steve Pritchard, Sales Director, Goodwin Electronics.

Anders Gullberg, Manager of the Electrical Department at AKAB, says that they choose Omron-Yaskawa products because "we export 98% of our product, so machine failure is simply not allowed."
Franco Stefani, General Manager of System Ceramics, highlights the zbenefits of Omron Yaskawa's reliability. "High reliability reduces costs and increases productivity," he explains. "This is the way to win!"

So what's the secret?

Yaskawa has developed a unique algorithm that perfectly balances the carrier frequency and the output current of the inverter. This not only allows but guarantees high current output at silent operation.

The figure above depicts the typical curve behaviour of a 4.0 kW V7 inverter against a conventional inverter in the market.

Note that in near-silent mode operation, the V7 delivers almost twice as much current as the conventional inverter. In fully silent mode, the conventional inverter just collapses. In most cases the user has to take one or even two sizes bigger to meet his application need. The V7 is designed to drive the matched motor power in silent mode at full torque. This position of "no compromise" is something that we take very seriously.

What you see is what you get

In a nutshell, with the V7 inverter you get exactly what you see specified, which is significantly better output than with a standard inverter within a high temperature range – even in silent mode.

"No surprise and no compromise!" One of the secrets of a true leader! ■

Omron RAS
For 24/7 industrial operation

OMRON
RAS
Solution

Created specifically for operation 24/7 in even the most demanding industrial environments, Omron's DyaloX industrial PC is setting new standards in industrial reliability. We've achieved this exceptional reliability by using only the highest industrial-grade components and by eliminating every potential source of failure – such as moving parts like hard disks and cooling fans.

Drawing on our many years' experience in the manufacture of industrial-class standalone PC-based equipment (like Automated Teller Machines), we've created unique self-diagnostic hardware and software, such as the Omron RAS solution (Reliability, Availability, Serviceability).

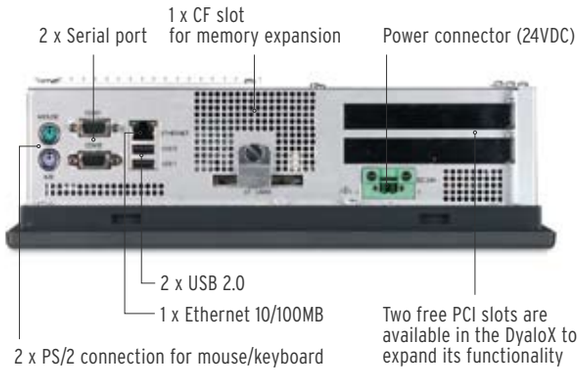
RAS board for continuous monitoring

Inside the DyaloX IPC series, a separate board, interfaced by embedded RAS utility software, continually monitors the motherboard. Because the RAS board is a stand-alone board, it can gather data from the motherboard no matter what the operating system or hardware conditions are.
The Omron RAS solution can notify you when unstable hardware or software conditions are detected. It can, if needed, take action to automatically resolve errors and enables you to investigate causes of failure.

Warning levels of monitor values can be set manually in the RAS utility. Data logged at time of failure, such as motherboard temperature, voltages, date and time, LCD conditions and other relevant data can all be displayed automatically on restart or manually by making use of the RAS utility software.

So whatever the reason for failure, the RAS board is able to provide a system snapshot just before failure occurs. By analyzing the log data, the trend and cause of failures can be quickly found and rectified for higher reliability in the future.

The DyaloX Industrial PC series with its RAS functionality will help you achieve the highest possible reliability in your PC Based application. ■



No hard disk drive

"Disk on Module" is a very reliable silicon storage type with bad sector management and industrial operating temperatures.

No Fan

A fan is a very unreliable part of a PC. If the fan fails the complete system eventually breaks down. That's why we chose for a fan-less concept.

Ask the expert

expertarea

Maickel van Haren

Product Marketing Manager HMI, Control Business Unit Omron Europe

Does RAS prevent my PC from crashing?

Not directly, but the RAS board can warn the user at certain hardware conditions and can also shutdown the PC before any damage occurs.

After restart, the log file of the RAS board enables you to analyse when and why the PC was shutdown, so this may prevent future failures.

Even when the PC crashed, the separated RAS board can still monitor the PC condition and can show after restart for instance which system processes caused the PC to crash.

What does RAS stand for?

RAS stands for Reliability, Availability & Serviceability. Meaning that with this Omron RAS board, your PC is:

- More Reliable – you will be warned for instance when unstable hardware conditions occur, before damage takes place.
- More Available – less downtime, because you can prevent errors by analyzing/solving trends in failures.
- Easier to Service – since analyzing the cause of failures is easy with the RAS utility. ■

CX-One software

keeps paper mill rolling at Papelera Brandia

A project to install continuous dosing for pulp manufacture at the Papelera Brandia paper factory in Santiago de Compostela, Spain, was carried out in record time thanks to the significant part played by Omron's CX-One software.

