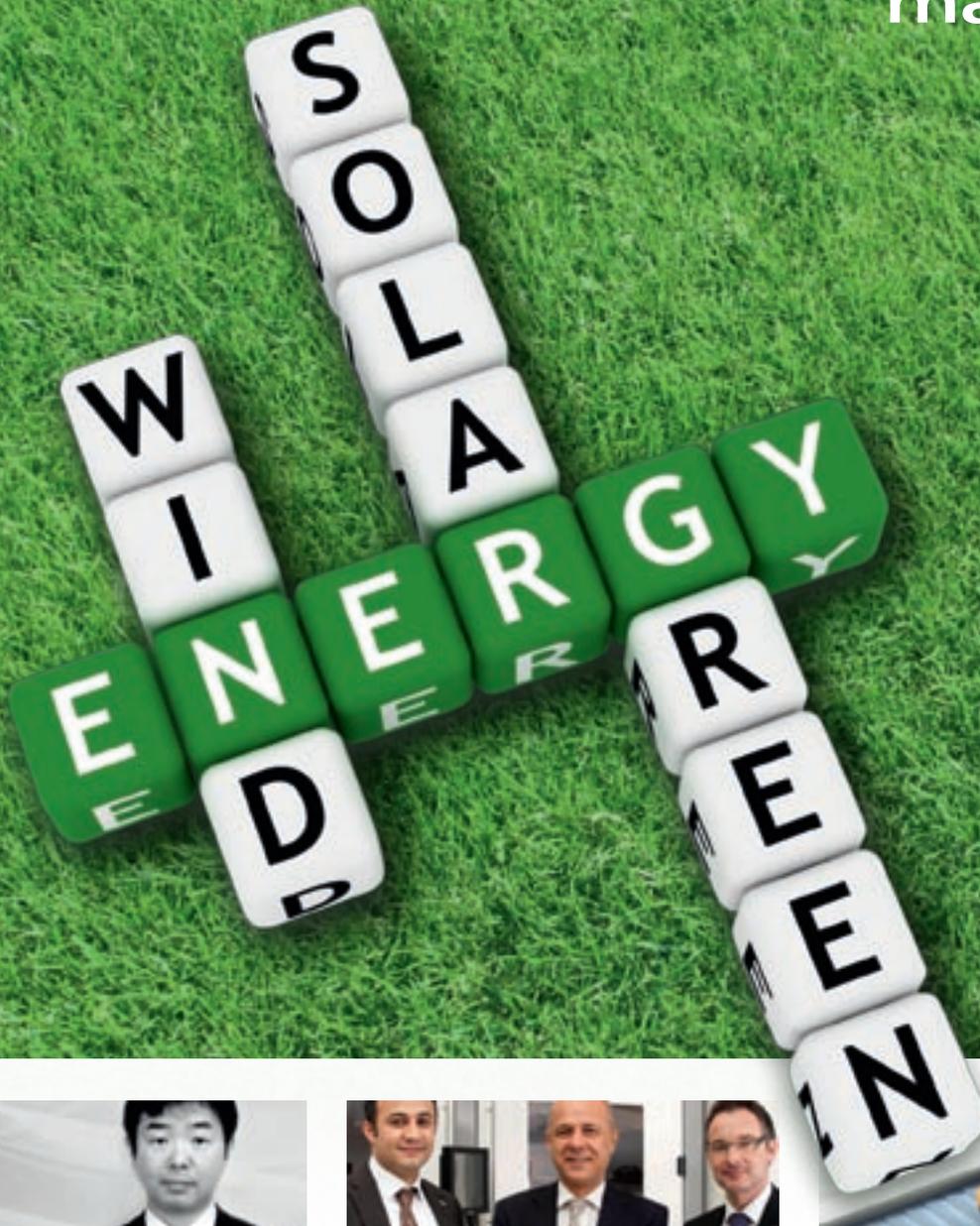


# technology&trends magazine



### From Return on Investment to Return on Carbon

Technology & Trends talks to Mr Taisuke Tateishi about Omron's efforts to help reduce CO<sub>2</sub> emissions profitably

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### Solutions for the photovoltaic industry

Close co-operation between supplier and systems manufacturer leads to success

More on page 8



### Sustainable production thanks to industrial image processing

The factory of the future will be designed to achieve maximum efficiency in productivity with minimum material and energy consumption

More on page 18

## Sustainability: staying in business and protecting the planet

We all know how much we depend on the natural world, and how important it is that we take better care of our planet. Recently, earthquakes, hurricanes, tsunamis and oil-spills have all confirmed this in a very graphic way. Now, more than ever, we need to accept our shared responsibility to use resources more responsibly and to deploy technology more efficiently.

As you will read in this issue of Technology & Trends, sustainability is increasingly the driving force for businesses and economies worldwide. I was fascinated by the concept, described by Taisuke Tateishi, of measuring company performance by Return on Carbon, rather than Return on Investment. It may sound futuristic, but it is very much an idea whose time has arrived.

You can also read how Omron is working with companies throughout Europe to use energy more efficiently, to generate power from the sun and wind, and to reduce waste production, based on the idea of staying in business and working together to safeguard the planet's resources. You can also find out how we are putting these theories into practice at our factory in The Netherlands, working with the local municipality.

It's clear that it is always worth taking a second look at ways in which we can improve energy efficiency and cut waste, both in our work environment and our daily lives. At Omron, we constantly remind ourselves of our company motto, developed by our founder: "At work for a better life, a better world for all". I hope you'll be inspired by the articles in this issue to find ways of working together to make this a better world for all.



**Lucian Dold**

*Divisional Marketing Manager EMEA  
Sensing, Safety & Components*



### Cover:

The Future starts today!

Environmental protection through energy saving and the use of green energy are some of the main objectives for today's companies.



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At the Corteolona plant of Italian waste recycling specialist, Ecodeco.

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### Maximising the efficiency of unique wind turbines!

An innovative direct-drive system to produce wind-generated electricity in a highly efficient manner, using Omron technology.

