IEC e-tech

News & views from the IEC

ISSUE 04/2015

MANUFACTURING & BIG DATA

TECHNOLOGY FOCUS

Thwarting cyberattacks

What's new in robotics?

Benefits of the Cloud for industry

INDUSTRY SPOTLIGHT

Connecting machines, IoT and the Cloud

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Calling Young Professionals to Minsk

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IEC WORLD

WSC Conformity Assessment Workshop

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Manufacturing & Big Data

The focus of issue 04/2015 of *e-tech* is on manufacturing and Big Data. Manufacturing is entering a new era in which formerly separate manufacturing processes combine to produce intelligent data. ICT is increasingly transforming manufacturing into highly automated and IT-driven processes, in a concept of change generally referred to as smart manufacturing.

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Billions of connections

How manufacturing can benefit from Big Data and IoT

Claire Marchand
Managing Editor **e-tech**

Issue 04/2015 of e-tech focuses on manufacturing and Big Data.

A new era

Manufacturing has entered in a new era in which formerly separate manufacturing processes combine to produce intelligent data. Information and communications technology is increasingly transforming manufacturing into highly automated and IT-driven processes, in a concept of change generally referred to as smart manufacturing.

More and more devices are being connected through wired and wireless sensor networks. This multitude of connected smart objects has led to the Internet of Things (IoT), a trend that is increasingly attracting the attention and investments of several governments, companies and academia.

The keyword here is sensor. Without sensors, no smart anything. They are the key element that enables device-to-device communication. They enable the collection and analysis of huge amounts of data.

Opportunities and connections

The combination of Big Data and IoT presents countless opportunities for the manufacturing sector. Together they can track complex manufacturing processes and help increase yields while reducing costs. They can monitor product performance, which can lead to product improvement and innovation.

IoT is bound to have a major impact on businesses and individuals in the next five years. According to Gartner, 3,9 billion connected things were in use in 2014 and the figure is expected to rise to 25 billion by 2020!

This issue takes a closer look at the development of cobots or collaborative robots, the integration of the Cloud in businesses, innovations and safety in industrial automation, and how government and industry can mitigate risks posed by cyberattacks. Several IEC Technical Committees and Subcommittees prepare International Standards in these fields.

Manufacturing has entered in a new era in which formerly separate manufacturing processes combine to produce intelligent data

More and more devices are being connected through wired and wireless sensor networks, leading to the Internet of Things (IoT)

No rest in efforts to thwart cyberattacks

IEC works to hinder IT security risks to industry and institutions

Morand Fachot

Following a surge in instances of attacks targeting government, organizations and private computer systems, cybersecurity threats are emerging as a major issue for economies and societies. Through its standardization and conformity assessment (CA) work, the IEC is taking steps to mitigate the risks posed by cyberthreats.

New IEC Standard aims at protecting nuclear power plants from cyberattacks

Multifaceted risks for government, industry and even individuals

Hardly a week goes by without news of a major security breach affecting an institution. Many of the attacks are aimed at financial services, where the most lucrative pickings are to be made. However, many other industries report security breach attempts made via their IT networks. These often concentrate on pilfering commercial or trade secrets.

Cyberattacks are seen as a growing threat for financial systems everywhere. In its 2015 annual report, the US Financial Stability Oversight Council warns that "malicious cyber activity is likely to continue in the future (…) more concerning is the prospect of a more destructive incident that could impair [US] financial sector operations".

A 2014 Information Security Breaches Survey, commissioned by the UK Department for Business, Innovation and Skills and conducted by PWC, revealed that 81% of large organizations and 60% of small businesses in the UK had been victims of an information security breach during the year. The average cost of the worst breach suffered was up significantly over the figure in the previous year, nearly doubling for small businesses as well as for large organizations. The same is reported in other countries.

Energy suppliers and power grids are seen as a target of choice for state and non-state cybercriminals, seeking to cripple a country's economy and disrupt everyday life.

Individuals are also at risk of attacks aimed at gaining access to personal or financial details or of viruses such as "ransomware" that encrypt their computers' content so as to blackmail them into making a payment to have it decrypted.

Another potential risk for institutions, companies and individuals is reputational damage when confidential information is made public.

IEC work key to protecting infrastructure IT systems

The IEC is aware of the risks cyberattacks pose and has launched a number of initiatives and developed International Standards to combat these. As cybersecurity is of prime importance for industrial safety, IEC Technical Committee (TC) 65: Industrial-process measurement, control and automation, has developed the IEC 62443 series of standards on *Industrial Communication Networks – Network and System Security*.

Energy installations, nuclear power plants in particular, are also seen as prime targets for state and non-state cyberattacks. To address this risk, IEC Subcommittee (SC) 45A: Instrumentation, control and electrical systems of nuclear facilities, published IEC 62645:2014, *Nuclear power plants – Instrumentation and control systems – Requirements for security programmes for computer-based systems*. IEC 62645 is the first IEC International Standard aimed at defining "adequate programmatic measures for the prevention of, detection of, and reaction to malicious acts by cyber-attacks".

Hackers target firms, institutions and individuals

SC 45A is also preparing an International Standard concerning requirements for coordinating safety and cybersecurity for instrumentation and control systems of nuclear power plants.

Significant international standardization in the field of IT security techniques is carried out by ISO/IEC JTC 1/SC 27, an SC of the Joint Technical Committee (JTC) set up by the IEC and the International Organization for Standardization (ISO) to work on International Standards for information technology.

The second edition of ISO/IEC 27001:2013, *Information technology – Security techniques – Information security management systems – Requirements*, published by the SC, "specifies the requirements for establishing, implementing, maintaining and continually improving an information security management system within the context of the organization".

The importance the IEC attaches to cybersecurity was highlighted by the decisions taken last year to create two entities.

IEC Standardization Management Board (SMB) agreed to set up a new Advisory Committee on Security (ACSEC) at the 2014 IEC General Meeting. Its scope includes dealing with information security and data privacy matters which are not specific to a single IEC TC; coordinating activities related to information security and data privacy; providing guidance to TC/SCs for implementation of information security and data privacy in a general perspective and for specific sectors. ACSEC held its first meeting in May 2015.

IEC Conformity Assessment Board (CAB) set up a Working Group, WG 17, on cybersecurity in June 2014. The WG, which may also involve participation by members of the IECEE WG 3: Industrial automation, held its second meeting in February 2015.

Together with IEC International Standards on cybersecurity, ISO/IEC JTC 1/SC 27 publications in the information security management systems (ISMS) family of standards and work by IEC CAB WG 17 will play a key role in enhancing cybersecurity in the future.

Data centres strive to limit risks from cyberattacks

Embracing cage-free colleagues

A new breed of robot is extending the benefits of automated industry to smaller manufacturers

Baxter by Rethink Robots

Antoinette Price

Advances in the development of cobots or collaborative robots, capable of working safely with humans along assembly lines, is paving the way for smaller businesses to become more streamlined and competitive.

Automating production

Industrial robots have come a long way since the first robotic arm was developed in 1957 by Unimate in Sweden and used in the world's first production line at General Motors, New Jersey, USA.

The next five decades saw many innovations which broadened the robots' repertoire from sequencing, stacking, painting and spot welding to machines offering far greater flexibility as a result of using six electromechanically-driven axes. Robots equipped with dynamic vision sensors could move objects, while touch and force-sensing capabilities enabled them to guide pins into holes at one pin per second. The advent of the dual arm robot facilitated working with much smaller parts, and a robot able to pick up a record 120 objects/min was developed.

Sensory machines

Sensors are the devices that enable robots to perform many of the tasks they undertake. In some of the most cutting-edge robots, embedded sensors allow the machines to feel their way and place parts into a fixture or recognize and adjust to subtle changes while they work, just as humans do.

IEC standardization and conformity assessment contribute significantly to this technology. Manufacturers can build more reliable, efficient and safe sensors and microelectromechanical systems (MEMS) thanks to International Standards prepared by IEC Technical Committee (TC) 47: Semiconductor devices and IEC Subcommittee (SC) 47F: Microelectromechanical systems.

A number of other IEC TCs prepare International Standards connected with specific areas of automated industry, including IEC TC 65: Industrial-process measurement, control and automation; IEC TC 2: Rotating machinery; IEC TC 17: Switchgear and controlgear; IEC TC 22: Power electronic systems and equipment; IEC TC 44: Safety of machinery - Electrotechnical aspects, and IEC TC 66: Safety of measuring, control and laboratory equipment.

Manufacturing game changers

According to the International Federation of Robotics (IFR), more than 1,1 million industrial robots work in factories around the world. In 2013 robot sales hit a global high, with a 12% increase, in the same year that China became the biggest market for robots with a 20% share of the total supply. Traditionally, industrial robots have served the automobile and electronics industries, although dual arm robots are being used increasingly in a number of small and medium enterprise (SME) sectors and are entering new global regions. In Brazil, for example, greater production capacity in the automotive industry has accelerated the pace of robot installations.

In some countries such as the US, these dextrous machines are changing the face of industrial automation as their use increases. In addition to being more competitive, SMEs can react quicker to market demands, thanks to key features including:

- Collaborative operation – working securely alongside people without the need for a safety cage and saving humans from carrying out dull or dangerous tasks
- Safety first – human touch shuts the robot down automatically, thanks to sensors
- Easy, intuitive programming – "teach mode" programming means anyone who can use a smart phone or tablet can get the robot working with little training
- Portability – relatively lightweight and compact robots adapt to their workspace, require less space and can be moved easily along the assembly process
- Low cost – a price tag of between USD 25-35 000 makes them viable for SMEs

Hospital roving robots

Robots are moving into new areas thanks to advances being made in automated technology.

At the University of Pittsburgh Medical Centre, a germ-zapping ultraviolet robot called Violet cleans patients and operating rooms after conventional cleaning by staff. Delivered in three five-minute cycles, ultraviolet C light destroys strong viruses and bacteria superbugs like methicillin-resistant Staphylococcus aureus (MRSA). Statistics from the Centers for Disease Control and Prevention, showing that 1 in 25 patients got some kind of infection during their hospital stay, prompted the USD 75 000 investment.

High-tech tug autonomous mobile robots navigate virtual paths at the University of California San Francisco, carrying linens, medicines and waste and cutting down on workplace injuries and costs. Laser, sonar and infrared sensors guide the 25 machines. Medicine delivery carts have biometric and code access features to ensure they go to the correct place. The robots need to charge for a minimum of four hours.

Going where humans can't

Robots can reach awkward, dangerous places and assess situations. During the Fukushima Daiichi nuclear power plant disaster, a robotic vacuum cleaner removed radioactive dirt from the reactors, while a small robot went inside a reactor to look for missing fuel rods, from where it sent back a report. A Japanese-invented snake shaped robot with cameras can probe narrow spaces and locate people trapped under rubble after natural disasters, and robots can defuse bombs or mines remotely with no risk to humans.