Meeting modern requirements

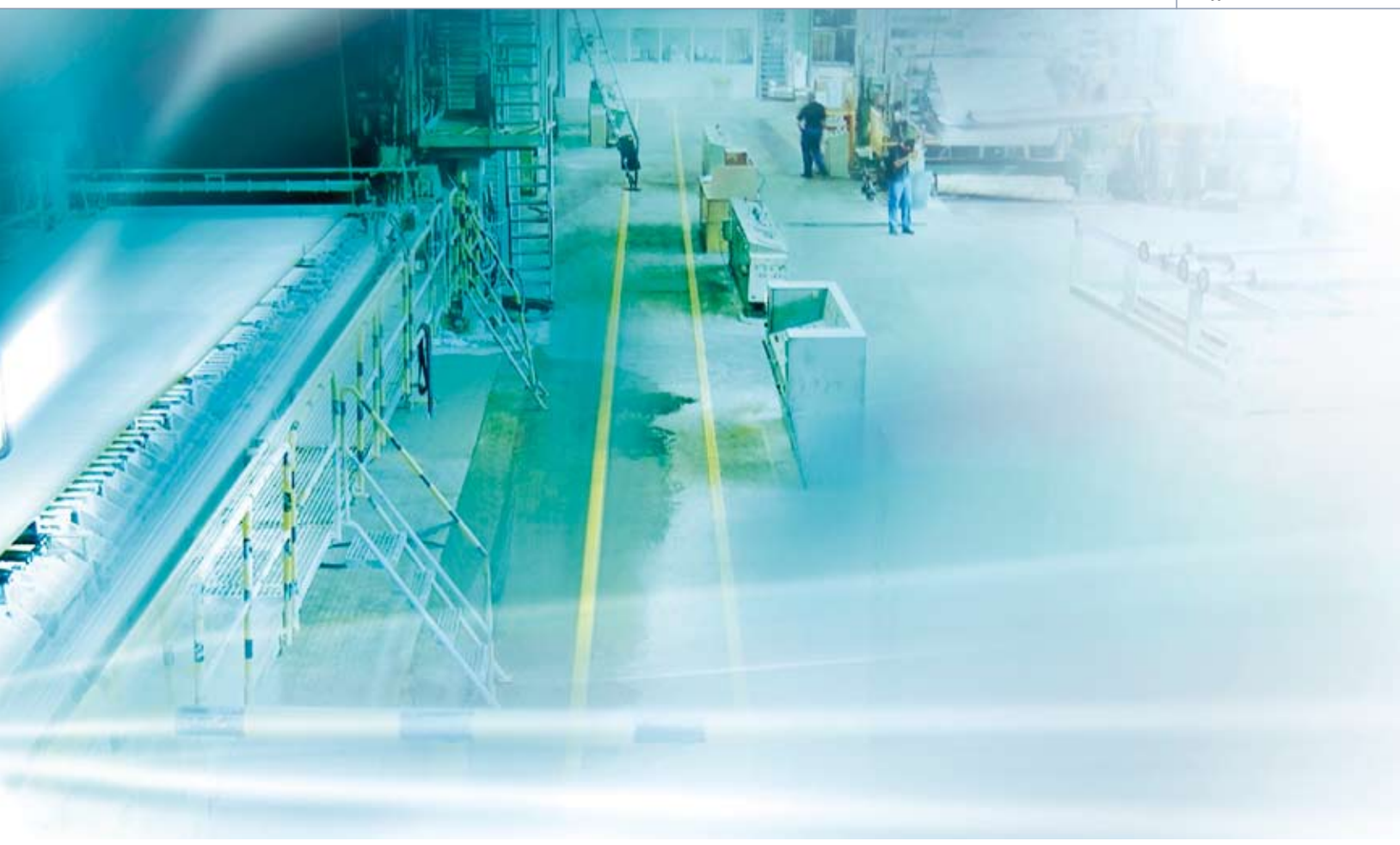
To meet the trend towards increasingly smaller orders and tighter delivery deadlines, Papelera Brandia called in the engineering consultancy firm, ABECOR Sistemes, S.L., to provide a solution that would give the factory a more flexible manufacturing process.

ABECOR Sistemes, S.L. specializes in the automation and management of industrial installations, and specifically developed an innovative control system for continuous dosing during the paper-manufacturing processes. The solution developed involves a control system for up to 35 loops and features Omron equipment based on the CS1 programmable controller. It allows the factory to optimize its manufacturing processes to meet the current trends in paper demand.

Continuous dosing

In paper manufacture, there are two basic ways of arriving at a mixture of ingredients or components with specific characteristics: by batching and by continuous dosing.

The batch process involves placing predetermined quantities of raw material in a vessel according to a recipe. The final quantity or volume of pulp is then cleaned, deflaked and refined until the desired characteristics are achieved. With continuous dosing, however, which is now installed at the



Continuous dosing process

Papelera Brandia factory, components are conveniently prepared and treated individually before being placed directly in a mixer vessel. This method reduces raw material and energy costs while saving time during changes in production. It also gives maximum manufacturing flexibility, which is an increasing requirement in today's paper industry.

Highly sophisticated process

Continuous dosing calls for the tracking and analysis at all preparatory stages of pulp manufacture and maximum flexibility in terms of monitoring.