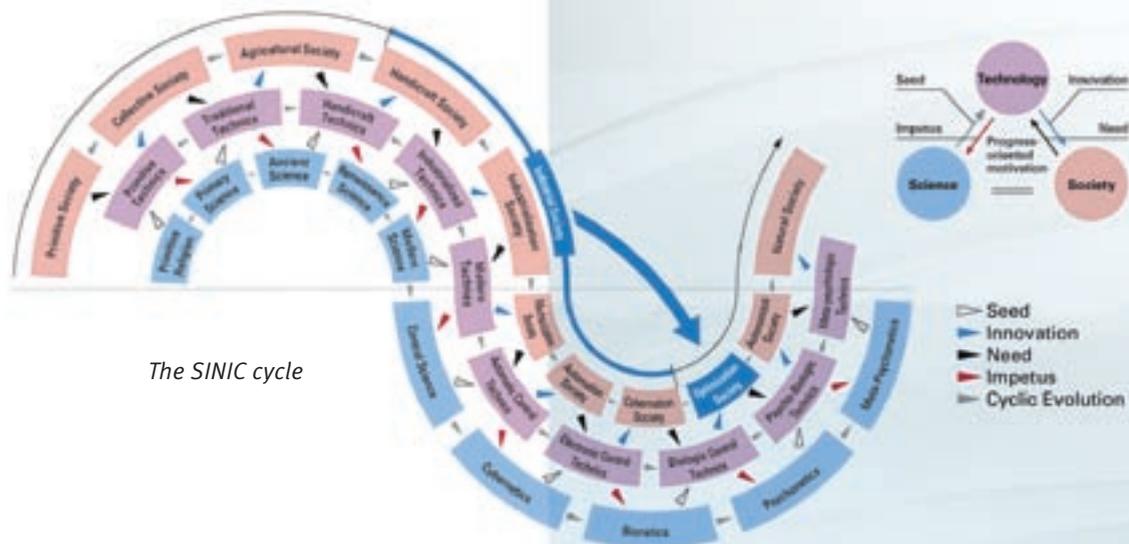
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### High energy savings with Omron frequency inverters

Panasonic Energy Company, Belgium taking steps to become the most sustainable company in the technology sector by 2018.

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### Colophon & Contact



The SINIC cycle



Mr Taisuke Tateishi  
Environmental Solutions Business  
H.Q., Power Electronics Business  
Promotion Department, General  
Manager

*Return on carbon could become as important a management indicator as return on investment. Reducing CO<sub>2</sub> emissions is a major social challenge, but businesses also need to simultaneously ensure profitability.*

*Technology & Trends talks to Mr Taisuke Tateishi about Omron's efforts to help reduce CO<sub>2</sub> emissions profitably.*

**Mr Tateishi, could you explain what return on carbon means?**

*Mr Taisuke Tateishi:* At its simplest, it is profit divided by the volume of CO<sub>2</sub> emissions. The way of thinking is to consider CO<sub>2</sub> emissions as a rare resource, and to “use” them sparingly while maintaining or increasing profitability.

**What were the reasons behind the Environmental Solutions Business that Omron set up in 2009?**

*Mr Taisuke Tateishi:* Back in the early 1970s, Omron's founder proposed the SINIC (Seed-Innovation to Need-Impetus Cyclic Evolution) theory. This suggests that science, technology and society affect each other in two ways: science yields new technology that helps society, while society's needs to encourage both technological developments and scientific discovery. It's a cyclical process that helps social evolution and will lead to an “optimising society” in which there is a balance between quality, delivery and cost on the one hand and reliability, safety, and environmental concerns on the other. This is the seed of the new business.

**What are the main targets of the Environmental Solutions business, and how will they be met?**

*Mr Taisuke Tateishi:* Many countries now have strict limits on CO<sub>2</sub> emissions, so reducing environmental impacts is vital for any business that wants to trade globally. That's the starting point for the Environmental Solutions Business, which will use Omron's core competences in sensing and control to help businesses improve their return on carbon. Our main targets are in steel, semi-conductor, liquid crystal, and automobile industries, all of which have high energy consumption, and a major requirement for reducing CO<sub>2</sub> emissions.

# From Return on Investment (ROI) to Return on Carbon (ROC)

A management index for business and social profits

## What are the main issues in achieving this reduction?

*Mr Taisuke Tateishi:* One problem is that introducing energy-saving equipment can be expensive, so what we're proposing is a "visualisation" approach to improving operational techniques and equipment usage. This will keep energy costs down while reducing emissions and wastage – in other words, we are looking at improving the return on carbon employed, rather than just cutting emissions. Our target is to achieve future CO<sub>2</sub> reductions of up to 50%, and we adopt a twin-track approach to this. Firstly, using renewable energy sources will have a direct impact on CO<sub>2</sub> emissions. Then, through reducing waste and improving efficiency, we'll make further reductions. We use monitoring and analysis to make operational improvements, then we look at energy control techniques which we apply to components and systems. The detail is different for each sector, but the approach is always basically the same.

## What does Omron do to reduce CO<sub>2</sub> emissions within the company itself?

*Mr Taisuke Tateishi:* Before the Environmental Solutions Business was established we introduced energy-saving methods in our manufacturing plants. We started with a visualisation exercise at five domestic factories in Japan, and reduced electricity usage by 10% in the first year. The approach is to optimise electricity use in production machinery, air conditioning, compressors and so on, but without affecting the performance of the equipment. We're taking this approach forward to our production bases in China, and intend to roll it out worldwide.

## What specific ways does Omron have for helping customers to reduce CO<sub>2</sub> emissions?

*Mr Taisuke Tateishi:* For manufacturing businesses, we offer sensors for electricity, temperature and humidity, data-collection equipment, and systems to analyse the data. We provide training so customers can see precisely where energy consumption can be reduced and, of course, we're always available to work as a project team alongside customers and give them the benefit of our experience and expertise.

## Is this going to be extended to other countries?

*Mr Taisuke Tateishi:* Until recently, we've been concentrating on Japan, but this year we are helping Korea's leading producer of LCDs, and there are plans to expand into other Asian markets. However we're aware that it's difficult to use domestic business models in other countries, so we're developing software that incorporates the experience and expertise of our consultants: we've two so far, KM50 and Dr.Eco, and will develop more over time.

## What else does the future hold?

*Mr Taisuke Tateishi:* We will continue to focus on sectors where energy use is high, helping them to improve return on carbon by cutting costs and emissions. We also recognise that in order to work with global organisations, we must use Omron's global resources. So Environmental Solutions will work with other Omron businesses, on manufacturing, on product development, and on sales.

# Environmental awareness

... starts here!

*Omron has always had a strong sense of corporate social responsibility, and in recent years, the group has established targets on a range of environmental issues, including CO<sub>2</sub> emissions, waste, chemical usage, sustainability audits, and green procurement. The Omron factory at s'Hertogenbosch – known as Den Bosch – in The Netherlands has had a Quality and Environmental Manager since it was established. Technology & Trends spoke to the current manager, Mr Eric van Ochten, about how Omron in Europe sets targets about reducing its environmental impact.*

*Eric van Ochten  
Quality and Environmental  
Manager, Omron Europe*



**Mr van Ochten, can you start by telling us about your main responsibilities?**

*Mr Eric van Ochten:* A large part of my job is to maintain and improve the quality and environmental management systems at the factory in s'Hertogenbosch. I monitor the system, and establish with the process owners how and when to make improvements.