New generation of cobot by Universal Robots

Out of this world robotics

Robotics technology involves the design, construction, operation, and application of robots, and the robots rely upon computer systems for control, sensory feedback, and information processing. The technology is increasingly being incorporated into other devices, although this is not always recognized. The Lick Observatory in California, US, uses the Automatic Planet Finder (APF), a 2,4-metre automated telescope and enclosure and a high-resolution spectrograph to comb the solar system robotically for new planets in a way that people cannot. While speeding up the search for planets which could support human life, the technology also saves employees from sleepless nights and allows them to do the tasks APF can't.

Cars represent a further example of the wide applicability of the technology with their rapid progression to full automation as we head towards a driverless world.

Job creators or destroyers?

So are robots taking our jobs? Populations have always experienced times of job insecurity. Recessions, cheaper labour, depleting energy sources and evolving life styles are some of the reasons certain job sectors come under threat.

A report by market research company Metra Martech, which focuses on Brazil, China, Germany, Japan, Republic of Korea and the US, states that the one million industrial robots in operation have been responsible for directly creating close to three million jobs worldwide. They are expected to add to this in industries including consumer electronics, food, solar and wind power, advanced battery manufacturing and shipbuilding. The report reveals that

manufacturing is stronger in countries that continue to invest in robots, such as Germany, where the number of people employed in the automotive industry has increased.

In cases where robots have taken unsafe, repetitive tasks off humans, the latter have been given more responsibility and better paid jobs managing the robots. Machines and humans work in harmony, each doing what it excels at, resulting in greater employment and production and in a safer and more dynamic work environment.

Yumi collaborative dual-arm robot by ABB

Robo planet earth?

The future looks bright for robots and robotics, which are constantly improving and broadening their scope of application. The World Robotics – Industrial Robots 2014 report compiled by the International Federation of Robotics (IFR) says the next two years will see a 12% average increase of robot installations per year. Modernization of production facilities, human-machine collaboration, growing consumer markets requiring greater production capacity and the technological evolution of robotics are factors contributing to this expected growth.

From farm to table

Paying less for good bread

Morand Fachot

Industrial automation mainly evokes images of assembly lines where machines and robots put together, pack and dispatch semi-finished products or manufactured goods. Yet, one sector that rarely comes to mind, although it has experienced an unprecedented degree of automation and has a direct impact on the lives of hundreds of millions, is the food-processing industry. A striking example of this is provided by the bakery sector.

Grain silos are explosive-risk installations (Photo: Scott Davis)

Safer and more affordable food

Even if there are large disparities between countries, it is true overall that

Grain is gradually transformed into flour using roller and other mills (Photo Bühler AG)

the cost of food as a percentage of the total household budget is decreasing consistently. One of the key reasons is a growing trend for the massive automation in transforming produce into consumer-ready food products. Large scale automation in the food-processing industry has helped reduce waste and increase food safety all the way from the farm to consumers' tables.

This trend, obvious in developed economies, is also now being observed in emerging economies. Automation in all parts of the food-processing industry relies mainly on the introduction of electrical and electronic systems. International Standards for automation are developed by IEC Technical Committee (TC) 65: Industrial-process measurement, control and automation and its Subcommittees (SCs).

All about bread

Bread plays a crucial role in the diet of many people across the world. In some countries it is the staple food and makes up a sizeable share of household food expenditures. An increase in the price of bread resulting from cuts in subsidies or a rise in the price of cereals can provoke unrest. This was the case in the 2007 "tortilla riots" that followed the introduction of higher corn prices in Mexico, and in subsequent bread riots in many other regions of the world.

By contrast, the share of household income allocated to bread consumption in most industrialized countries has kept falling, and now represents just a fraction of overall expenditure on food. This is a result of massive automation throughout the whole production chain.

From grain to flour

With cereal crops forming the basis of the diet of 3,5 billion people around the world, bread is probably the most widespread food staple. Agricultural mechanization together with genetic selection has resulted in higher yields in grain production. Once harvested, grain must be stored for a certain period before being processed. Grains of all kinds are kept in special silos, an operation that presents certain safety risks as grain dusts make up an inflammable and potentially explosive mix. To prevent this hazard, electrical installations in grain storage facilities must meet stringent safety requirements to prevent such explosions. IEC TC 31: Equipment for explosive atmospheres, and its SCs, develop International Standards for the explosion-proof so-called Ex electrical installations fitted in grain storage facilities.

The next step in the bread-making process is the production of flour. The quality of the bread and other bakery products depends to a large extent on the quality of the flour, which requires specialist machines for its production. These machines include equipment destined to clean grain, to mill it and to sort the end products. Most of these machines are powered by electricity.

From silo to shelves in 24 hours...

Wide range of machines

Cleaning grain is a complex process that requires drum magnets and drum sieves designed to remove ferrous items from granular or mealy products as well as straw fragments, paper, pieces of wood, or maize cobs from fine- and coarse-grained bulk materials. Combi-cleaners and separators are used to remove all the material that deviates from the size of the grain kernel. In the final step of the cleaning process, an aspirator eliminates all low-density particles such as dust and husks. Once grain is cleaned it can be milled.

Milling of grain is carried out using mainly electrically operated rotating steel rollers and sieves to separate bran and germ from the endosperm, which will end up as white flour through gradual reduction. A wider choice of flours, including wholemeal, can be produced by mixing back bran and germ into white flour.

All machines used in cleaning and milling grain and in sorting out end products rely on electricity, most of them on rotating machinery for which International Standards are developed by IEC TC 2.

The whole procedure is highly automated, allowing mills to process vast quantities of grain around the clock. A single UK milling company transforms 6 000 tonnes of wheat into flour every day. This flour is then distributed either in bags or in bulk to both small-scale and industrial bakeries. Just as with grain storage in silos, the bulk transfer of flour in lorries from the mills requires explosion-proof equipment and special measures such as earthing of vehicles to prevent the build-up of potentially dangerous static electricity.

From flour to the loaf on the table

The transformation of flour into bread is an equally complex process that also requires a wide range of machines. The difference between industrial and small-scale bakeries is not only about the kind and quantity of bread they produce and the way it is distributed, but also the speed at which it is produced, and hence the range of equipment they both use.

Flour, water, yeast, salt and other ingredients are blended together using mixing machines; the flour is wetted evenly and immediately transformed into dough.

Once dough is ready, a process that is speeded up in industrial bakeries by submitting it to a succession of quick rises in temperatures followed by cooling periods, it is cut into smaller portions and baked.

Heating and baking equipment for the final baking processes uses a variety of sources of heat such as direct and indirect resistance heating, microwave heating, or infrared radiation heating. IEC TC 27: Industrial electroheating and electromagnetic processing, develops International Standards for this type of equipment.

Once bread is baked, the final stage in industrial bakeries consists in sorting, packing and dispatching products to the shops. This process is also highly automated, with equipment used in this phase including conveyor belts, automated packing machines and forklifts. International Standards for all components and systems for this equipment are developed by a number of IEC TCs. The highly-automated structure of industrial bakeries allows them to produce loaves in under four hours between flour delivery and packing and to ensure they are on shelves within 24 hours – all this at very low cost to consumers.

More than just bread

Automation in the food-processing industry extends well beyond the baking industry to include many other sectors such as the dairy industry, which makes extensive use of automated machinery from the cow-shed to the bottle of milk or to other dairy products.

Automatic milking systems, first introduced in the 1990s, are now in widespread use in dairy farms. They allow higher milk production as cows are now able to enter automated milking units by themselves when they feel the need to be milked.

Following milk collection from farms by wholesale distributors, milk is sent to large plants where it is processed, packaged and dispatched using automated installations that allow fresh milk to be on shops' shelves within a day of having left the farm.

Automation in the food-processing industry has given a greater number of people wider access to good-quality, safe products at an ever lower relative price. The IEC is playing an important part in this process by developing International Standards for a wide range of systems and equipment used throughout the whole industry.

No Cloud-free zone!

The Cloud is here to stay and is expected to bring significant benefits for industry and individuals alike

Morand Fachot

Mentions of "The Cloud" can be found every day as its significance increases for businesses, whether big or small, and for individuals. However confusion still reigns in most people's minds as to its definition and characteristics, with many not even realizing they have been using cloud applications for years. It is seen as offering significant economic advantages as well as presenting a number of challenges and issues that need addressing. The IEC has started working on this in some areas.

Elusive concept

Most people connected to computers or mobile devices such as tablets or smartphones use Internet-based cloud applications, whether to access mail or multimedia content on the go or to connect with friends or colleagues via social media. Yet for them the Cloud remains an abstract concept. Many are not even aware of what the Cloud means.

The business community, on the other hand, is aware of cloud computing and of its benefits. It makes it possible for small businesses to have access to extensive IT software and technical services solutions on a subscription basis, without having to rely on an expensive in-house infrastructure or full-time IT staff they cannot always afford. Furthermore, using a range of cloud-based platforms for storage or file exchange makes the technical needs of small businesses easily scalable.

Fast growing market

As more and more businesses, big and small, come to rely on cloud computing, spending on global cloud Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS) are expected to grow at a much higher rate than overall enterprise IT spending.

Gartner predicts that spending on IaaS will "reach almost USD 16,5 billion in 2015, an increase of 32,8% from 2014, with a compound annual growth rate (CAGR) from 2014 to 2019 forecast at 29,1%". IaaS is the segment with the highest growth in the cloud computing sector, but spending on SaaS and PaaS will also experience very healthy growth rates.

Cloud content can be accessed from anywhere and from many different devices (Photo: Lenovo)

Glocalization

Cloud computing makes it possible for businesses and individuals not physically close to one another to collaborate and share information and ideas. This decentralization of content and information allows small businesses to go global and global businesses to go local through awareness of local needs and realities.

It also gives individuals and businesses that do not have large IT resources the ability to benefit from additional computing power by linking to institutional machines. Students in some art and design schools now have access to university hosted cloud-based services designed to facilitate rapid rendering of complex 3D designs.

However, the wealth of data made available by cloud computing sometimes makes it difficult to sift through the clutter to select what is relevant. Tools to achieve this are still lacking.

Actually, where is the Cloud?

International regulation of cloud computing services is emerging as an

Art and design students use cloud-based rendering service to facilitate quick rendering of complex 3D designs

issue that is linked to different national regulations and to data security. Owners of data may be resident in one country, but their data may be held on cloud servers in one or more other countries. Examples of questions that are cropping up are: who owns the data, who controls it, what happens if data is moved from one country to another? These are issues that have yet to be tackled as cloud computing is relatively recent and, as usual, laws have to catch up with facts and reality.

Security

Security of data held on the Cloud is a major issue. Reports of some high-profile cases of intrusion into cloud storage systems and tampering with data have made users wary in terms of the integrity of the data they may be willing to keep on the Cloud.