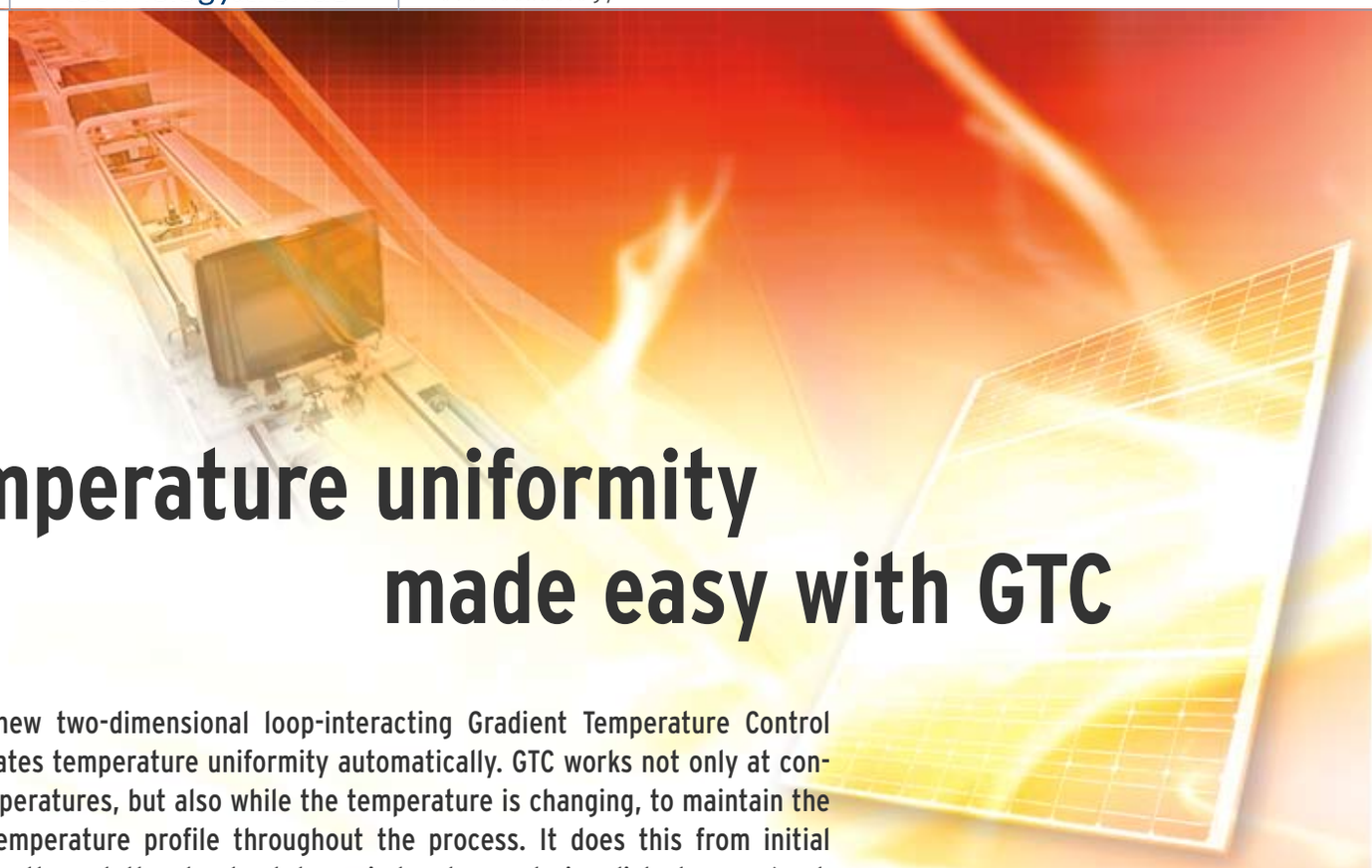
It also calls for precise control, including the coordination of all movements and actuations (opening and closing valves, stopping and starting motors, with control loops, tank levels, flow rates and pressure values, etc.), as well as the realization of calculations using the real variables of the process, flow rates, production figures, proportions, etc.

Smooth software changeover

All of the above aspects were achieved using Omron equipment, which included the CS1 programmable controller and NS12 touch screens.

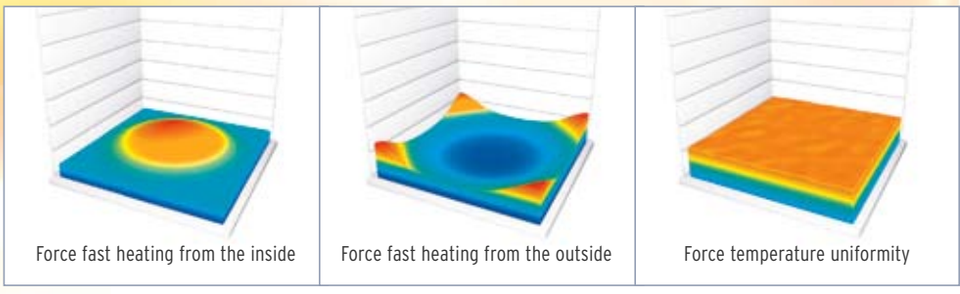
However, it was the CX-One software that made a key contribution to the project by enabling the transformation to continuous dosing to be carried out in record time and without interrupting production. In fact, the plant continued to produce at normal levels, around the clock and without having to disappoint a single customer.

A spokesman for ABECOR Sistemes, S.L. said, "The features and power functionality of the above devices, together with the new CX-One software, enabled the project to be carried out in a record time of only three months for the design and development of the applications, while the set-up of the complete system was realised in only six weeks. This was achieved without interruptions to the continuous 24-hour manufacturing process." ■



Temperature uniformity made easy with GTC

Omron's new two-dimensional loop-interacting Gradient Temperature Control (GTC) creates temperature uniformity automatically. GTC works not only at constant temperatures, but also while the temperature is changing, to maintain the perfect temperature profile throughout the process. It does this from initial heating up, through the steady-state period and even during disturbances (such as those caused by putting a new component on the heating plate).



Force fast heating from the inside | Force fast heating from the outside | Force temperature uniformity

With Omron GTC you get:

- Perfectly-controlled 2D temperature profiles, either uniform or any shape required for the processing
- Shorter commissioning time without the need for a laborious trial-and-error adjustment process
- Optimum and reproducible product quality and yield
- Reduced stress on components and machine parts
- Faster processing
- Energy saving, thanks to the optimum temperature distribution

Hotspots and large temperature gradients are a big problem in the thermal and chemical processing of sheet materials, including glass laminates, ceramic foils, silicon wafers, plastics, as well as in moulding machines and food processing. Differences in temperature across the product can cause loss of quality and yield.

In thermal processes, surface temperature scatter is observed in steady and transient states. In the steady state, it is suppressed with integral action and by proper design of equipment. In the transient state, however, it is caused by different rates of thermal conduction from the heaters to the product and their interaction, whereby each zone is affected differently. This is more acute where the thermal plate is wide and thin. Many designs, from semiconductor wafers to glass lamination in solar panels, fall into this category. Improved quality and yield require a uniform temperature profile at all times.

Multi-loop controllers use multi-heaters to reduce this gradient. The heated surface is divided into many areas, and precise controls are used in each area. However, thermal interference between the zones affects dynamic stability and control accuracy. Thus, it is difficult to realize the precise temperature control system based on conventional PID control alone.

How GTC works

GTC is an enhancement of conventional PID control that makes use of two additional elements to the PID control loop – a mode converter and a pre-compensator.