**Is this part of Omron's commitment to Corporate Social Responsibility?**

*Mr Eric van Ochten:* To some extent, yes: there is, for example, a global commitment to reduce the company's CO<sub>2</sub> emissions by 10% within ten years, based on the 2002 figure. But there are other dynamics, including a wide range of EU Directives and regulations. In fact, we don't need to comply fully with all of these regulations, but in line with our commitment to environmental awareness, we're going to meet, and where possible exceed, all of their requirements.

**Can you give us some specifics?**

*Mr Eric van Ochten:* We use the legislation as a target for product development, and we add in voluntary requirements like reducing chemicals, increased use of recycled material, energy saving during use, longer product life and so on – there's a list of maybe 20 different targets. We have a similar number of targets in the production process itself and in our offices, including energy saving, waste reduction and recycling. We've adopted the Trias Energetica concept, which involves reducing demand through energy-saving, using renewable sources, and adopting the most efficient techniques for producing and using energy.

**Are you working with the Den Bosch municipality on this?**

*Mr Eric van Ochten:* Yes, we've signed an energy covenant with Den Bosch, which wants to be climate neutral by 2050. As part of this, we're committed to sharing our know-how and technology on energy saving with other local companies. For example, the city is building a biomass plant close to our factory which will use waste material to produce hot water to heat buildings. There's likely to be a surplus and I took the initiative to work with other local businesses to see whether we should invest in using this surplus. Five businesses have contributed to a feasibility study to assess the technical and economical aspects of the scheme, and I'm expecting the results very soon.

**And what are the goals for the future?**

*Mr Eric van Ochten:* The biomass project should virtually eliminate gas consumption, so we need to find other ways to cut electricity usage. We already buy 'green' electricity, but we want to look at solar energy and combined heat and power generation. It's a continuous process, and one in which we need to constantly review the options to make sure they make both environmental and financial sense.

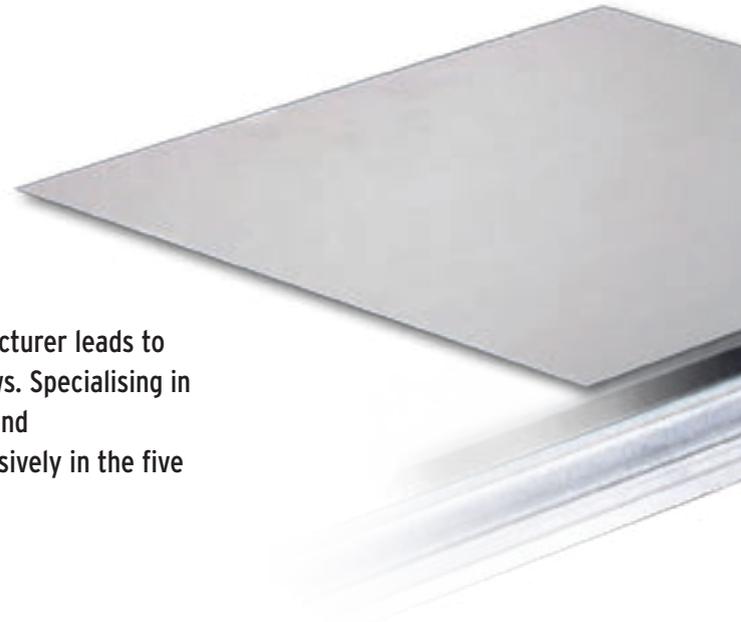


# Solutions for the photovoltaic industry

Close co-operation between supplier and systems manufacturer leads to success, as the ATMgroup from Salem, Germany well knows. Specialising in the manufacture of testing systems for the photovoltaic and semiconductor industries, the company has grown impressively in the five years since its foundation.



*Saban Akbasoglu (Strategic sales, Omron),  
Schadnusch Nejad (CEO ATMgroup),  
Stefan Spiekermann (Manager strategic sales team, Omron)*

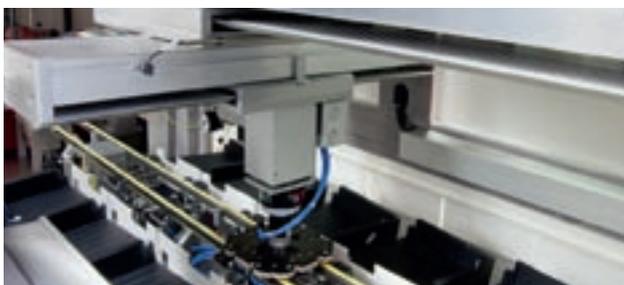


The Salem-based company's product range includes everything that the manufacturers of photovoltaic systems need in order to assure the high quality of their products, whether for ingots, wafers, or entire cell-strings. Today, the company relies on numerous components from Omron.

## Application range extended

The successful co-operation began with sensor systems from Omron, which were used in a testing facility for determining the quality of solar wafers. Further solutions are now being implemented. These currently include drive technology for handling systems and safety technology.

Schadnusch Nejad, CEO of ATMgroup describes the co-operation as follows: "Recently, for example, we added a lay-up machine with an integrated inspection unit to our product range. The relevant drive technology was realised in an extremely short timescale. The key success factor was the close co-operation between ATM and Omron."



*Omron's high speed linear motor slider system for precise sorting and handling of wafers*



*Wafer conveyor controlled by G5 servo motors with EtherCAT motion bus and optical E3Z family sensor*

ATMvision AG  
Salem/Beuren, Germany  
[www.atmvision.de](http://www.atmvision.de)



A design engineer supported us throughout the development process, helping us to perfectly adapt the new linear drive solutions to our requirements and to integrate them into our machine.”

In conveying systems, rotational servo drives from the new Accurax G5 series are used in conjunction with the EtherCat communication bus to ensure simultaneous, smooth transport of the wafers.

**“The relevant drive technology was realised in an extremely short timescale.”**

The linear drive technology was not only used in the lay-up machine, but also in or behind a variety of inspection machines for feeding, turning, distributing and sorting solar wafers.

Extensive systems such as the lay-up machine cannot simply be accommodated in housings. To ensure that they are not a hazard to persons in the vicinity of the systems, the relevant safety equipment is necessary.

### **All components from a single source**

Machine and system manufacturers within the photovoltaic industry benefit from Omron’s many years of experience in the semiconductor industry and from its product portfolio with automation products for the complete process chain. Omron employees from the strategic semiconductor and photovoltaic industry sales team provided support during the integration of automation components such as drive, control and safety technology, sensors and image processing. The advantage here is that these employees are familiar with their own company’s components and systems, and also understand the challenges faced by the users.

# Making solar energy even more attractive

CO2削減

系統保護

再生エネルギー



*KP100L solar inverter*

Omron offers a comprehensive range of components, hardware and software for solar-power generation. The latest addition is the new KP100L solar inverter, which uses advanced circuitry to maximise both power output and efficiency. As a result, it's becoming increasingly viable for businesses to generate electricity for their own use.