However, IT security specialists point to the fact that there is a huge difference between the security approach of banks and of free file-sharing companies; the latter has a more lax approach to data security. The IEC has been involved in developing International Standards that are aimed at protecting IT systems from intrusion or mitigating their impact (see article on cybersecurity in this *e-tech*).

Greening the Cloud

One issue that is seldom noted is that IT in general, and now the fast expanding realm of cloud computing too, is not necessarily synonymous with green activities. In common with many other pieces of IT equipment, large data centres used by cloud and other storage services are high consumers of energy.

HP Moonshot server systems use 65% less power, 90% less space, 98% less cabling (Photo: HP)

The IT sector is responsible for 2% of CO_2 emissions, the same volume as the aviation industry. Solutions for reducing the carbon footprint of the IT sector, and in particular of data centres, can be found in introducing more economical servers that are up to 85% more energy efficient. Data centres can also be located in places/countries where renewable energies are available or where operators install renewable energy sources to cover part of their power needs.

International Standards key to cloud computing's future

A comprehensive overview of the importance of International Standards for cloud computing was given to *e-tech* in January 2014 by Don Deutsch, Chairman of Subcommittee 38: Distributed Application Platforms and Services, of Joint Technical Committee 1 on information technology, set up by the IEC and the International Organization for (ISO/IEC JTC 1/SC 38).

Deutsch stressed that standards were needed for clarity and interoperability and to guide the transition to cloud computing. He further indicated that ISO/IEC JTC 1/SC 38 was "uniquely positioned to serve as a consolidator of cloud computing standards because of the JTC 1 Publicly Available Specification (PAS) process. This allows specifications developed through consensus processes outside the formal structure to be transposed into JTC 1 and recognized as International Standards".

Many issues to be resolved

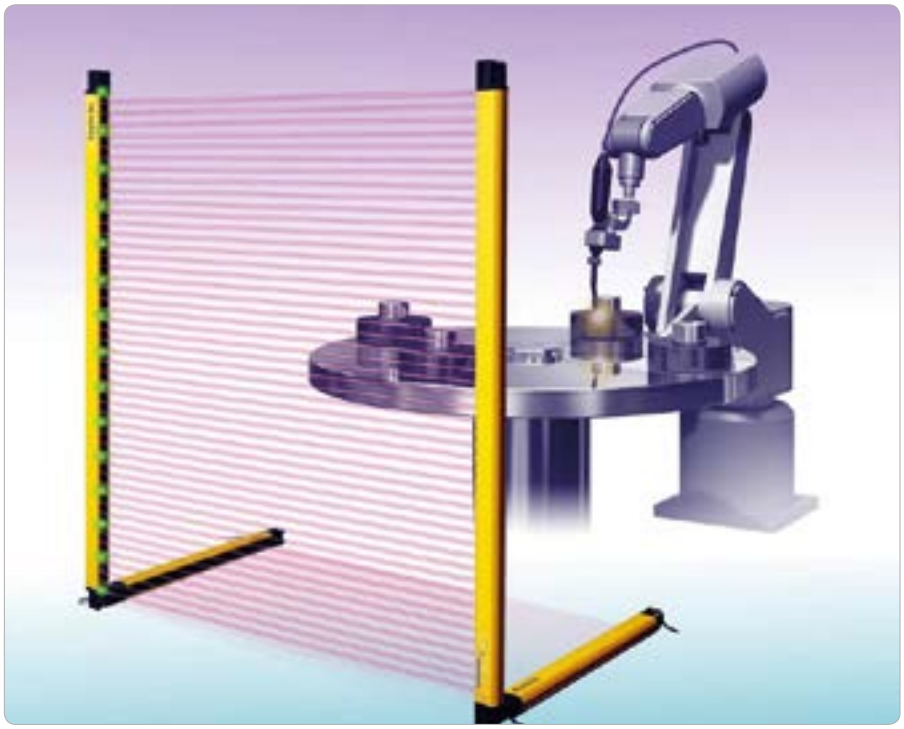
Cloud computing is still relatively young, even if it is growing at a rapid pace. As a result some issues have already emerged and more will undoubtedly appear later. The IEC has been involved in tackling some of them, such as IT security and energy-efficient systems, but as more surface, a greater IEC contribution will be needed.

No light, no safety, no automation

In industry, light plays a central role in many domains, not just for lighting premises

Morand Fachot

Lighting fulfils a growing range of tasks in the industrial environment, improving safety and enabling automation in many areas.



Safety light curtains switch off machinery if workers get too close

Human safety first

Lighting in the industrial environment often evokes little more than a vision of a drab setting. This is no longer the case everywhere, in particular in modern factories.

The industrial environment is likely to be full of potential hazards for the humans working within it. Lighting has always been important in ensuring workers have a clear view of the equipment they operate and of their surroundings.

IEC Technical Committee (TC) 34: Lamps and related equipment, develops International Standards for these lighting installations, including new technologies such as LEDs or OLEDs (organic LEDs), as well as for lighting systems used in some safety systems.

Stacklights give indications on equipment condition/operation (Photo: PATLITE)

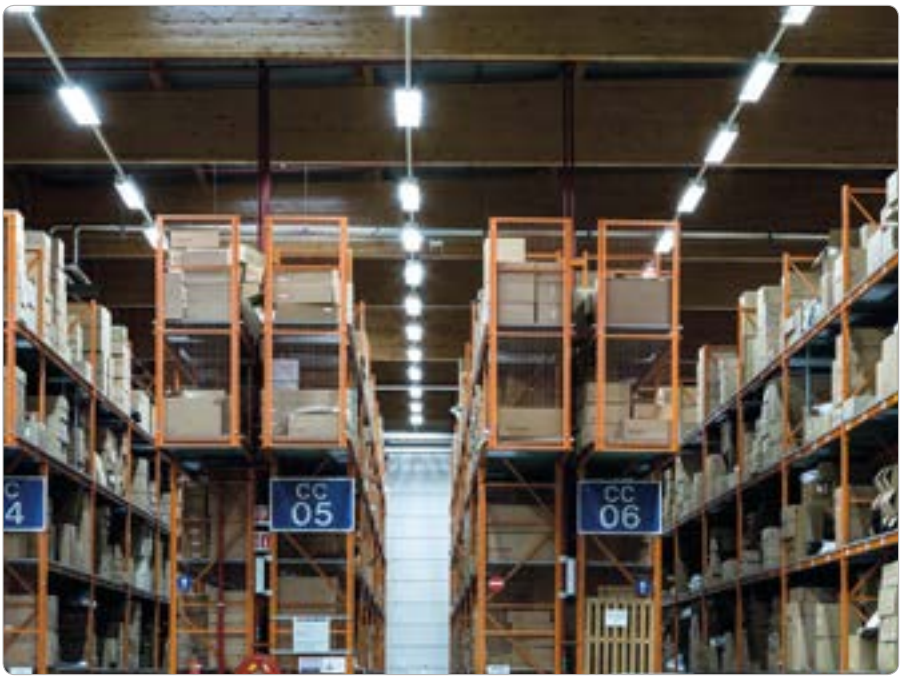
Lighting use in industry has moved beyond a mere "passive" role to a more active one with lighting systems, often in combination with a variety of sensors, becoming ever more important in ensuring a safer working environment.

A major risk in highly-automated sectors using machines and robots, in particular, is to keep humans away from a machine's or robot's work envelope. For this, passive measures such as external physical barriers (a secure fence or enclosure) around the workstation are the first line of defence. However, if this line is breached, safety rests on a variety of sensors for the detection of a human presence in a restricted or dangerous location.

Among these sensors, some of the most important are light curtains which consist of photoelectric barriers of several aligned beams between emitting and receiving columns. Interrupting a single beam will trigger the emergency stop for any machine. Different resolutions permit intrusion of a finger, hand, limb or body. These photoelectric sensors can also detect the presence of an unauthorized individual in the restricted zone.

Other lighting/optical safety devices include optical zero-force touch switches, which provide low impact machine control, or single beam photoelectric safety sensors for protecting small openings or large areas.

IEC International Standards for electro-sensitive protective equipment apply to these devices. These are developed by IEC TC 44: Safety of machinery



New lighting storage areas systems are now energy efficient (Photo: Osram)

– Electrotechnical aspects. They include International Standards for electro-sensitive protective equipment using active opto-electronic protective devices, vision-based protective devices or passive infra-red protective devices.

Machine safety matters too

Making sure that machines are not damaged is essential in ensuring they operate smoothly and, more importantly, that operators are not hurt. Warning lighting systems connected to the machines or to sensors installed on these provide indications about equipment condition and operation.

Stack lights (also called light bars or tower lights) are used in similar applications as beacon lights/strobes, to display information regarding machine/process conditions. They have colour-coded indicator segments stacked on top of one another. A stack light will typically have up to five differently coloured segments, including, as a minimum: red, showing failure conditions, yellow, warning of conditions such as over-temperature or over-pressure and green, indicating normal machine or process conditions.

Better products, higher productivity

Lighting systems have undoubtedly made a major contribution to advances in automation at all stages.

The detection of defective components or unwanted and contaminated raw material (such as the presence of stones or damaged grains) in large quantities of rice, corn or wheat relies increasingly on optical machines that detect flaws with special lighting, often using LED-based lamps, in fully or partly automated processes.

Finding, precise positioning or identification of objects or rotating axes in factory-automated production processes relies on sensors, many of which depend on a variety of lighting sources that include LEDs or lasers.

International Standards for fibre optic sensor systems are prepared by IEC Subcommittee (SC) 86C: Fibre optic systems and active devices (see article on IEC SC 86C in this *e-tech*). IEC TC 76: Optical radiation safety and laser equipment, develops International Standards for equipment using laser as well as LED-based lights.

Laser sensors are particularly useful for making precise measurement of dimensions such as thickness, diameter, height and distance to carry out difficult distance-based applications such as filling containers or handling objects of the same colour – for example, black foam on black plastic, black rubber in front of metal or multicolour packaging and targets.

Proper and safe lighting conditions not only rely on IEC International Standards, but also on two IEC Conformity Assessment (CA) systems, IECEE and IECQ. IECEE (IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components) provides a global platform for testing and certifying lighting products (see article on IECEE CA for lighting products in January/February 2015 *e-tech*). For its part, IECQ (IEC Quality Assessment System for Electronic Components) has introduced the IECQ LED initiative (see article on IECQ CA for LED lighting solutions in January/February 2015 *e-tech*).

No lighting in industry without IEC standardization and CA work

Nowadays, staff safety, plant reliability and proper operation, higher productivity and enhanced quality of products rely to a great extent on a multitude of components and systems based on lighting.

The importance of lighting in industry, and in automation in particular, is set to expand further in the future, owing in no small part to International Standards prepared by a number of IEC TCs and to IEC CA systems that provide assurance that they comply with international technical and regulatory requirements.