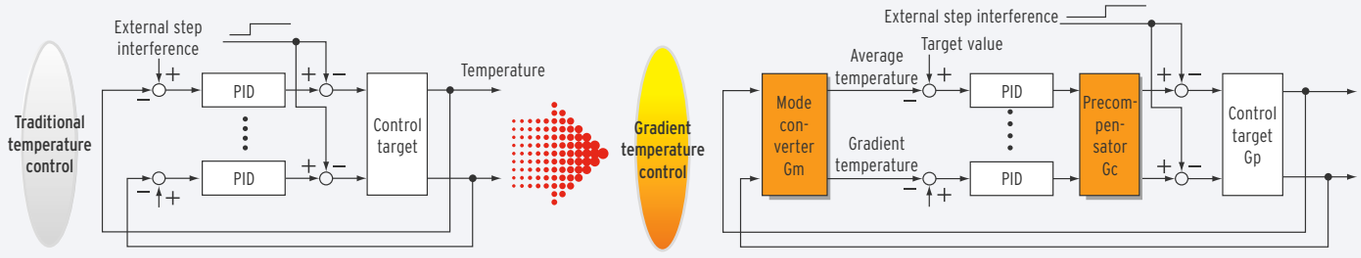
The **mode converter** converts the process values (PVs) from the output of the PID controllers into an average temperature and a series of gradient temperatures. The **pre-compensator** reduces the thermal interference between heating zones.

With thermal interference eliminated, GTC is able to minimize gradient temperature scatter and rapidly create a well-controlled 2D temperature profile over a defined area – eliminating the damaging effect of hotspots. Additionally, the autotune feature also allows the control scheme to identify the optimum pre-compensator and PID parameters. This will reduce the configuration and set-up time in most applications, thus reducing the overall costs of commissioning these instruments.

Conclusions

Omron's GTC technology allows the user to tune, commission, run and maintain control of sheet materials in the same way as conventional single-loop controls. This is a great benefit towards achieving easy and optimum commissioning in our competitive market.

GTC technology is available in EJ1 series of multi-loop controllers, as well as CJ/CS series of PLCs, to suit target applications. ■



A new approach to interactive multi-loop PID control

Ask the expert **expertarea**

Obtaining uniform temperatures is not new. How does GTC differ from conventional solutions?

With conventional solutions, only the sensitivity to disturbances and change is reduced. This is done either mechanically by large, thermal inertia, or by "detuning" individual controllers. The controller reacts very slowly to changes in setpoints and external disturbances. With GTC, the natural interaction between channels is identified and largely eliminated through the pre-compensator. The PID loops can then be more responsive to setpoint changes and external disturbances.

Where and how can I save money with GTC?

GTC offers clear advantages in three distinct areas.

- **Initial setup and commissioning:** As GTC offers a systematic autotune, commissioning largely consists of performing initial wiring checks followed by the autotune procedure. This completely eliminates the lengthy and haphazard trial-and-error approach.
- **Start-up:** As interaction is significantly reduced, the practical startup time of the process to operating temperature is shortened. This means higher through puts and lower energy costs.
- **Higher quality:** As the temperature gradient across the product is better controlled, there is much better process yield, less scrap and more consistent higher-grade product.

Do I need to understand advanced control technology to use GTC?

No. The underlying technology within GTC is advanced, but the user does not need to understand the details. The intelligence built into the algorithms frees users to only concern themselves with the process issues.

Who benefits from this technology? What are the applications?

There are currently customers using GTC in manufacture of large LCD screens for TVs, high-quality glass coating and lamination for solar panels, and larger 300 mm silicon wafers. Other application opportunities are in plastics forming, extrusion, and mould machines, or paper coating where quality is becoming an increasingly important differentiator.

Which control platform do I use?

This very much depends on the scale of the process involved. For small-to-medium scale solutions where sample times of 500 ms to 1 s are adequate, EJ1 provides the logical platform. For a large number of channels, or where faster sampling down to 10 ms is required, then CJ1-CPU45P-GTC will offer the ideal solution. Finally, when this forms part of a larger process, then CS1W-LCB05 is the correct choice. ■

Coorous Mohtadi

Product engineer,
Smart Platform Team
Omron Europe

CJ1 Loop Controller and EJ1 Multi-loop Temperature Controller

Junma ML-2 servo system

The Junma ML-2 ultra-compact servo series draws on our world-leading servo-drive technology to open up new dimensions in drive simplicity. The Junma is probably the first servo drive that is fully tune-less and programless. It also comes with a built-in MECHATROLINK motion bus. The Junma can save you up to 30% of cabinet space and up to 50% in cabling and set-up time. ■

F3S-TGR-KXC safety light curtains

Omron's latest development in safety light curtains, the F3S-TGR-SBx-KxC series is the perfect choice for palletising applications.

The series features both Type 2 and Type 4 safety products and is distinguished by the transmitter and receiver being integrated into a single unit, creating an active-passive system with a simple reflector forming the second unit of the light curtain. This greatly simplifies installation and reduces costs.

The series also embodies a fully integrated muting function that prevents automatic machine shutdown when palletised products pass through the light beams. This further simplifies installation by cutting the amount of wiring needed and eliminating the need for a separate muting control box. ■