In many ways, solar power is the most attractive form of renewable energy, because it comes directly from the ultimate source – the sun. This means that there are no harmful by-products, and most photovoltaic (PV) cells – which collect the solar energy – are made from silicon, which is the second most abundant material on the planet. PV systems are inherently safe, and have very little environmental impact, so they can be integrated into buildings in a number of aesthetically pleasing ways.

In many European countries, building legislations are now framed to encourage the use of renewable energy for both public and residential buildings. As a result, Europe is far and away the leading market for photovoltaic electricity: more than seven billion watts of PV capacity was added to the world's energy supply in 2009, of which over 75% was installed in European countries.

### **Selling surplus solar-generated electricity**

Germany has led the development of solar energy technology. This followed the introduction, ten years ago, of laws establishing feed-in tariffs for solar electricity producers.

**“The KP100L is based on highly innovative technology using a Zigzag-Connected Chopper (ZCC) Converter.”**

Feed-in tariffs pay eligible producers a guaranteed price for any renewable electricity they generate. This makes it very attractive for both businesses and home-owners to generate electricity for their own use, selling any surplus into regional or national electricity grids.

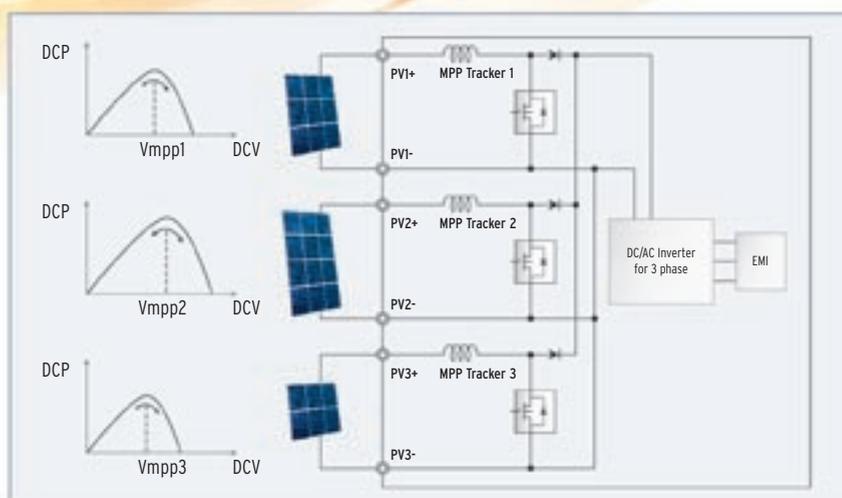
Other European countries have followed Germany's lead, notably Spain, Portugal, Italy, France and Greece, and step-by-step electricity consumers are taking advantage of the system and switching to solar electricity generation.

The problem is that the output from PV cells is DC power, whereas national grid systems invariably require AC power. This means that a conversion method is needed to deliver AC power on to the grid,

and typically a solar inverter is used. As it lies at the core of the photovoltaic plant, the efficiency and reliability of the inverter is vitally important. Omron has developed a range of solutions for photovoltaic plants, including solar inverters. The latest of which is the KP100L, which offers substantial performance benefits.



You can now order the new KP100L brochure on:  
[www.industrial.omron.eu](http://www.industrial.omron.eu)



### Highly innovative technology

The KP100L can be used with different types of solar modules, so that installations can be established to take advantage of local conditions. This has been achieved through highly innovative technology using a Zigzag-Connected Chopper (ZCC) Converter invented by Dr. Hideaki Fujita of the Tokyo Institute of Technology. This reduces switching losses – a problem with previous converters – and allows three Maximum Power Point Tracking (MPPT) devices to be used. These are essentially boosters, which step up the DC input voltage to a higher DC output voltage. The KP100L is the only solar inverter to use ZCC circuitry.

The design of the KP100L enables it to search for the operating voltage that will produce the maximum output power when the ZCC technology converts the DC input voltage to AC power. This is important because the output power of solar modules varies according to the amount of sunlight and the temperature of the modules. High power-generation and flexible arrangements of the PV cells is possible, ensuring an ideal combination of maximum output power and optimum efficiency. This allows the KP100L to be used in virtually any type of fixed solar power installation, from 10KW up to several megawatts.

*The KP100L has 3 individual MPP (Maximum Power Point) trackers, which convert PV input into a common BUS voltage and search for the maximum power point of PV input at all times. Designers can connect differently aligned PV strings as a DC input from a wide MPP voltage range.*

It's also suitable for solar tracker plants, such as those where the Omron MX2 inverter is used with panels that move with the orbit of the planet so that they point at the sun for the maximum amount of time.

With devices such as the KP100L, the use of photovoltaic plants is becoming increasingly viable for businesses, which can benefit from reduced energy costs, at the same time as minimising their environmental footprint. The wide availability of feed-in tariffs, allowing excess capacity to be sold into the local grid, makes solar energy even more attractive.

# Solar tracking – making the most of the sun’s energy



## quickinfo

Omron has a comprehensive range of products for the automation and control of solar trackers, including:

- PLCs
- solar inverters
- switch mode power supplies
- limit switches
- low-voltage switchgear
- proximity switches
- temperature sensors
- servo motors
- inverters
- relays
- push buttons
- safety switches

Dedicated software, engineered by Omron, integrates the equipment, to maximise efficiency and ensure accurate tracking.

Many recent developments have improved the efficiency with which solar energy is collected. One of the most important of these is the tracker system, which automatically points solar panels directly at the sun. German manufacturer Danzer, with help from Omron, is a leader in this field.

There’s now a broad range of photovoltaic systems, ranging from the very small – providing power for individual pieces of equipment – to large plants generating electricity for entire communities. Solar panels are usually deployed in rows, and are fixed in position. However, solar trackers have automated systems that adjust the attitude of the panels so they always point towards the sun, ensuring that sunlight falls vertically on to the solar cells. The effect is impressive: solar systems with integrated tracking systems are up to 35% more efficient than fixed systems.

German specialist Danzer Elektro Solar manufactures a comprehensive range of solar-tracking systems, and with in-house design and production facilities they can adapt these to meet the needs of any individual customer. A fundamental consideration in the effectiveness of any tracking system is the automation equipment and software, and at the heart of Danzer’s system is the Omron CP1L PLC. This replaced a four-quadrant diode-controller, which was affected by clouds and by dust and dirt.

Danzer Solartechnik GmbH & Co.KG  
Neufahrn, Germany  
[www.danzer-energie.de](http://www.danzer-energie.de)



*The inaugural Solar Decathlon Europe took place on the waterfront close to Madrid's Royal Palace*



A solar-powered house designed by The Cardenal Herrera CEU University and developed with Omron was most popular with visitors to the Solar Decathlon Europe 2010.