Connecting machines, IoT and the Cloud

ICT is increasingly transforming manufacturing into highly-automated and IT-driven processes

Peter Feuilherade

Manufacturing accounts for around one-sixth of gross world product, which represents a significant contribution to the global economy. Now it is entering a new era in which formerly separate manufacturing processes combine to produce intelligent data. Information and communications technology (ICT) is increasingly transforming manufacturing into highly automated and IT-driven processes, in a concept of change generally referred to as smart manufacturing. In Germany it is known as Industrie 4.0.

Automation is key to smart manufacturing

Merger of many assorted elements

Smart manufacturing involves the union of conventional automation with cyber physical systems combining communications, ICT, data and physical elements, and the ability to connect devices to one another.

The ICT element includes hardware and software, communication protocols, networks and interfaces, while automation comprises devices, sensors, systems, processes and control. Cyber physical systems use low cost sensors to monitor and collect data from manufacturing processes.

Smart sensors with interfacing circuits are capable of decision making, logic function and two way communication. The major benefits of smart sensors are high reliability, minimal cost, high performance and scalability.

In the words of the Smart Manufacturing Leadership Coalition (SMLC), a non profit US organization for sharing manufacturing intelligence, "in smart manufacturing, everything is connected with the aid of sensors and RFID (radio frequency identification) chips. For example, products, transport options and tools will communicate with each other and will be organized with the goal of improving the overall production…"

The ultimate goal of smart manufacturing is to interconnect every step of the manufacturing process. As Mark Watson, senior technology analyst at the global information company IHS, explains, "standalone plants can also communicate with other factory sites, merging vast industrial infrastructures already in place with cloud computing and the Internet of Things (IoT). The end result is a complex, but vibrant, ecosystem of self-regulating machines and sites, able to customize output, allocate resources optimally and offer a seamless interface between the physical and virtual worlds of construction, assembly and production."

Smart manufacturing is a major driver of growth in the industrial automation market, which was worth an estimated USD 170 billion in 2013.

Automotive, electrical and electronics manufacturers, as well as the food, beverages and pharmaceutical industries, are among the sectors adopting smart manufacturing technologies in production processes.

Smart manufacturing in action

Smart manufacturing processes include sensors and devices with embedded software that can communicate with one another and with other systems in a given network; automated controls; improving productivity through shared information and improved decision making tools;

and capturing and utilizing 'big data' to analyse, improve and troubleshoot operations.

For example, the German Research Centre for Artificial Intelligence operates a pilot smart factory in Kaiserslautern, Rhineland-Palatinate, where a large chemicals manufacturer has successfully tested producing customized shampoos and liquid soaps. In response to a test order placed online, RFID tags attached to empty soap bottles on an assembly line communicated to production machines what kind of soap, fragrance, bottle cap colour and labelling were required. Nearly all communication was between the machines and the products through a wireless network, with the only human input coming from the person placing the sample order.

Elsewhere in many countries, automated machines able to fetch and assemble components with limited human input are being installed in industrial factories. Other companies are also using thousands of sensors in their factories to collect data during manufacturing processes. The sensors not only alert workers to changes in production output, but can also allow machines to adjust without human intervention, for example, when certain types of fragile material enter the assembly line.

Benefits, drivers and obstacles

The main benefits of moving to smart manufacturing are improved quality, adaptability, product innovation, lower costs and increased efficiency, including energy efficiency, and productivity.

Other benefits include less specialization required for workers to perform previously technically intensive analysis and tasks, quicker customization of products and shorter innovation cycles, enabling faster responses to customer needs and changes in the marketplace and environment, as well as speedier product introductions.

Digital technologies will be a major driver of smart manufacturing, as they are central to the fusion of the physical and virtual worlds by enabling machine to machine communication and autonomously acting smart production processes. "We are deeply convinced that the fourth industrial revolution will be driven through digital transformation," Capgemini Consulting said in a 2014 report.

All kinds of sensors play a central role in smart manufacturing (Photo: Baumer)

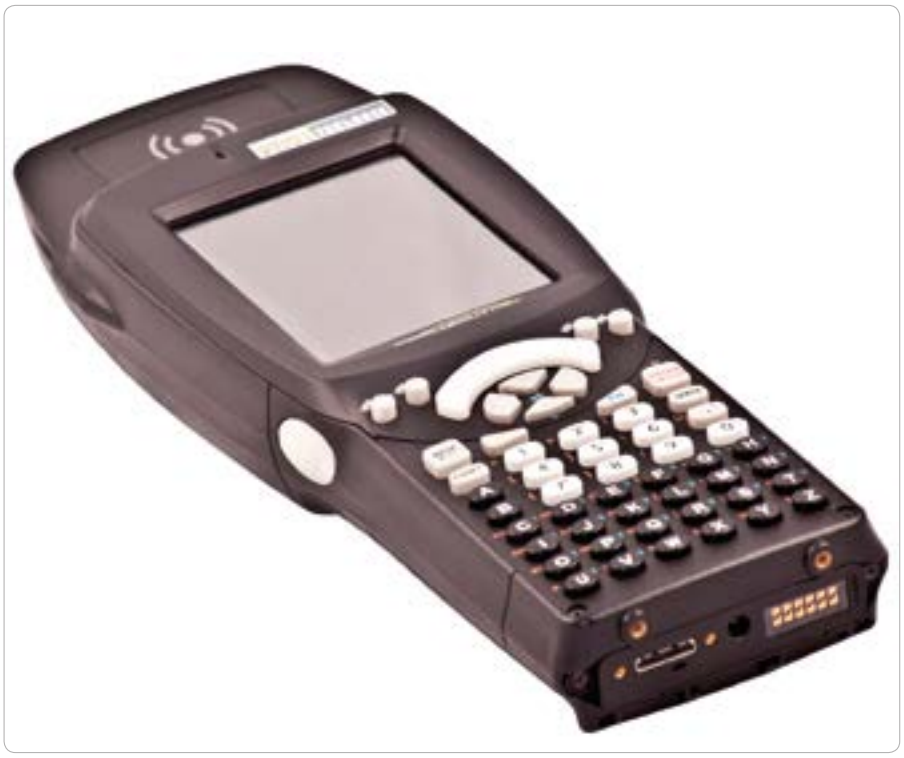
The increase of low-cost sensor technologies means that many manufacturing processes and components are becoming potential sources of data. The ability to make better use of the huge volume of 'big data' collected and exchanged within the network of billions of devices and users (the IoT), and to monetize it profitably, will be one of the main business drivers of smart manufacturing.

According to a 2015 study by the market intelligence firm International Data Corporation (IDC), commissioned by Microsoft, the potential global additional value of the "data dividend" in smart manufacturing could be as much as USD 371 billion over the next four years. This would come from high-value areas identified in the IDC study as employee productivity, operational efficiency, product innovation and better customer engagement models.

In Germany, respondents to a survey of manufacturing companies conducted by the Fraunhofer Institute for Industrial Engineering cited what they saw as the main hurdles to creating a smart factory. They included unresolved questions about IT security, a lack of standards, the advanced qualifications needed by personnel, the as yet inadequate performance of the ICT infrastructure and high investment costs.

IEC and International Standards key to smart manufacturing

As more companies adopt smart processes, connecting manufacturers



RFID reader/writer

with logistics providers and other factories in similar industries via the IoT will require integration and interoperability standards. There is growing awareness that for manufacturing to be safe, sustainable and energy efficient, standards that are globally recognized must be met. IEC International Standards and Conformity Assessment systems already play a key role in improving factory and equipment safety and enhancing product reliability and quality. Other relevant areas include wireless communication network and communication profiles – WirelessHART™, and cybersecurity.

To ensure smart manufacturing can rely on relevant standards, the IEC Standardization Management Board (SMB) set up a new Strategic Group, SG 8: Industry 4.0 – Smart Manufacturing, in 2014. Its scope includes defining terminology, summarizing existing standards and standardization projects in progress, and developing a common strategy for the implementation of smart manufacturing.

SG 8 will enhance cooperation and establish new liaisons with IEC Technical Committees. It indicates that the preliminary inventory of standards will come from the following IEC Technical Committees (TCs):

- TC 3: Information structures and elements, identification and marking principles, documentation and graphical symbols
- TC 17: High-voltage switchgear and controlgear
- TC 22: Power electronic systems and equipment
- TC 44: Safety of machinery – Electrotechnical aspects
- TC 65: Industrial-process measurement, control and automation
- TC 77: Electromagnetic compatibility
- TC 111: Environmental standardization for electrical and electronic products and systems
- TC 121: Switchgear and controlgear and their assemblies for low voltage
- CISPR: International special committee on radio interference, and its SCs

In addition to these, SG 8 indicates that some standards will also come from ISO/IEC JTC 1/SC 27: IT security techniques, the Subcommittee (SC) set up in the Joint Technical Committee (JTC) 1 created by the IEC and International Organization for Standardization (ISO) to develop standards for Information technology.

Other organizations, such as the International Society of Automation (ISA), the Institute of Electrical and Electronics Engineers (IEEE), will also provide standards, according to SG 8, which states that the goal of this work and liaisons with other organizations will be to achieve system compatibility, interoperability and functional exchangeability.

Market forecasts point to uninterrupted healthy growth

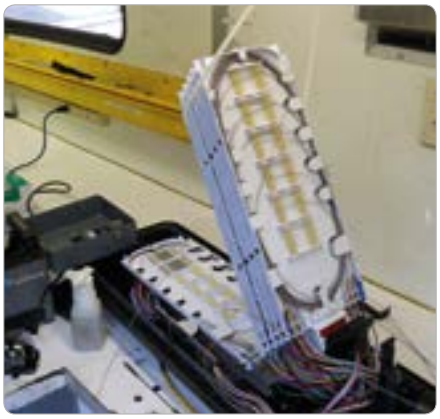
In the context of the worldwide trend towards industrial automation, there is great potential for growth in the smart manufacturing market. IHS forecasts that the global market for motors, generators, controllers and other industrial automation equipment, which totalled USD 169,4 billion in 2013, will grow to almost USD 200 billion in 2016 and reach USD 210 billion in 2018.

A March 2014 Markets and Markets report forecast that the global smart sensor market would grow to USD 10,46 billion in 2020 from USD 650 million in 2012, at a compound annual growth rate (CAGR) of 36,25% from 2013 to 2020.

Al this point to a busy agenda for SG 8 and for all IEC TCs involved in standardization work for smart manufacturing-related systems and services.

Sensing light at fibre end

A number of components bring light to the end of the fibre, allowing multiple applications



Fibre optic technology is central to the IT and telecommunication sectors

Morand Fachot

Fibre optic systems can be found in a number of applications including communications and sensors. IEC Subcommittee (SC) 86C prepares International Standards for fibre optic systems and active devices embracing all types of communications and sensor applications. The importance of this work is increasing as the range of these applications keeps expanding.