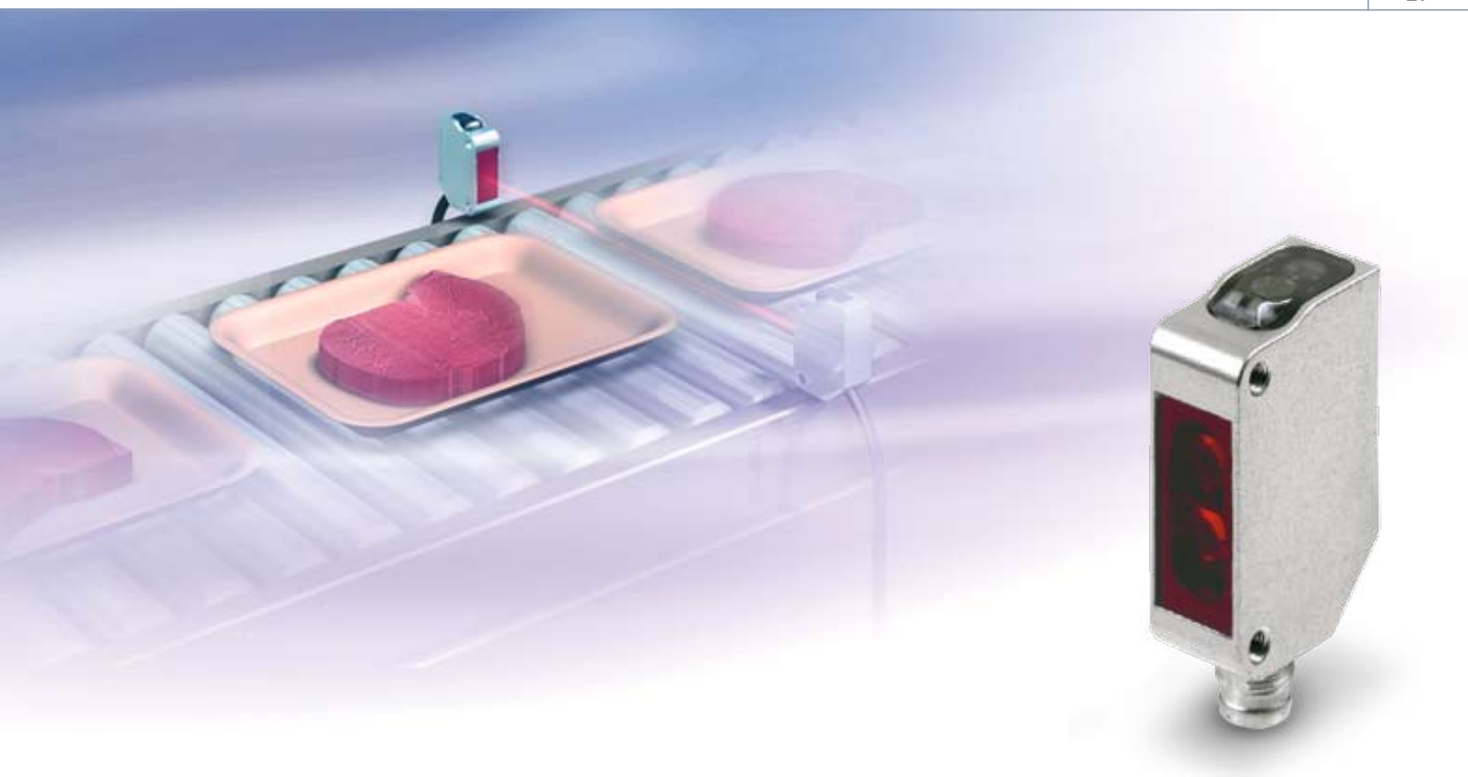
EJ1 modular temperature controller

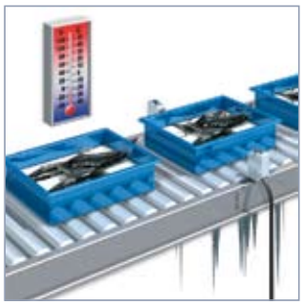
The EJ1 is a multi-channel modular temperature controller. It is designed to handle complex temperature profiles thanks to Omron's unique Gradient Temperature Control (GTC) algorithm and to offer easy program-less communication with Omron and third party PLCs and HMI.

Above all, the EJ1 incorporates all "simple to use" clever temperature control technology, like 2-PID, disturbance control and various ways of tuning. ■

S8M digital multi-circuit protector

With the S8M your machine will comply directly to UL Class 2, maximum tripping current is 3.8 A per channel (adjustable). This unit can control up to 4 circuits. Additionally, you will get startup/shutdown –sequence control, display and alarm functions, like voltage, output current, run-time, and over temperature and external reset. These functions can be set by using the front buttons or with the free support tool software. The settings can be protected. ■





Harshest conditions

Water-tight housing

Robust construction

E3ZM stainless-steel series

Sharing the features of our E3Z general-purpose series, the E3ZM series comes in a high-grade SUS 316L stainless-steel housing.

The series features outstanding corrosion and wear resistance, and offers the ideal solution where hygiene and resistance to aggressive cleaning agents are important – as in food-production lines for example.

The hermetically-sealed housing also provides resistance to high-pressure water meeting IP69K requirements.

Features at a glance

- High-grade SUS 316L stainless-steel housing offering excellent corrosion and wear resistance
- Sealed to stringent IP69K standard
- Approved by the Ecolab Institute
- Item labels replaced by laser printing on product
- Cleaning substances: Sodium hydroxide (NaOH), Hydrogen peroxide (H2O2), Potassium hydroxide (KOH), Phosphoric acid (H3PO4), Sodium hypochlorite (NaClO), Ecolab P3-topax-66, Ecolab P3-topax-56, Ecolab P3-topactive DES, Ecolab P3-topax 91, ABC Compounding TEK12 ■

If you would like to know more about Omron's latest products, please see our Product News magazine or have a look at www.omron-industrial.com