## Competing for energy-efficiency

The Solar Decathlon is sponsored by the US Department of Energy, and challenges 20 college teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive. The first Solar Decathlon was held in 2002, and since 2005 has been held in the USA every two years. In 2010, following an agreement with the Spanish Government, the Solar Decathlon Europe was introduced, and will run in alternate years to the original competition.

Universities from Europe, America and Asia took part in the Solar Decathlon Europe 2010, which was held in Madrid. During the ten-day event, more than 190,000 people visited the Villa Solar, as the site near the Palacio

Real was named. The 17 teams were each tasked with designing and building energy-efficient homes that were both habitable and economically feasible. Homes were assessed in ten different categories, ranging from affordability to engineering, and visitors to the show were also asked to pick their favourite.

### **Viable and popular**

The home developed by the Cardenal Herrera CEU University of Valencia was awarded the highest number of votes by visitors. It also scored well in a number of assessment categories, including industrialisation and market viability, where it won first prize, and in architecture, engineering, construction and innovation.

Sustainability of the house was based on five key attributes: the use of solar power; reduced energy consumption; increased energy efficiency; the use of non-hazardous, reusable and environmentally sustainable materials; and optimised water use. Comfort (one of the assessment categories) was achieved through passive bioclimatic systems including natural lighting and cross-ventilation.

Several innovative solutions were developed to minimise energy consumption, such as integrating solar panels into the house's façades. In addition, the 70 m<sup>2</sup> roof has a hybrid system of fixed solar energy collectors and overlapping photovoltaic units.

*Solar panels are integrated into the façades of the house*



*The “intelligent roof” has three different types of solar collector, which can be separately deployed to meet the energy requirements of the house at any one time*

*The energy control system is managed by an Omron CJ1 PLC located in the kitchen of the house*

These automatically unfold to meet the house’s energy needs at any particular time, and combine three different systems:

- Hybrid photovoltaic and photo-thermal blocks, which make the solar energy collection more flexible
- Purely thermal blocks with concentrating mirrors, to provide hot water
- Purely photovoltaic blocks

The thermal roof can be maximised during the winter months to enable the solar collectors to make the most of even diffuse radiation. When heating is not required, the roof can be used to collect photovoltaic energy for later use.

### **Climate control using solar cooling**

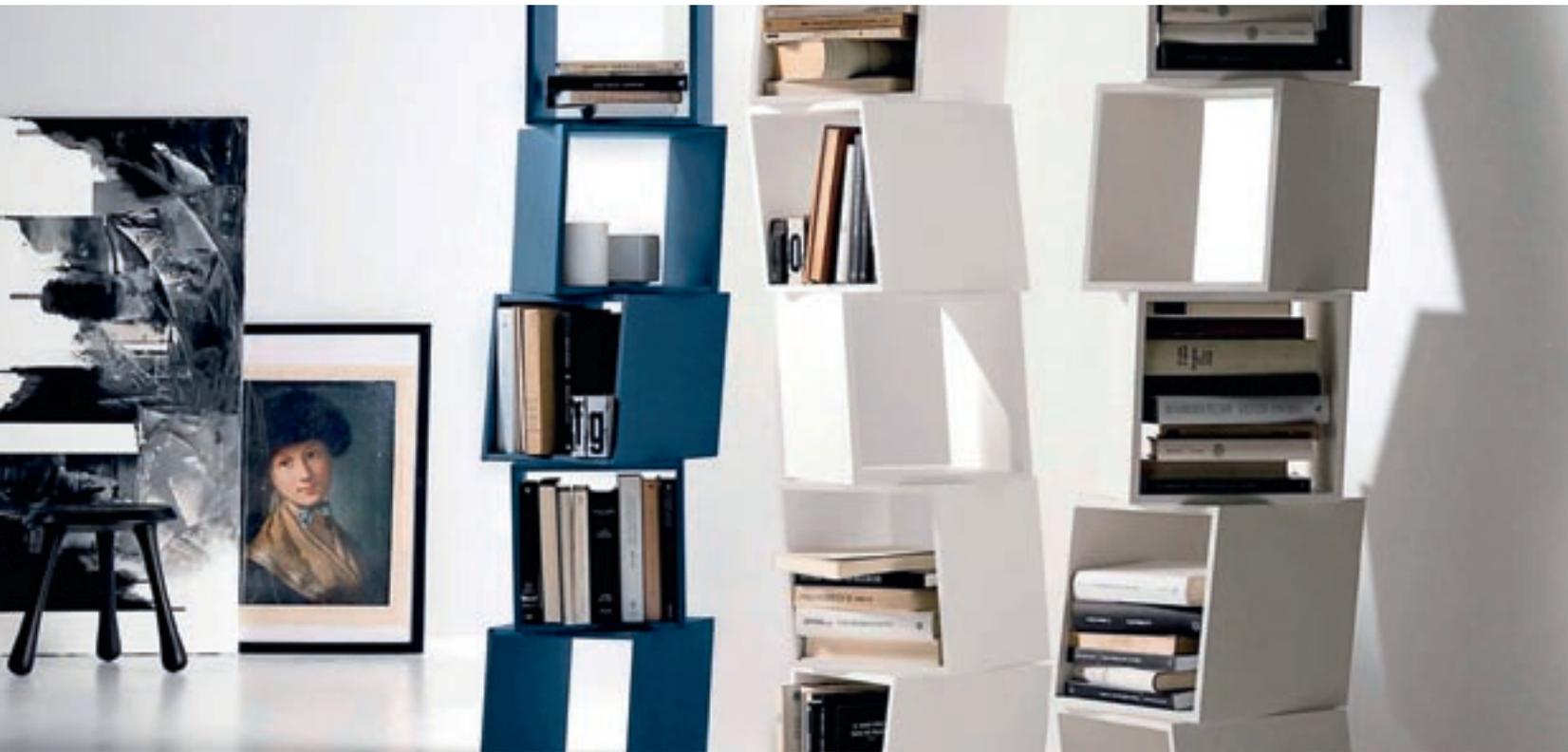
A solar cooling system was developed to provide internal climate control, with hot rising air being cooled through cold water pipes that run through the ceiling of the house. This cold water comes from an absorption machine that is fed with water at 90° C from the house’s solar collection thermal system. This “virtuous circle” supports the

designers’ objective of zero energy consumption.

The house featured a thermal oven. This has a series of oil-carrying pipes, with the fluid heated by solar thermal collectors. The latest version of this oven, which uses food-grade oil, can deliver temperatures of up to 240° C.