The optic fibre revolution – some 40 years on

Ever since the first commercial fibre optic communications systems were developed in 1975, they have revolutionized the way information (data, image and voice) is transmitted over long distances and have proven a reliable and more efficient alternative to traditional copper cables.

Fibre optic systems are now installed in domains far beyond their initial use in communication networks, where their unique characteristics have made them particularly valuable. IEC Technical Committee (TC) 86: Fibre optics, and its three SCs covering different areas, develop International Standards for fibre optic fibres and cables, fibre optic interconnecting devices and passive components and fibre optic systems and active devices.

Multifaceted work

The standardization activities of IEC SC 86C: Fibre optic systems and active devices, cover "terminology, characteristics, test and measurement methods and functional interfaces including all mechanical, environmental, optical, and electrical requirements to ensure interoperability and reliable system performance". These multiple activities are covered by five Working Groups (WGs).

Structure reflects domains of activity

Responsibility for the different SC 86C standardization activities is shared between five WGs.

WG 1: Fibre optic communications systems and sub-systems, defines specification parameters, test procedures and the design methodology for the physical layer of fibre optic communications systems and sub-systems. It also prepares generic, sectional and blank detail specifications for fibre optic communications sub-systems and test procedures measuring the parameters associated with the specification of fibre optic communications sub-systems.

WG 2: Fibre optic sensors, prepares International Standards and specifications for optical sensors based on fibre optics, covering performance and interface characteristics as well as other standardization aspects including terminology, test methods, reliability and environmental attributes. Optical sensors play an ever growing role in a very broad range of domains (see "Sensing with optical fibres" article in *e-tech*, November 2014).

WG 3: Optical amplifiers, develops International Standards and specifications for optical amplifiers to be used in communication systems. Optical amplifiers are required to "regenerate" optical signals through optical fibre networks without having to resort to the multiple procedure of optical to electrical to optical conversion. The WG work consists of defining relevant parameters for optical amplifiers, preparing specifications for optical amplifiers and related test procedures.

WG 4: Fibre optic active components and devices, works on standardization in the field of optical active components, devices and hybrid modules, in particular for telecommunications applications and for trade and commerce.

Series 66 fibre optic sensor (Photo: Baumer)

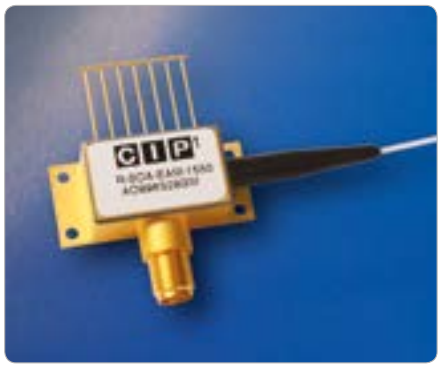
WG 5: Dynamic Modules and devices, ensures the coordination and harmonization of documents relating to dynamic modules and devices of all relevant TC 86 SCs and WGs. It is also responsible for the creation and maintenance of the standard documents and technical reports for such modules.

High-value of global fibre optic market

The fibre optic market is dynamic and in constant expansion, driven by a growing demand for high bandwidth which is particularly important for applications such as online gaming, video calling, file downloading and others.

The actual value of the global fibre optics market is difficult to assess as it is divided between a wide range of devices and systems including fibres and cables, interconnecting devices, active and passive components, fibre optic sensors, optical amplifiers and dynamic modules and devices.

However, its rapid overall expansion points to a continuous workload for SC 86C, which now incorporates members from 23 Participating and 17 Observer countries and 133 experts.



CIP semiconductor optical amplifier

As of May 2015 it had issued 109 publications and is developing and updating more standards.

The heat is always on for special TC

Clean and energy efficient electroheating is found in many industrial processes

Morand Fachot

Electroheating, the high-power heating of material using electrical energy, is widely used in the food-processing industry. However, it is better known in other sectors for dealing with elements ranging from metals to glass, ceramics, polymers and natural fibres. More energy-efficient than other industrial processes relying on fossil fuels, it is also significantly cleaner. IEC Technical Committee (TC) 27: Industrial electroheating and electromagnetic processing, develops International Standards for the sector.

Extremely versatile with total control...

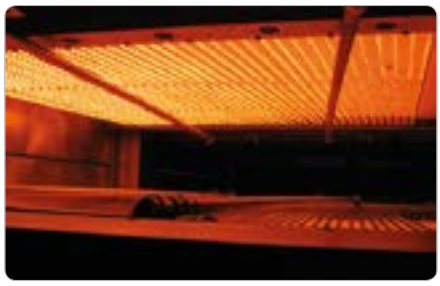
Electroheating is widely used in a number of industrial processes for heating materials or elements without burning fossil fuels. One of its major advantages is that it allows very precise temperature control, which in turn results in more consistent, better quality finished products.

Electroheating is very precise and can bring materials to very high temperatures quickly. Alternatively it allows materials to be processed at consistently low temperatures. Electroheating covers many different technologies and can be used in heavy industrial applications, such as the melting and forging of metals, as well as in lighter processes such as the processing and sterilization of food products and the drying of textiles and of ceramic tiles.

From infrared to arc and lasers, from forging to food...

Electroheating, especially in modern continuous manufacturing, is growing in importance. Below is a non-exhaustive overview of some key technologies.

Food processing uses a variety of electroheating processes to deactivate microorganisms in food. These include radio frequency, microwave heating and conductive (or ohmic) heating,



Heaters in continuous coil coating dryer (Photo: Casso-Solar Technologies)

in which food material, which serves as an electrical resistor, is heated by passing electricity through it.

The use of an electric arc for melting iron dates back to the 19th century, with patents being taken out for electric arc furnaces (EAFs) in the 1880s and the first commercial EAF plant being built in the US in the early 1900s.

The advantages of EAFs in steel production are their relatively low capital cost in comparison with traditional steel mills and their capacity. They can process anything from around one tonne to hundreds of

Forced convection electric oven (Photo: Borel)

tonnes, allowing the establishment of mini-mills.

EAFs also allow steel to be made from 100% scrap metal, providing considerable energy savings when compared with primary steelmaking from ores using blast furnaces. Unlike the latter, EAFs can also be started and stopped rapidly, enabling them to cater for variation in demand.

In induction heating, an electrically conductive object (usually metal) is heated by passing an alternating current through an electromagnet. Induction furnaces are used for melting various metals including steel, copper or aluminium, or even precious metals. Their capacities range from less than one kilo to 100 tonnes. The temperature of the material to be heated can be controlled with complete precision.

Resistance heating is used extensively in electroheating. The process involves current being passed through a set of resistances that act as heating elements and is generally applied in a well-insulated enclosure so as to minimize heat losses. Resistance heating is used to heat treat, form, melt and dry metals; to cook, sterilize and roast in the food industry or to fire and dry ceramic products. Resistance heating can be indirect: heat from the resistor is transferred to the work piece via conduction (close proximity between resistances and work piece), convection (through the air) or radiation (infrared heating); it can also be direct. Direct resistance heating, also referred to as conductive heating, involves passing current directly through the work piece to be heated.

Other electroheating technologies include the use of plasma torches to cut steel plates, microwaves to treat food products, radio-frequency electric fields to dry textiles, and lasers to weld, cut and treat various materials.

Energy-efficient and flexible

Industrial applications of electroheating technologies in many sectors show them to be more energy efficient and cleaner than their "conventional" equivalents that use fossil fuels, especially at higher temperatures. The optimum efficiency of gas furnaces ranges from 40%-80%, while that of an electric furnace can reach 95%.

However, measuring the emission of CO_2 and other noxious gases is complex for electroheating as it depends on the primary energy mix used to generate the electricity that the equipment needs.

Ensuring electro-heating safety and efficiency

IEC TC 27, created in 1937, prepares International Standards for industrial electroheating and electromagnetic processing. The TC encompasses 13 Participating and 13 Observer countries. As of May 2015 it had issued 33 publications.

Its scope now covers all applications of industrial electroheating, including electroheat-based surface treatment technologies and their combinations as well as electromagnetic processing of materials (EPM). It also addresses specific aspects of electromagnetic compatibility (EMC) and electromagnetic fields (EMF).

As demands for energy savings, improved product quality and environmental protection grow, the range of applications is expanding. Electroheating also offers interesting prospects in new domains such as nanotechnology and optoelectronics.

TC 27 works extensively where the safety of electroheating installations is concerned, having issued 13 publications covering all electrical and non-electrical safety aspects. Its objectives for the next 3-5 years include a comprehensive revision of these publications as well as of the large series of test standards, in terms both of technological developments and market demands.

The TC will also start work on developing safety and test standards for new installations not covered by existing standards.

TC 27 intends to amend existing standards to address electrical energy efficiency, EMC and EMF issues in electroheating installations.

The increasing number of technologies being used in electroheating means that the process is constantly evolving and highly flexible, as well as becoming economically more significant and able to be implemented in countless operations.

TC 27 plans to undertake new projects aiming at the development of safety and test methods standards concerning:

- plasma arc furnace installations
- new casting systems
- electromagnetic processing of materials
- crystal growth and orientation
- ultrasonic heating
- spark erosion

All this points to the continuation of a very busy agenda for TC 27 in coming years.

Infrared ovens are used to colour meat products

Safety on the factory floor

IECEE certification brings benefits to industrial automation

The automotive industry, for instance, has been transformed radically by the development of automation

Claire Marchand

The development of automation throughout the 20th century brought enormous changes to the industrial world: some jobs disappeared, others underwent major transformation, new ones were created and, most importantly, the interaction between man and machine was altered forever. In recent years, the emergence and proliferation of robots on the factory floor has raised automation to a new level.

Safety, reliability and quality through automation

The advantages of having automated systems were soon recognized by industry. The systems enabled human operators to be replaced in tasks that involved hard physical or monotonous work, or those being performed in hazardous environments including nuclear facilities, underwater or where there was a high risk of fire. Automated systems can also undertake jobs that cannot be performed by human beings because of excessive demands, for example where extremes of speed, size, weight or endurance are called for. Automated processes often achieve more consistent quality and reliability in the assembly chain than humans are able to replicate.

Automation changed the industrial landscape

The rapid evolution of information and communication technology (ICT) in the second part of the 20th century enabled engineers to create increasingly complex control systems capable of being integrated fully with the factory floor.

The automotive industry, for instance, has been transformed radically by the development of automation. Over time, the food and pharmaceutical industries and other manufacturing companies have also relied heavily on automation to produce higher quantities and at lower cost. Today, most sectors of industry use at least some element of automation.