Junma "tuning-less" servo
combines space and simplicity

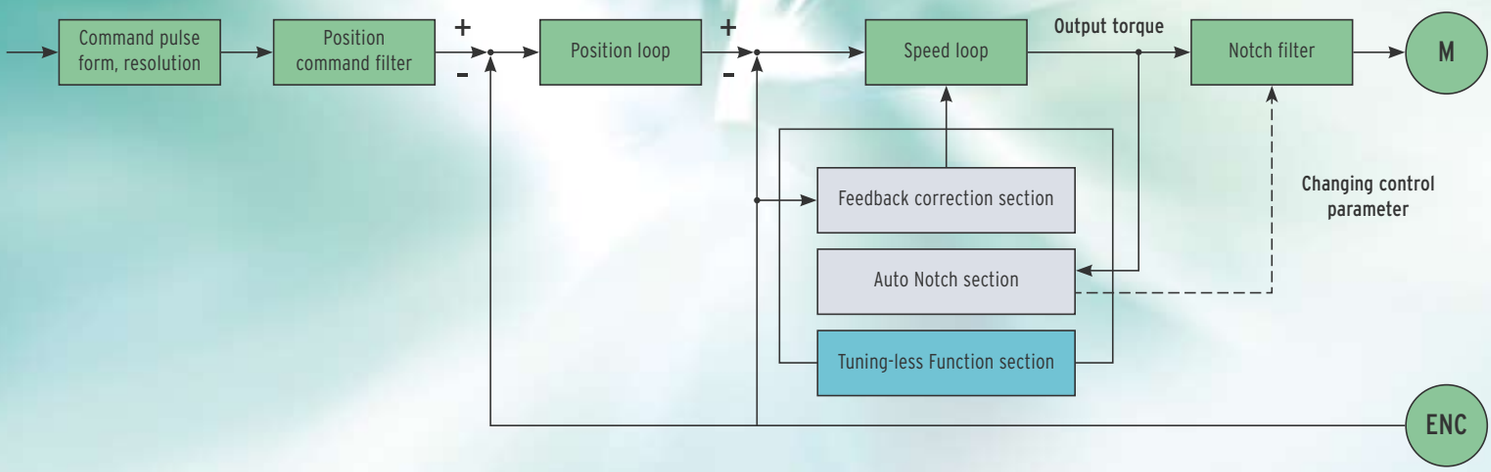


Fig.1: Block diagram of Junma tuning-less control loop.

YASKAWA
Yaskawa Electric Corporation
Takashi Kitazawa, Servo Development Project Team
Tokyo Plant, Motion Control Division

Yaskawa is the world leader in servo-drive technology. Key successes of Yaskawa servos are unparalleled reliability and torque-to-size ratio. Now, the new Junma series is setting a new standard in compactness and simplicity. Its "tuning-less" feature (Dynamic Self-Tuning) is a revolution in servo technology that we are delighted to share with you.

Architecture and Function

In order to achieve optimal servo-control, the servo drive's control parameters must be adjusted to match the machine's moment of inertia and resonance characteristics.

However, two difficulties make this task harder than you would think. First, it is difficult to accurately determine the machine's characteristics and second, tuning the servo drive's parameters to match the machine is very time-consuming and complicated.

Now, both of these have become a thing of the past thanks to the "tuning-less" function (Dynamic Self-Tuning). This consists of two major components: "feedback correction", which provides constant time responses, and "auto notch", which changes the parameters in the notch filter to suppress mechanical resonance, utilizing the amplifier's internal signal.
"Feedback correction" adjusts the internal figure of a calculation in a speed loop so that the same response characteristics are always obtained without reference to changing the moment of inertia.
"Auto notch" detects mechanical resonance peaks and sets "notch filter" to suppress mechanical resonance automatically.

This allows Junma to instantaneously control virtually any resonance, eliminating the need to adjust the servo drive's control parameters and giving users the benefit of easy setup and servo tuning.

The effects

The effects of this "tuning-less" function are explained using the following examples:

"Tuning-less"

A comparison of the difference for a rigid load with and without "tuning-less" function is shown in Illustration 1 for a rotor inertia ratio of 0% (motor only) and 1000% of the inertia of the load.

Fig. 2 shows the position deviation and output torque without the "tuning-less" function and Fig.3 shows it with the "tuning-less" function. Fig.2 shows that it is unable to position normally and that it suffers oscillation when the load inertia ratio is 1000%. Fig.3 shows that positioning is fully completed with a load inertia of 1000% in the same time as with 0%. Thus, with the "tuning-less" function the same response can be achieved without changing control parameters.

Transfer mechanisms

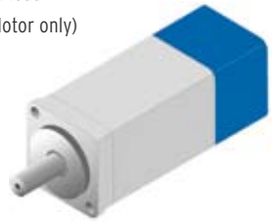
In addition to the above-mentioned rigid load, the effect on different transfer mechanisms is shown below. Fig.4 shows reflected rotor inertia ratio's of 197% and 910% in ball screw drives (see Illustration.2) Fig. 4 shows that the same positioning time is achieved for any load condition. Thus, even when the characteristics of a transfer mechanism are changed, the same response can be realized with Dynamic Self-Tuning, without having to change the control parameters.

Now, you can enjoy the benefits of this technology, which can revolutionise the performance and productivity of your industrial machines.

For more information contact us at www.omron-industrial.com ■

Illustration 1: Rigid load

Load inertia 0% (Motor only)



Load inertia 1000%

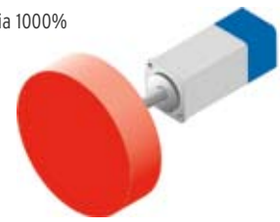
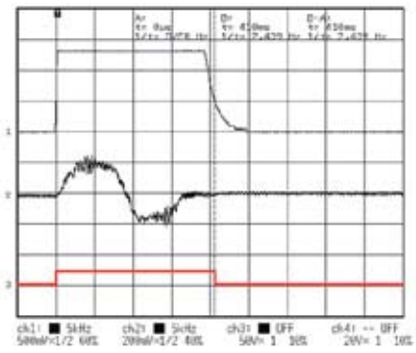


Fig.2: Rigid load without "tuning-less" function (Dynamic Self-Tuning)

Load inertia 0% (Motor only)
Positioning time: 410 ms



Load inertia 1000%
Positioning time: -

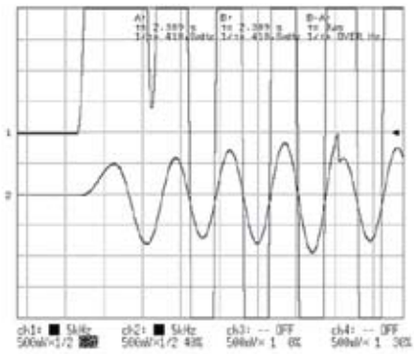
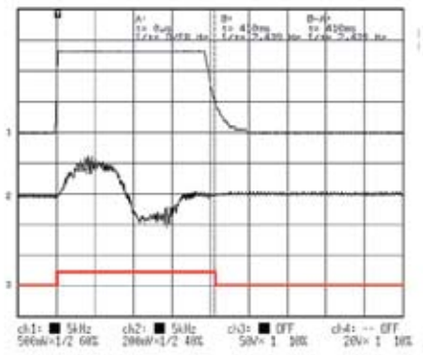