Through its office in Valencia, Omron Electronics Iberia collaborated closely with the University on the development of the house. In addition to technical advice, Omron supplied innovative and advanced control equipment – CJ1 PLCs, and NS5/NS10 programmable touch-screen terminals – which manage the energy distribution, and the management of the intelligent roof. An Omron frequency inverter controls the speed of the oil in the thermal oven, the operation of which is managed by a NS5 programmable terminal: both devices are connected to an Omron CJ1 PLC.

# Big savings from more energy-efficient dust extraction



Emmebi, a well-established Italian manufacturer of high-quality interior design products, cut its power consumption by 25% by simply installing Omron inverters to control extractor fans.

Brianza, the heartland of the Italian furniture industry, is home to Emmebi, a family business manufacturing furniture that combines attractive design, craftsmanship and the use of modern industrial processes. The company's headquarters is based in Cesano Maderno, which also houses the joinery and finishing shops. Here Emmebi has invested in a powerful dust-extraction system that can trap even the finest and lightest particles of wood-dust. This kind of system is vital for maintaining a safe working environment and to avoid damage to production equipment.

About 18 months ago, Luca Peverelli, manager of the Cesano Maderno production facility, undertook an analysis of the dust-extraction system's electricity consumption, working with Mipro, an Omron Solution Partner. The extraction system consists of three extraction fans, each powered by a 45 kW motor, and it ran throughout the day, with a short break at lunchtime. The annual power consumption was about 260 MWh, and cost more than 30,000 €.

### Using 25% less power for the same performance

“The Omron evaluation software made it clear that there was plenty of room for improvement,” says Luca Peverelli, and by fitting inverters to the three motors it was possible to run them at a lower speed with no loss of performance. The lower speed meant 25% less power was needed to run the motors. What’s more, the inverters allow the extractor fans to be started and stopped without problems during the day to meet production requirements. According to Luca Peverelli, “We couldn’t do this before, as we wanted to avoid electrical and mechanical stresses caused by current peaks on starting.”

The operating frequency can be reduced even further when the production processes are creating only small amounts of sawdust and chips, and this enables even greater energy savings to be made. At times the three motors only need to draw about 15 kW each, a third of the nominal power. In the first 12 months of running the extraction system with inverters, Emmebi cut its power consumption to about 100 MWh, a substantial saving which meant the installation more than paid for itself during this time.

### More comfortable working environment

A reduction in energy usage is not the only benefit of using inverters to control the extraction-fan motors. By reducing the frequency of operation, and cutting the speed of the extractor

fans, noise levels have been greatly reduced, improving the working conditions in the building. The other positive result is that maintenance work has been virtually eliminated. This is in part because the use of inverters meant there was no need for the outdated electricity distribution board which was previously used, and which needed regular attention. The motors are now subject to far less starting stress and run at lower power levels, so a maintenance-free future seems assured.

What Emmebi’s experience shows is that intelligent energy management is not a matter of a “quick fix”. Instead it involves a step-by-step process of identifying all the elements in a production process where efficiency improvements can be made. Luca Peverelli says that the work done on the extraction system is just the first action to be taken. “Next, we want to look at our paint booths,” he says, “because the fans, extractors and compressors run continuously, even though there are active and passive periods. The paint booths use less power than the dust extractors, but they are still using energy unnecessarily.”

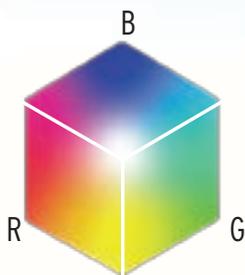
It’s clear that there are multiple benefits to cutting energy usage, and not just financial ones. Long-term, Emmebi will consider all the possible opportunities for savings and optimisation, using the dust-extraction success as a template.

Emmebi industria Mobili  
Cesano Maderno, Italy  
[www.emmebidesign.com](http://www.emmebidesign.com)

**EmmeBi**



# Sustainable production thanks to industrial image processing



In the past, the automation industry focused on increasing productivity by lowering manufacturing costs. The growing shortage of resources and the effects of industrial production on the environment have, however, led to a significant rethink. The factory of the future will be designed to achieve maximum efficiency in productivity with minimum material and energy consumption. One of the key technologies that will deliver this added value is image processing.

Products do not only consume energy during their final use. In the manufacturing process itself, the consumption of energy and the use of raw materials are considerable. Through image processing technology, it is possible to effectively intervene in production processes at an early stage. Faulty parts can be detected early, which avoids further processing, thereby preventing material wastage and reducing costs. In many cases, separated reject parts can be returned to the production process. Experts believe that in the future due to the use of industrial image processing up to 10% cost saving is possible. Image processing systems also enable 100% quality control and thus seamless documentation and traceability of the individual production steps.

## True-colour detection for consistent quality

One of the most significant innovations in the field of image processing during recent years is true-colour processing. This technology is particularly effective when decisions need to be made based on colour characteristics. This



is particularly advantageous, for example, in the food industry during the production of bakery products. In order to precisely determine when a

subjective assessment of individual workers. Moreover, the required baking status can now be achieved more rapidly.

An image processing sensor with true-colour processing converts colour data into digital RGB values. If, for example, a colour is registered as  $R=225$ ,  $G=150$ ,  $B=130$ , a different threshold can be determined for each of these values. In addition to information such as temperature and conveyor belt speed, the recipe for the

“Experts believe that in the future due to the use of industrial image processing up to 10% cost saving is possible.”

biscuit is fully baked, one leading manufacturer uses image processing sensors in its conveyor belts. This has two decisive advantages: Firstly, it is possible here to determine an unequivocal reference value for the colour of the biscuits following the baking process in order to rule out the uncertainties associated with the

biscuits now also includes R, G and B data from the image processing sensor, permitting closed-loop control for the faultless achievement of the required baking status. As a result, the company has succeeded in significantly reducing its consumption of flour, sugar, dairy products, water and energy. This not only represents



an improvement in business terms, but also a contribution to environmental protection, a goal that the company also pursues in conjunction with the conversion to image processing aided bakery production.

## quickinfo

### True-colour systems

With true-colour detection, all 256 graduations of the RGB colours are processed directly, so that more than 16 million colours can be detected and minimal colour deviations in objects can be identified. The user profits from reliable inspection results, even in the case of difficult lighting conditions, shiny surfaces, or low contrast between object and background. Omron's vision sensors and image processing systems are equipped with this technology.



For further information please order our Vision Product Brochure or visit our website [www.industrial.omron.eu](http://www.industrial.omron.eu)



## Saving money and cutting pollution: win-win!

Italian waste-recycling specialist Ecodeco has converted more than a megawatt of power at its Cortelona plant to an inverter system, yielding considerable financial savings while eliminating almost 600 tonnes of CO<sub>2</sub> emissions a year.