IEC standardization plays major role

The IEC has a number of Technical Committees (TCs) that prepare International Standards connected with specific areas of industrial automation. IEC TC 65: Industrial-process measurement, control and automation, provides many of the Standards that are relevant for industry. IEC TC 2: Rotating machinery, IEC TC 22: Power electronic systems and equipment, IEC TC 44: Safety of machinery - Electrotechnical aspects, IEC TC 66: Safety of measuring, control and laboratory equipment, and TC 121: Switchgear and controlgear and their assemblies for low voltage, all play important roles in this field.

Specific certification for industrial automation

Most of the International Standards developed by these IEC TCs are already integrated within services provided by IECEE, the IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components. However, the complexity and sophistication of today's systems and equipment in industrial plants requires a specific approach to be taken in terms of safety and security. To provide improved response to industry and market needs, IECEE has a service (INDA) entirely dedicated to industrial automation.

Safety and functional safety

In industrial plants, overall safety needs to be more extensive than is traditional with safety: it also includes functional safety and has to meet very strict requirements.

Control system on an injection molding machine and robot (Photo: KraussMaffei)

A standard definition of safety might be protection from an unacceptable risk of physical injury or from impairment to the health of people, caused either directly or indirectly by damage that occurs to property or to the environment.

Functional safety is the part of overall safety that depends on the correct operation of a system or equipment in response to its inputs. If a potentially dangerous condition is detected, a protective or corrective device or mechanism may be activated to prevent hazardous events arising or some mitigating feature may reduce their consequences.

Neither safety nor functional safety can be determined without taking into consideration the system as a whole as well as the environment with which it interacts.

Benefits of INDA

The INDA product category has benefits for industry as well as for IECEE CBs (Certification Bodies) and TLs (Test Laboratories):

- it provides a platform offering progressive support of global recognition and acceptance of industrial automation products;
- it allows for the sharing of expertise, knowledge and tools that enable third-party CBs to deliver compliance services pertaining to the functional safety of industrial automation products;
- it provides easier and faster market access for industry, eliminates the need for multiple testing and ultimately drastically reduces the costs associated with the global rollout of products.

Robots are being developed that can work alongside humans without safety fencing or protection (Photo: Universal Robots)

IECEE facilitates access to market...

A CB Test Certificate is a global passport that allows products to be accepted in all IECEE member countries. It is well known that global acceptance is a reality, even in countries that are not part of the IECEE community. “One test, one international certificate” opens the doors to the global market.

...through the CB Scheme...

The IECEE CB Scheme provides the assurance that tested and certified products meet the strictest levels of safety, reliability and performance in compliance with the relevant IEC International Standards. It helps reduce costs and time to market, eliminates duplicate or multiple testing and provides a high level of confidence for manufacturers, retailers and consumers alike.

...and the CB-FCS

The CB-FCS Scheme for Mutual Recognition of Conformity Assessment Certificates for Electrotechnical Equipment and Components is an extension of the IECEE CB Scheme in that it also includes factory audits and inspections. It goes far beyond mere product testing by including a complete quality system and surveillance methods at the factory that manufactures a certified product. This is of interest to manufacturers who need to provide proof that products manufactured in a given factory offer a consistent level of quality over time.

The IECEE website provides a full list of IEC International Standards currently available in the INDA product category. www.iecee.org

Smart oil and gas

Ex-tremely safe Big Data

Claire Marchand

Big Data is set to change the way we work by improving operations and allowing faster, more accurate analyses which lead to more informed decisions being made. Confident decision-making could in turn lead to greater efficiency, reduced risks and cost savings. While the oil and gas sector hasn't really embraced the concept yet, it could derive huge benefit from it.

Why Big Data?

According to Wikipedia, "Big Data is a broad term for data sets so large or complex that traditional data processing applications are inadequate. [Its] challenges include analysis, capture, data curation, search, sharing, storage, transfer, visualization, and information privacy".

The key element is data collection. While this task may be relatively "easy" to perform in many industry sectors, since the tools and processes are already in place in those environments, it may prove more difficult to acquire industrial data in the oil and gas sector.

Updating and upgrading operations is essential

According to a recent article in Automation World [1], "these operations are often remote and involve several different types of sensors, controllers, remote terminal units (RTUs) and flow computers – often from different companies – that house the data needed by these applications. Plus, some of the equipment in the field is ancient – a result of the "if it ain't broke, don't fix it" mindset; and, given the time period in which much of this equipment was created, it wasn't designed to share data well. On top of this, communications to these remote sites are often limited, relying on wireless telemetry systems like radio, cellular and satellite that have limited bandwidth and high latency".

How to make oil and gas smart?

By installing sensors and controllers in pipes and wellheads, companies will be able to capture, classify and filter data in the field as well as control processes and perform quality checks. Transmitting this data to onshore and offshore facilities in real time will allow companies to monitor the wells' conditions and operations, detect problems when they arise and make real-time decisions to schedule interventions. This will prevent damage occurring in equipment and reduce the risks of failure and potential accidents.

Of course the systems that need to be put in place are more complex than is implied by the simple installation of a number of sensors and controllers to connect data and people. The entire

Oil pipes

Gas wellhead in Germany (Photo: Hartmann Valves GmbH)

workflow and communications process between the wells and pipes on one side and the facilities on the other has to be fully automated and optimized so as to set up simulation models that will in turn lead to risk mitigation and safer operations.

Smart oil and gas operations will help prevent disaster, maximize production and increase profitability while reducing operating costs.

Designed and built for Ex areas...

As is the case with larger pieces of equipment used in explosive (Ex) atmospheres, any device – from the tiniest of sensors to controllers, central processing units (CPUs) and RTUs – has to be designed and built in compliance with the very strict requirements set out in standards and specifications, most notably in IEC International Standards developed by IEC Technical Committee (TC) 31: Equipment for explosive atmospheres.

Designing and building these devices in compliance with IEC International Standards is not enough on its own. To ensure that any piece of equipment meets the required criteria, it has also to be tested and certified. Products associated with a certificate of conformity satisfy the criteria for safe usage in hazardous environments.

Explosion-proof pressure transmitters (Photo: American Sensor Technologies)

...tested and certified by IECEx

IECEx, the IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres, is the only truly international Conformity Assessment (CA) System to provide testing and certification for all items of Ex equipment and installations as well as certifying the skills and competence of individuals working in hazardous areas.

The System addresses the inspection (location and other), installation, maintenance and repair of equipment and systems and assesses the competence of personnel working in this highly specialized area.

IECEx has been endorsed by the United Nations (UN) through the UN Economic Commission for Europe (UNECE) as THE certification system for the assessment of conformity in Ex areas.

- IECEx operates the following Schemes:
- IECEx Certified Equipment Scheme
- IECEx Certified Service Facilities Scheme
- IECEx Scheme for Certification of Personnel Competence (for Explosive Atmospheres)

The System also has the IECEx Conformity Mark Licensing System which provides on-the-spot evidence that products bearing the Conformity Mark are covered by an IECEx Certificate of Conformity.

For more information: www.iecex.com

[1] "How Big Data Can Benefit Upstream Oil and Gas", Automation World, 15 May 2015

Sensored all the way

How to make sure devices and systems are smart and safe

Claire Marchand

Sensors: they are invisible, most people don't even know what they look like, but they are omnipresent today. They have a major impact on our home and work environments and are making our lives much safer and easier in many ways.

Ubiquitous sensors: from smart devices...

Smartphones or tablets wouldn't exist without sensors. The proximity sensor that determines how close the phone is to your face or the accelerometer and gyroscope that detect the rotation and movement of the device and allow the switch between landscape and portrait modes are only two of the numerous sensors that equip these devices today.

...to public facilities...

They have brought a new level of hygiene to public washrooms and kitchens. Having touchless soap dispensers or automatic faucets in hospitals, restaurants, schools, and any public buildings help eliminate the spreading of germs.

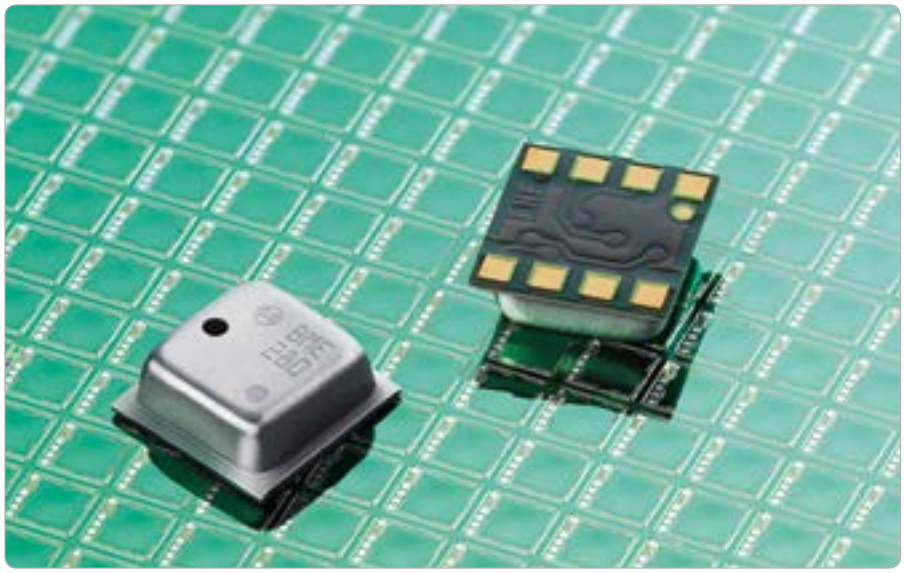
...to vehicles

Cars fitted out with advanced driver-assistance systems (ADAS) may be few these days, but as is the case with all technological advances, they will eventually equip all vehicles and contribute to an increase in road safety. ADAS provide many interesting features, such as adaptive cruise control, blind-spot monitoring, lane-departure warning, night vision or collision warning systems with automatic steering and braking intervention. These automated safe systems are paving the way for tomorrow's fully autonomous cars.

None of this would be possible without sensors.

Higher safety levels

Sensors and sensor systems are a key underpinning technology for a wide range of applications. They can be used to improve quality control and productivity in manufacturing processes by monitoring variables such as temperature, pressure, flow and composition. They help ensure the environment is clean and healthy by monitoring the levels of toxic chemicals and gases emitted in the air, both locally and – via satellites – globally. They monitor area and regional compliance with environmental standards. They enhance health, safety and security in the home and workplace through their use in air-conditioning systems, fire and smoke detection and surveillance equipment. They play a major role in medical devices, transportation, entertainment equipment and everyday consumer products.



The BME280 sensor combines pressure, humidity and temperature measurement (Photo: Bosch Sensortec)

Size matters

Technological innovations have brought a new generation of sensors, such as microelectromechanical systems (MEMS) and nanoelectromechanical systems (NEMS). These are smaller, smarter and can be integrated into fixed and portable devices.

But whatever the size of the sensor, the device has to be accurate and reliable. Whatever it measures, the measurement has to be extremely precise. A defective sensor can have serious consequences, putting human lives in jeopardy.