Fig.3: Rigid load, with "tuning-less" function (Dynamic Self-Tuning)

Load inertia 0% (Motor only)
Positioning time: 410 ms



Load inertia 1000%
Positioning time: 410 ms

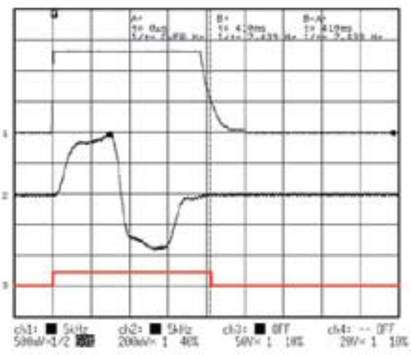
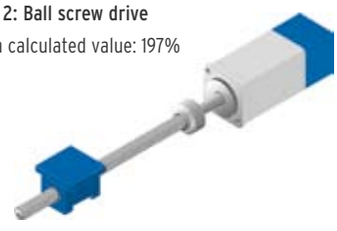


Illustration 2: Ball screw drive

Load inertia calculated value: 197%



Load inertia calculated value: 910%

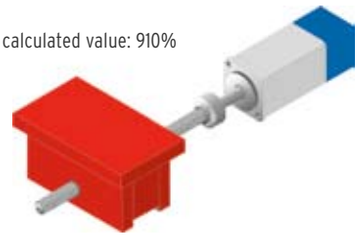
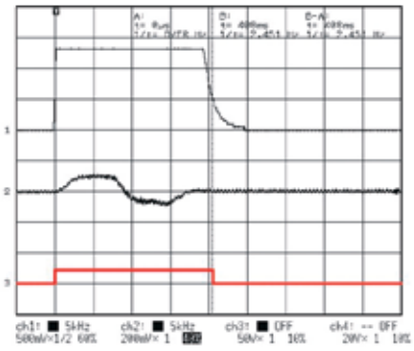
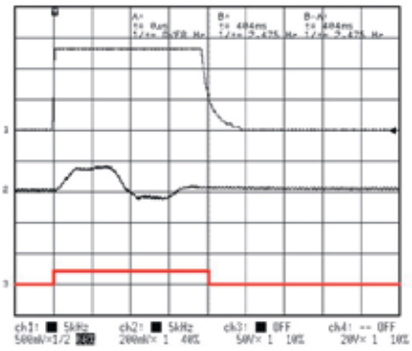


Fig. 4: Ball screw drive, with "tuning-less" function (Dynamic Self-Tuning)

Load inertia calculated value: 197%
Positioning time: 408 ms



Load inertia calculated value: 910%
Positioning time: 404 ms



Trace: 1. Position Deviation Trace: 2. Torque Trace: 3. Positioning Signal H: Positioning L: Complete positioning

Your Automation Guide for the best machines

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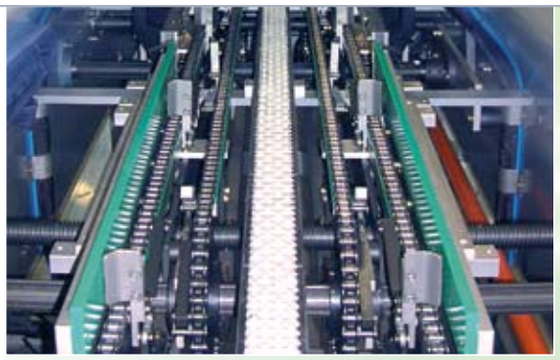
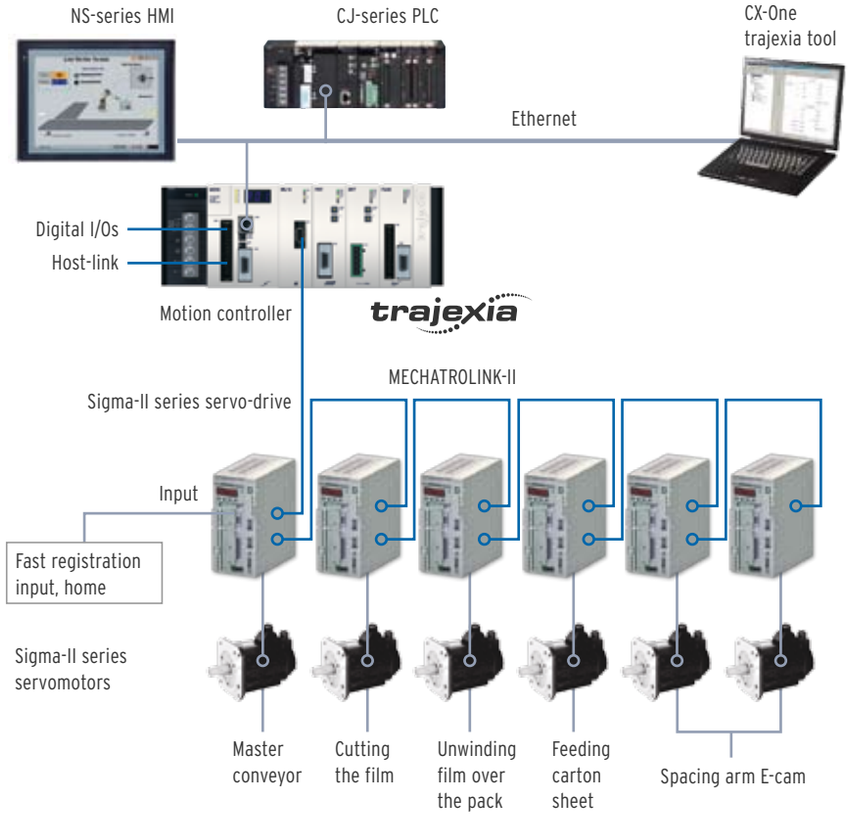


When a Russian customer decided to build new packaging equipment for bottle wrapping they had 3 key requirements: 50,000 bottle/hr throughput, longer machine availability and system flexibility to wrap various package sizes. With over 30 years experience in packaging systems, Novopac and Ci.ti.emme, were selected to design the new packaging line. It was clear to both companies that the complete production process had to be continuous. Hence fully synchronized multi-axis motion control was a must. To achieve that Trajexia platform offered the best option.