Ecodeco  
Giussago (PV), Italy  
[www.ecodeco.it](http://www.ecodeco.it)

Ecodeco, which has been part of Italy's leading energy group A2A since 2008, was set up in the late 1970s, helping businesses to comply with early environmental legislation. In particular, Ecodeco devised modified production processes that resulted in fewer by-products, or in by-products that could be used by other businesses. The company now specialises in all aspects of designing,

making and managing waste-disposal systems.

At its site at Cortelona, Lombardy, Ecodeco operates a sludge treatment plant, a plant for converting urban waste into refuse-derived fuel (RDF), and a waste-to-energy plant. RDF is a complex product which has a range of different calorific values – a measure of its heat-generating capabilities



*Fans provide steam cooling, turning it into water*

– depending on the original waste material.

At Cortecolona, RDF is fed into the waste-to-energy furnace using a batching system, varying the amount delivered according to its calorific value. At the base of the furnace is 1.5 m of sand which is “fluidised” by pumping air in from below: this makes the sand “boil” like a fluid, and mix with the RDF.

### **Producing 8.5 MW from urban waste**

This is a highly combustible mixture which has good heat-exchange distribution. It is used to produce steam that drives a turbine generating about 8.5 MW of electricity under normal conditions. As it leaves the turbine, the steam is forced into a cooling tower where a series of twelve fans cool it, converting it back to water, that is pumped back to the waste-to-energy plant and recycled through the system.

Plants like this use many electric motors, often operating at high power: as said above, there are twelve 22 kW fans cooling the steam into the cooling tower, three 160 kW motors for the pumps sending the cooled water back to the heat generator, and 185 kW motors for each of the two boiler-feed pumps. In total, the power requirement was 1,114 kW.

Ecodeco wanted to reduce this electricity consumption, but without affecting the amount of energy

produced. Omron was asked to advise on a suitable solution. This was complicated by the fact that the three 160 kW motors which send the cooled water back to the waste-to-energy plant are about 120 m from the electricity distribution board. Omron’s solution would need to use the existing wiring, to avoid major excavation work and the cost of new cables.

The solution involved the use of Omron inverters to modulate the frequencies of the different motors while maintaining pressures at a constant level. For the three recirculation pumps, and the two boiler-feed pumps, the inverters simply replaced the throttle valves, so there was no need to dig up and replace any of the wiring.

### **Exceptional reduction in power consumption**

There is no impact at all on the plant’s generating capability, but the reduction in power consumption is exceptional. The Omron equipment cuts the annual electricity usage from 6152 MWh to 5328 MWh, which saves Ecodeco almost 100,000 € at current prices. Ecodeco have calculated that the total investment will pay for itself within about 13 months.

The energy and financial savings are not the only important aspect of this solution. As the operator of a waste-to-energy plant, Ecodeco are very conscious of their position in the sustainability chain. Generating a

single MWh of electricity by conventional methods causes about 725 kg of CO<sub>2</sub> emissions, so by cutting its annual consumption by 824 MWh, it has also reduced CO<sub>2</sub> emissions by almost 600 tonnes. This single project has saved energy, cut costs, and helped to protect the environment. Win-win!



# Maximising the efficiency of unique wind turbines!

Leitwind wind turbines use an innovative direct-drive system to produce wind-generated electricity in a highly efficient manner. Now, by using Omron technology, the benefits of this efficiency have been maximised, while maintenance times have been substantially reduced.

LEITWIND AG  
Sterzing (Bozen), Italy  
[www.leitwind.com](http://www.leitwind.com)

In 1888, Gabriel Leitner, a mechanic in the Italian town of Sterzing, close to the Austrian border, set up a small engineering business. Over the next hundred years, the company – now known as Leitner Technologies – grew to become a global player in the field of ropeway engineering, making ski-lifts, cable-cars, and urban cableways – as well as snow-grooming equipment.

In the early years of this century, Leitner began to look at ways to take advantage of the synergies between ropeway and wind turbine technologies. It established a

separate division, Leitwind, and developed an innovative wind turbine based on a direct-drive generator: the first of these was produced and installed in 2003.

The major advantage of the Leitwind turbine stems from the patented direct-drive mechanism, which operates on a permanent-induction synchronous generator. This gearless/brushless system maximises the efficiency of power generation by substantially reducing the mechanical and electrical losses associated with indirect drives. There are fewer moving parts, so maintenance is also

reduced, resulting in lower service costs and improved reliability.

### **Maintaining accuracy is critical**

One critical aspect of the system is the need to ensure an accurate gap – phase register – between the rotating and static parts of the generator. This is because even small variations – less than 0.1 mm – from the optimum gap size can cause a significant loss of generating capacity. Therefore, measurement and control of the gap is one of the key operations performed by Leitwind technicians during installation and maintenance of the turbines.

Until fairly recently, the engineers used tools such as feeler gauges to carry out these checks, which is not particularly accurate and – because tests are sometimes conducted on the moving generator – potentially risky.

With the involvement of Omron engineers and designers, a more efficient and effective method of measurement has now been developed. This is based on the Omron ZG2 Laser Sensor, integrated with three servo-motors. The ZG2 provides accurate profiling and measurement of the generator sections, to detect any variations from the optimum gap, and the servo-motors make the necessary adjustments to correct any variations from the norm. It's a non-contact system that provides immediate – and highly accurate – feedback on the status of the generator, eliminating the need for a monthly inspection.

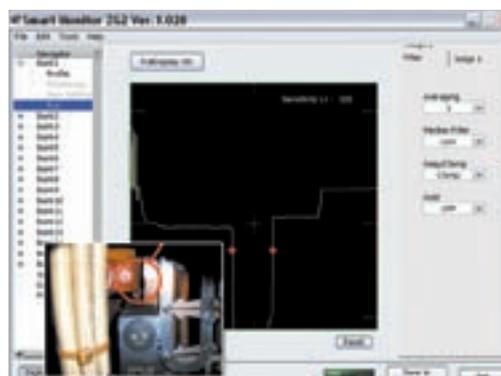
As the illustration shows, the system provides a detailed visual of the gap to be measured, and the related 2D profile acquired by the sensor. With a 22 mm sensing area, the required width and direction resolution are delivered as required. The illustration also shows how difficult it would be to get an accurate measurement using a tool such as a feeler gauge.

### **Faster, safer, more reliable: real long-term benefits**

The first trials of the ZG2 Laser Sensor system have now been completed, and Leitwind technicians and engineers have been unanimous in acknowledging its ease of use, compact size and user-friendly software. The system's resolution, and the fact that it delivers continuous measurements, mean that measurement is now faster and more reliable, and because it's a non-contact system, it's also totally safe – even when the turbine is rotating.