IECQ: Safety inside

Sensor manufacturers and suppliers all over the world have a powerful tool at their disposal, enabling their products to meet the strictest requirements: IECQ testing and certification. IECQ is the IEC Quality Assessment System for Electronic Components.

The motion sensor/accelerometer enables the smartphone or tablet screen to automatically switch between landscape and portrait modes

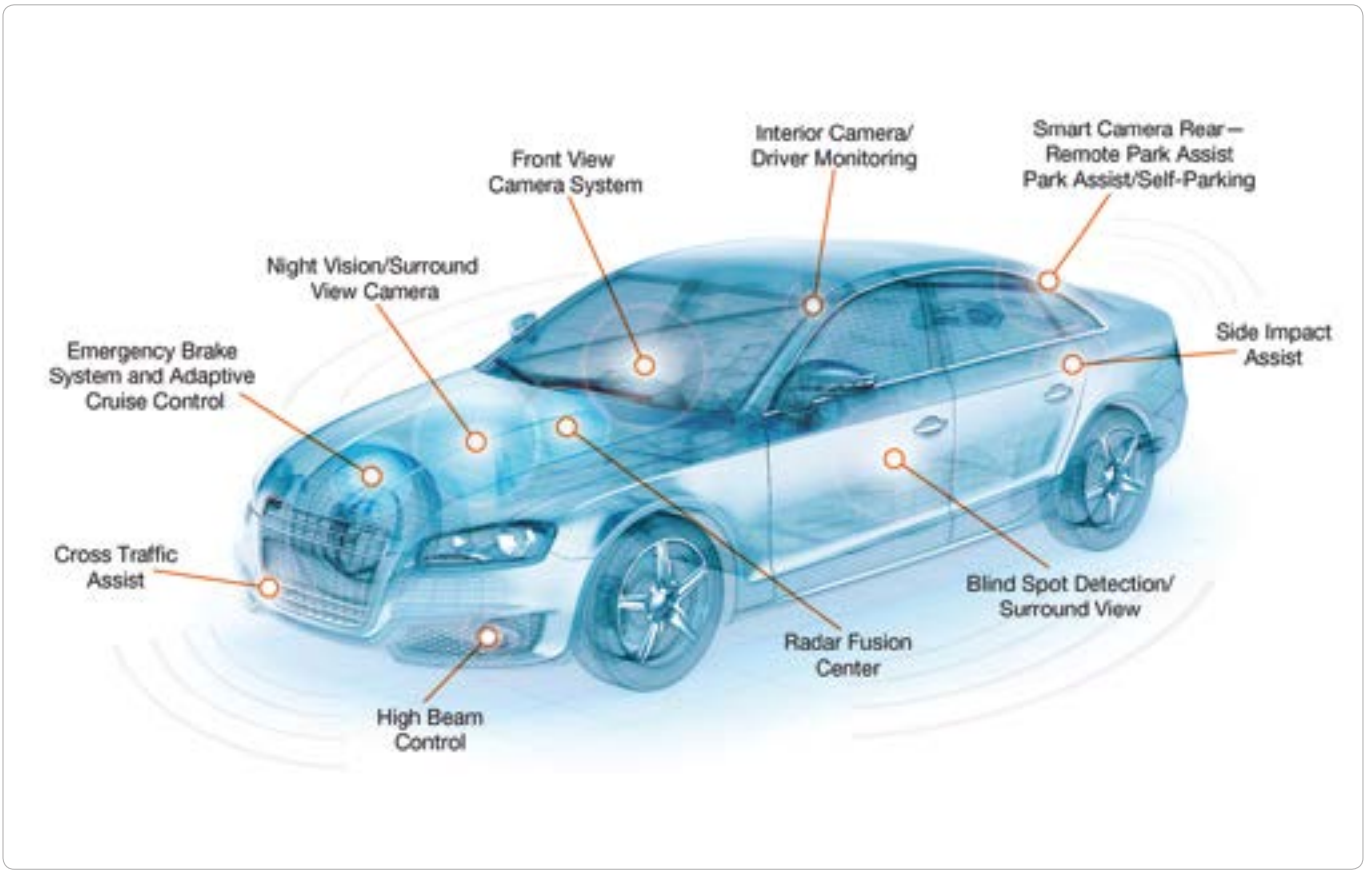
As the worldwide approval and certification system covering the supply of electronic components, assemblies and associated materials and processes, IECQ tests and certifies components using quality assessment specifications based on IEC International Standards.

In addition, there are a multitude of related materials and processes that are covered by the IECQ Schemes. IECQ certificates are used worldwide as a tool to monitor and control the manufacturing supply chain, thus helping to reduce costs and time to market, and eliminating the need for multiple re-assessments of suppliers.

IECQ operates industry specific Certification Schemes:

- IECQ AP (Approved Process)
  - IECQ AP-CAP (Counterfeit Avoidance Programme)
- IECQ AC (Approved Component)
  - IECQ AC-TC (Technology Certification)
  - IECQ AC-AQP (Automotive Qualification Programme)
- IECQ Avionics
- IECQ HSPM (Hazardous Substances Process Management)
- IECQ ITL (Independent Testing Laboratory)

For more information: www.iecq.org



ADAS ecosystem for automotive vision applications (Photo: Freescale Semiconductor)

Calling Young Professionals to Minsk

IEC Young Professionals – 2015 workshop registration closes 30 June

Janice Blondeau

National Committees (NCs) have until the end of June to register participants, selected at national level, for the IEC Young Professionals – 2015 workshop. The workshop will be held in Minsk in October during the IEC General Meeting.

Growing the IEC Family

Expanding its expert community to involve more and more qualified people is an ongoing IEC priority. The IEC Young Professionals Programme (YPP) provides a springboard for further involvement in electrotechnical standards and conformity assessment work.

The Programme brings benefits to participants, to their employers and to the IEC – a win-win-win situation. The response from participants and their companies from previous workshops has been positive and enthusiastic.

"I'm really grateful to be able to participate in the year's IEC Young Professionals workshop. What I found extremely valuable were the many opportunities to network with IEC experts as well as other Young Professionals. I found many like-minded friends also working in the same industry as me."
Zijuan Lian, Singapore

Getting involved

Geared towards younger professionals who already use electrotechnical standards and conformity assessment in their work, the IEC Young Professionals Programme provides direct networking opportunities and capacity building to enable them to become tomorrow's leaders in the world of international standardization.

Participants have the opportunity to meet key management, from IEC Officers to members of the Standardization Management Board (SMB) or of the Conformity Assessment Board (CAB). They can also participate in a Technical Committee (TC) meeting of their choice.

"The whole workshop has been extremely valuable but the insights into the inner workings of the IEC really are invaluable. I don't think that there is any other scheme that would get you the insights that the Young Professionals workshop has given me."
Neil Moran, UK

Minsk workshop

For the Minsk workshop, each IEC Member country can register two representatives, chosen via a National Committee selection process. Participants' prior experience of standardization is essential, though the depth of experience varies.

Participants at the IEC Young Professionals workshop meet IEC leaders

Workshops participants gain a deeper understanding of standardization and expand their technical expert networks. Moreover they have the satisfaction of seeing where they can make a difference to the bigger picture of IEC International electrotechnical Standards and Conformity Assessment work. To help the networking between the NCs and their respective YPs the country

It's also a great networking opportunity and the chance to expand...

tables' breakfast will be held in Minsk as part of the workshop.

Every year, the IEC Young Professional Leaders have contributed to the development of the workshop agenda and participated in the next year's workshop. Some YP Leaders will run a session at the Minsk workshop.

Building a base

Contacts made through the programme serve the individual participants in their professional development and also benefit the companies they work for.

"The thing I found most valuable in this workshop is the networking. It's not just the networking with the IEC experts and officials but also the networking amongst Young Professionals, because you can exchange ideas and you can understand other cultures. Also to get involved with an institution as important as the IEC is very valuable for my employer."
David Manrique Negrin, Mexico

...horizons in international standardization and conformity assessment

Workshop registration

Information about the IEC Young Professionals – 2015 workshop is available on the IEC website. Registration will remain open until the end of June.

The emergence of Big Data in the power sector

A look at the issues

Thahirah Jalal, of New Zealand, is an IEC 2014 Young Professional Leader

Dr Thahirah Jalal, Unison Networks Limited, New Zealand IEC, 2014 Young Professional Leader

With many utilities around the world embarking on Smart Grids, installations of real time sensors around the grids have generated an unprecedented amount of data for utilities. Terms such as 'data avalanche' and 'data tsunami' indicate that the data issue has taken some utilities by surprise, either by its sudden emergence or by its volume. This article will highlight some of the issues that are typically faced by a power utility that has implemented a Smart Grid.

Volume and Velocity

Any company with a large number of assets and customers will have a lot of data collected from the moment it started its business. This data issue is known as 'volume', which brings about the term 'Big Data'. However, with Smart Grids utilizing sensors which generate data automatically every few minutes or even seconds, the issue of data velocity emerges – where multiple data is generated too quickly for any person to make sense of. Due to velocity, the volume of data received by the business continues to increase exponentially.

Reporting from silos

Besides these two issues, data in any corporation is generally stored

Numerous issues need to be faced by a power utility that has implemented a Smart Grid

in various systems, creating data silos across the business. When any reporting is required on an asset, manual data processing becomes tedious and complicated because the following processes have to be carried out:

- Sift data from multiple sources.
- Validate data to ensure its correctness. Multiple data can appear to conflict with each other if it is collected in different manners. Data often needs cleaning and correcting.
- Transform the data into the required reporting format.
- Consolidate any missing data to ensure that all required information for the report has been covered.
- Visualize the information in suitable formats such as graphs to increase the effectiveness of the message.

Quick decisions needed

The manual processing of data is called data curation. However, for any power utility that needs to ensure that electricity is delivered to consumers, the manual process takes too long. Without energy storage, the laws of physics dictate that electricity delivery from a power plant has to reach consumers within nanoseconds. A utility cannot afford to wait for lengthy data curation to take place if it needs to restore its network from an outage. There are now strong requirements for automated, advanced computational frameworks to be implemented in the power sector. Examples of such frameworks are the Wide Area Management System (WAMS) and Advanced Distribution Management System (ADMS). The framework performs real time computation that provides quick decision support to utility.

Growing need for automated advanced data analytics

With the wider adoption of Smart Grids globally, the need for automated advanced data analytics will grow. In 2013, GTM Research forecasted that between 2012 and 2020, cumulative global spending on Smart Grid related analytics would top USD 20,6 billion with an annual spend of USD 3,8 billion globally in 2020. GTM also estimated that despite huge investments, utilities would achieve more than USD 121,8 billion return on investment over the nine year period [1].