System configuration



Trajexia packs 50,000 bottles per hour!

The wrapping process

Fed randomly from a conveyor, the bottles are spaced, aligned and then fed in packs of 20 in full synchronization on the packaging tray. This complex task is performed by a 2-axis arm driven by two 850 W servodrives synchronized through a Cambox function. In order to avoid any collision at emergency stop the motors use absolute encoders. A third axis, driven by an 850 W servomotor and synchronized with the bottle tray, feeds a carton sheet underneath the packed bottles. A forth axis, driven by a 2900 W motor, unwinds the wrapping film over the bottles performing a Cambox function. Finally a fifth axis driven by a 850 W motor cuts the film using a Movelink function. All axes are slaved to the master conveyor, which is driven by a 2900 W motor.

The motion-control system

Trajexia's complete and integrated platform was chosen to handle the whole wrapping process. The TJ1 motion-control unit driving all 6 axes over the Mechatrolink II motion bus performed all complex motion tasks through simple and intuitive motion basic commands such as Cambox, Movelink and Connect commands. The machine management, safety interlocks and operator interface tasks are performed by a CJ1 PLC and an NS8 terminal.

Modular, flexible and robust

The use of electronic synchronization allowed huge flexibility and adaptability of the machine to satisfy customer demands for various packing sizes and production rates. It is more compact and also easier to maintain thanks to the transparent communications down to the servo level. The clear separation between motion tasks and sequencing tasks also gave the machine builder greater flexibility to use other PLC brands if the end customer so wishes.

Job well done

Thanks to the ease of use and the plug & work concept of Trajexia platform, the new production line was built and commissioned within schedule. Omron's fully integrated platform helps full operation at desired performance, with highest reliability. Also local or remote interaction with all devices on the machine allows full teleservicing. Trajexia makes motion easy. ■

Carin Hendriksen
Operations Manager
Omron Manufacturing of the Netherlands

"Lean Thinking" keeps European manufacturing competitive

Higher production output with faster adoption of changing customer needs and 40% less manpower are the result of a brave decision to adopt an approach called "Lean Manufacturing" at Omron Manufacturing Nederland (OMN), based in s'-Hertogenbosch.

More with less

"Nothing less than radical change was necessary for us to maintain operations into the future, but we knew that we had to begin with a clean sheet and without delay," says Carin Hendriksen, OMN's operations manager.

"Lean Manufacturing is a completely different production style from what existed before and everyone from top to bottom was involved. It meant literally clearing everything out and starting from scratch." To anyone walking around the factory floor today, the space, transparency, cleanliness and orderliness is striking. Also striking are the relatively few people to be seen. The production department achieves even higher level of output as before, but with 40% less manpower.

Flat organisation

The key to success has been the radical reorganization and change in mindset based on Lean Manufacturing principles. Several hierarchical layers have been stripped away and today the operations department comprises two self-steering, multidisciplinary teams. The members of each team include shop-floor operators, production and maintenance engineers, an equipment programmer, a planner/buyer, an improvement coordinator and a team leader. They are solely responsible for the day-to-day operations and for reaching set targets. With a focus on reducing waste, they tackle their challenges in small improvement teams, being careful to carry out activities that only add value to the product and process.

War on waste

The team's efforts are mainly devoted towards combatting waste in the form of waiting, defects and excesses in processing, transport, movement and inventory. And there have been great strides forward, particularly with regard to defects. "In 2002, 4% of our products didn't pass our own Quality Control (QC) inspection," says Carin. "Now we receive no rejects, so clearly the effect of our actions is being reflected in our products." This is a direct result of the Lean approach in conjunction with the company "Quality First" motto. Assembly line operators are supported in their work at each step by Poka Yoke, which eliminates the possibility of errors. These Poka Yokes are made with Omron products, such as sensors, PLCs, cameras, interfaces and small platform technology.

"Our own production facility is also a fully operational showroom in which Omron products are widely used," says Carin.

Poka Yoke: a monitoring and feedback system that tells the operator when something has gone wrong.

Continuous improvement

Lean Manufacturing has brought down the break-even point for operations significantly, which means greater flexibility regarding the cost price of products. Although Omron is among the first to adopt Lean Manufacturing in Europe, it is not standing still. "The focus is currently on reducing inventory waste by being able to deliver on the same day an order is received. We hope to achieve this by next year," says Carin. "This has been extended with a secondary focus of reducing waiting due to bottlenecks. With the success of Lean Manufacturing, not to mention the enormous drive and enthusiasm for improvement it has brought with it, Omron has a production 'showcase' close to its customers, ensuring success well into the future. Everyone is welcome to visit us and see it for themselves."

Lean Manufacturing at a glance

Developed by Toyota, Lean Manufacturing eliminates waste by reconfiguring factory operations into continuous flow cells linked by so-called 'pull' systems whereby only parts that customers need are actually made.

It starts with Lean Thinking, in which value is specified from the viewpoint of the customer. Value streams are identified for each product and value-creating steps are linked so the product can flow in the shortest possible time.

Only actions and assets that create value are considered. Activities must be standardized and repeatable, while machinery must be capable of delivering exactly what is required when it is needed. Reconfiguring operations across the value stream removes wasted steps and leads to performance improvement. The more waste is removed, the easier it becomes to remove further waste at the next improvement cycle. ■

Colophon & Contact

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