**“With the involvement of Omron engineers and designers, a more efficient and effective method of measurement has now been developed.”**

The long-term benefits are also clear. The system profiles the complete circumference of the rotating element, checking for any misalignments, and provides data-logging through a PC network for analysis of performance over time. This will help identify any continuing issues, as well as drastically reducing the time spent on maintenance.



*The gap to be measured and the related 2D profile acquired by the sensor*



*Leitwind Headquarters*

# High energy savings with Omron frequency inverters



Optimising speed levels of air group fans results in considerable savings as it reduces energy consumption and increases the well-being of employees in the workplace. The reduced CO<sub>2</sub> emissions resulting from these savings perfectly fits the "green strategy" of the company.

Panasonic Energy Company Belgium in Tessenderlo is one of the four global production sites for Panasonic's alkaline batteries. With an annual turnover of € 89 million, this site is the biggest producer of alkaline batteries within the Panasonic Group. By recently installing approximately 20 frequency inverters on the heating and air-conditioning systems, Panasonic has made significant advances in saving energy and managed to achieve a considerable reduction in CO<sub>2</sub> emissions.

Everything has been implemented within a relatively short time span, thanks to a well-considered strategy and action plan. A good reason for Technology & Trends to visit Tessenderlo and interview the two supervisors of this Panasonic project: Peter Vanderheiden, Plant Engineer and Patrick Neuteleers, Project Manager Electrical Department.

"Panasonic will be 100 years old in 2018", says Mr Neuteleers. "Several years ago, Panasonic included in its company goals that it wanted to be the

Panasonic  
Energy Company Tessenderlo  
Belgium  
[www.panasonic-batteries.com](http://www.panasonic-batteries.com)



most sustainable and innovating company in its sector by 2018.”

Protection of the environment is a high priority and in the Green Business Innovation strategy, Panasonic not only made it its objective to produce as economically as possible, in as little time as possible and with as little waste as possible, but to also do this without emitting CO<sub>2</sub>.

In order to succeed in these goals, all options to produce in a more sustainable way are being investigated. One of the aspects that came to light here was the air-conditioning system.

“Up to 2008,” says Mr Vanderheiden, “all air conditioning units operated the whole year round at full speed (50 hertz), whether work was being done at the factory or not. Because of a new awareness and initiatives to save energy, the first step was to switch off the systems on non-production days. In comparison with the previous annual consumption, this already

yielded a saving of 25% of the total energy consumption for the air-conditioning systems. By means of key switches, operators could easily switch off the air conditioning units when certain production departments were not producing. However, the problem remained that we did not really have an intermediate solution and the air conditioning units either

**“The systems operate more quietly, the air movement is much smaller and above all, exponentially less energy is used.”**

worked at full speed, or were switched off. There was no other option.” Neuteleers adds: “The key switches also had another disadvantage. The enormous peak in energy consumption due to all air conditioning units starting at full speed immediately when starting the system had negative effects on the total power supply.”



### Test project

However, due to the considerable advantages already achieved by selectively switching off the air groups, the idea that more savings were possible was conceived. When the air conditioning units operate at full speed with 6 refreshments per hour, then in fact 80,000 m<sup>3</sup> of air is sucked out of the space 6 times per hour and blown back into it again. “That is a considerable airflow and when, after the packaging department had been reorganised, some of our employees complained about draughts, we thought this needed closer investigation,” Neuteleers reports. “At that time we also contacted Omron to see whether they had any ideas and suggestions for this problem.” Omron has been Panasonic’s preferred supplier for process engineering for years and came up with the solution of installing a frequency inverter on the system. Vanderheiden: “With the frequency inverter, we are able to control the operating frequency of the

air-conditioning system. We chose a frequency inverter with 4 settings, i.e. 30, 37, 44 and 50 hertz. Through trial and error, we set the optimum frequency. Working with lower frequencies has great advantages.

“With the frequency inverter, we are able to control the operating frequency of the air-conditioning system.”

The systems operate more quietly, the air movement is much smaller and above all, exponentially less energy is used. In the packaging department alone, the installation of frequency inverters achieved a saving of 109,000 kWh. Within 8 months, the investment costs for the test project were therefore recouped.”

### Payback time

Due to the enormous success during the test project, it was decided halfway through the trial period to install frequency inverters on all air-conditioning units. Furthermore, this fitted in perfectly with Panasonic's policy to become the most sustainable company in the technology sector in 2018.

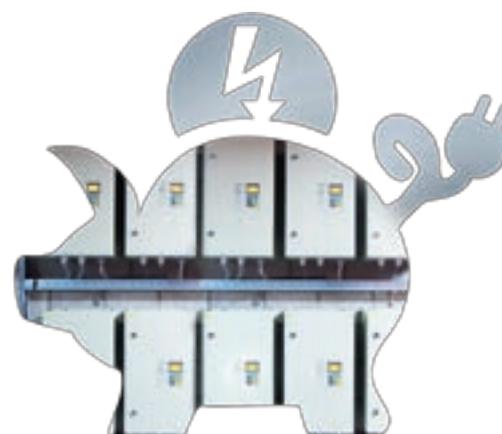
air-conditioning units have been provided with frequency inverters. In total, about 20 frequency inverters have been installed. Vanderheiden: "Savings on our annual energy consumption are huge. With the original solution, we had an annual consumption of 1.7 MWh, the key switches reduced this to 1.3 MWh and now, with the frequency inverters, we arrive at 0.85 MWh.

inverters, we haven't heard these complaints anymore."

"...investment costs have been recouped completely in just over 2 years."

Vanderheiden: "Installing the frequency inverters throughout the whole plant was not as simple as it seemed. Omron inspected all motors and adjusted the type of frequency inverter accordingly. In the first instance, it was decided not to install output filters between the motors and the frequency inverters, but these could always be added later, if required." In the meantime, 13

The energy consumption has been halved in 2 years, which means that the investment costs have been recouped completely in just over 2 years." Neuteleers adds: "The well-being of our employees has also improved. Previously employees complained about noise and draughts, but following the switch to frequency



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# Environmental protection is social responsibility

## At work for a better life, a better world for all

These words, conceived by Omron's founder Kazuma Tateisi, were adopted as the company's motto. Dr. Tateisi pioneered the idea that a company should fulfill its responsibility to society rather than solely focusing on productivity, efficiency, sales and profits. We recognize that the pursuit of harmonious coexistence with the environment is part of our responsibility towards society.

### **Providing environmentally safe products to the world**

Our policy is to offer environmentally safe products, guaranteed to be free from any banned substances, to customers all over the world. In accordance with this policy, we purchase environmentally friendly materials, fixtures, and fittings.

### **Expanding the use of renewable energy**

Solar and wind power represent sources of unlimited renewable energy that do not discharge CO<sub>2</sub>, a major cause of global warming, into the atmosphere. We invest heavily in the research and development of new technology to increase the use of renewable energy.

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