Big Data is key

For any utility that wishes to embark on Smart Grids, the issue of Big Data will be a key consideration. With the multitude of smart technology options available today, a utility needs to carefully think about the data applications. Some of the considerations are:

- How will the data be used? e.g. will the data be used to control load operation or to improve long term planning?
- Does the data require archiving and further analytics?
- Who will be using the data and how can they access it?

Applications influence platforms

The different applications will influence the choice of sensors and communication platforms because the data requirements can be completely different. Real time operational data often requires fast sampling rates and critical data might even require contingencies in its communication platforms. Data that requires archiving will incur storage costs and deciding between an internal storage system and a cloud solution is no small task. Data requiring analytics might necessitate a certain level of accuracy to generate meaningful results. Data that needs to be accessible companywide requires an enterprise system rather than standalone software on a personal computer.

The need for International Standardization

Enterprise systems that handle data for utilities are also highly specialized in their functions. A system that handles control room operations does not necessarily track the cost associated in addressing a fault. The data format in one system does not necessarily agree with another, which significantly increases the duration of any data curation activity. With many employees duplicating efforts in handling data, waste in terms of time and money are multiplied across the business.

This is where standardization is playing a key role. The standardization of models such as Common Information Model by enterprise systems will allow for data to be automatically shared and exchanged.

1. The Soft Grid 2013-2020: Big Data & Utility Analytics for Smart Grid, David J. Leeds, GTM Research

ISO/IEC JTC 1 have implemented a Study Group on Big Data

Important event on risk management

Managing risks in hazardous environments in Africa

Claire Marchand

Africa is rich in natural resources such as oil and gas, minerals and ores but their extraction is sometimes carried out under conditions that do not meet the strictest safety requirements. Observation of safe practices in hazardous areas is a must. When equipment is not installed, maintained, inspected or repaired by competent persons and according to strict Ex standards, the results can be devastating. What may be acceptable in non-explosive atmospheres can, in a different environment, lead directly to explosions that not only destroy property but can cost human lives or cause severe injuries.

Aerial view of Independence Square in Accra, Ghana...

Learn to identify risks

Recognizing the need to raise awareness on explosive (Ex) atmospheres and liabilities in Africa, the African Electrotechnical Standardization Commission (AFSEC) and IECEx (IEC System for Certification to Standards relating to Equipment for Use in Explosive Atmospheres), in collaboration with the African Energy Commission (AFREC) and the National Electrotechnical Committee of Ghana, organize an international seminar in Accra, Ghana on 20 July 2015.

The objective of the event is to provide a general introduction to IEC Conformity Assessment (CA) Systems, with special emphasis on IECEx and the Affiliate Conformity Assessment Status (ACAS) and to develop capacity building for African experts in the electrotechnical sector. An update on IEC work in Renewable Energies is also on the agenda.

Who should attend?

The event is for experts, senior staff and professionals from all electrotechnical sectors in African countries, including stakeholders, regulators and policy-makers, who are involved in the standardization, manufacture, inspection, repair, exploitation, maintenance and overhaul of equipment.

The seminar will provide a unique opportunity to learn about IECEx and the benefits of using the System.

...with the Independence Arch, also known as the Black Gate (Photo: Blake Maybank)

Truck loading at a mine (Photo: KPMG Africa blog)

Networking opportunity

The seminar will be conducted by IECEx expert Michel Brénon and by Thomas Robertson, IEC Project Coordinator Affiliate Country Programme & International Liaison for Developing Countries, who will share their experience and knowledge, answer questions and provide advice, information and background material.

As was done in previous AFSEC-IECEx seminars, the sessions will be in English and in French.

The seminar is a further opportunity for African professionals to make contacts, network and learn from IEC experience in the entire global Ex field.

Practical information

The AFSEC-IECEx event will take place in the Engineers Centre (the Ghana Institution of Engineers) in Accra, Ghana on 20 July 2015.

To apply to register for the seminar, send an email to info@afsec-africa.org, with your full name, indicating if you would prefer to attend the French or English language seminar.

Since space is limited, please make sure you register as soon as possible.

Solar thermal electric plants: New Chair

The Standardization Management Board (SMB) has approved the nomination of Werner Platzer as Chair of Technical Committee (TC) 117: Solar thermal electric plants.

Werner Platzer, new Chair of TC 117

Platzer takes over on 1 May 2015 for a period of six years.

A vast experience in solar thermal energy systems

Werner Platzer is Director of the Solar Thermal and Optics Division at Fraunhofer Institute for Solar Energy Systems and a Lecturer at the University of Freiburg. He has carried out material and component research for solar thermal energy systems and experimental testing and modelling of heat transfer and optical systems for solar systems.

Platzer participates actively in a number of standardization committees, namely IEC TC 117, DKE K374 of which he is Vice-chair on solar thermal power plants and VDI 3988 on solar process heat.

He is the author of more than 200 articles, conference contributions and book chapters on the subject.

Obituary

Dr Walter von Pattay passed away 28 April 2015, aged 75 years

Dr Walter von Pattay

Thomas H. Wegmann (left) and Walter von Pattay at the 50th session of ISO/IEC JTC 1/SC 25/WG 3 (Photo: DKE)

Janice Blondeau

The IEC Family was deeply saddened by the recent passing of Dr Walter von Pattay, Secretary of ISO/IEC JTC1/SC 25: Interconnection of information technology equipment, a long-time champion of Smart Homes and Smart Buildings, and strong supporter of international standardization.

In 1983 Dr von Pattay entered the international standardization arena via IEC TC 83: Information Technology*, initially as Assistant Secretary and subsequently (after a short interruption) in the role of Secretary. Dr von Pattay served as Secretary of JTC1/SC 25 for more than 25 years and as Convenor of SC25/WG 3: Customer Premises Cabling, from 1987 to 2011.

Since the mid '80s, Dr von Pattay pursued with his own special kind of enthusiasm the establishment of an international working group to elaborate a globally applicable standard for structured telecommunication cabling. He had a strong personal interest in and guided the development of ISO/IEC 11801, *Information technology - Generic cabling for customer premises*, which has become the recognized worldwide Standard for generic cabling.

Dr von Pattay was awarded the DIN Benefits of Standardization prize in 2002 for ISO/IEC 11801. An excerpt of the prize citation shows its importance: "The Standard ultimately contributed so significantly to the planning safety of all those involved in the establishment, management and use of buildings (manufacturer of components and application products, building owners, planners, installers, and users) that it is now unlikely for an office building being built around the world not to be wired in accordance with ISO/IEC 11801 or one of its derivatives."

He was also a pioneer of international standardization in the areas of Smart Homes and intelligent buildings, in ISO/IEC SC 25/WG1. Von Pattay deployed Smart Home technologies in his own home for more than 20 years, as this June 2010 *e-tech* interview with him illustrates ("Smart homes just a phone call away").

A strong, dedicated leader who was highly respected by those he worked with, Dr von Pattay gave tirelessly in his role as Secretary of JTC1/SC 25 and its Working Groups. Dr von Pattay remained Secretary of ISO/IEC JTC 1/SC 25 right up until his death.

All who worked with him will miss his efficient, foresighted and strategically skilled manner of chairing a meeting, particularly his charming way of using cheerful witticisms to help overcome the hurdles in gridlocked negotiations.

Dr von Pattay's friendship and work will be forever appreciated by ISO/IEC JTC1 and by the wider IEC Family. On behalf of countless standardization colleagues worldwide, we would like to express our sincere condolences to his family and relatives.

* When ISO/IEC JTC 1: *Information Technology*, was founded, IEC TC 83 became part of this new standardization group. Since 1990 it has been known as ISO/IEC JTC 1/SC 25: Interconnection of information technology equipment.

ISO/IEC 11801 had had a major influence on cabling and wiring worldwide

Make it yours

Your help is needed to define the Programme of the WSC Workshop on Conformity Assessment

Claire Marchand

Want to learn about conformity assessment (CA)? Get personalized and practical insights on topics of interest to you? Exchange views and network with experts and peers? Don't look further, the WSC Workshop on Conformity Assessment will help you get answers and meet people that matter in the CA field.

The second day of the workshop will take place at the Palais des Nations

What is to be achieved?

The World Standards Cooperation (WSC) is organizing its first workshop on conformity assessment, to be held over 1,5 days on 1-2 December 2015 in Geneva, Switzerland. The event takes place in conjunction with the United Nations Economic Commission for Europe (UNECE) Working Party on Regulatory Cooperation and Standardization Policies (WP.6) 25th session (also 1,5 days) on 2-3 December.

Take the survey now and select the topics that will be discussed next December

The overall objective of the event is to enhance awareness about global conformity assessment, in line with the relevant WSC terms of reference "to promote and increase the worldwide visibility of international consensus-based standardization and related conformity assessment matters". It is also to inform on and explore important international conformity assessment issues and return practical, relevant and usable feedback which will contribute to a path forward towards the resolution and understanding of those issues.

Have your say in defining the final agenda

Although the event is still several months away, a dedicated website is already up and running.

If you have an interest in national of regional quality infrastructure issues, or conformity assessment issues in general, and think of participating in the workshop, please visit the website, answer the questions and help shape the programme. The workshop topics will be defined by the information you provide. To help you make your choice, a number of topics are already listed, which you can rate according to your level of interest. They include:

- CA as a tool for business and regulators
- Global CA Schemes – Regulators dream come true
- Combating counterfeit goods – risks and rewards
- CA in transition economies – challenges and opportunities
- Harmonized risk classes, standards and CA
- Energy efficiency (EE)

Feel free to suggest alternative themes that you deem important and would like to see addressed during the event.

WSC is a high-level collaboration between the IEC, ISO and ITU

Practical information

Registration is open now and is free of charge for all participants.

The event will take place over 1,5 days. The first day will be at the Mövenpick Hotel near Geneva airport. The first day will be devoted to presentations by CA experts and breakout sessions. The second day will be at the Palais des Nations – to the very same room where the UNECE WP.6 meeting takes place. During the morning session results of the previous day's breakouts will be discussed. All delegates will be able to take advantage of the simultaneous translation services offered by the UN and have the opportunity to speak in their own language.

About WSC

The World Standards Cooperation is a high-level collaboration between the IEC, the International Organization for Standardization (ISO) and the International Telecommunication Union (ITU). Under this banner, the three organizations preserve their common interests in strengthening and advancing the voluntary consensus-based International Standards system.

IEC, ISO and ITU have undertaken several initiatives that were organized under the WSC banner. Those included workshops, education and training, and the promotion of the international standards system.

IEC, ISO and ITU believe that International Standards are an important instrument for global trade and economic development. They provide a harmonized, stable and globally recognized framework for the dissemination and use of technologies. They encompass best practices and agreements that encourage more equitable development and promote the overall growth of the Information Society.

International Standards are consensus-based and transparent. They invite the contribution of all interested stakeholders through an extensive network of national members. International Standards increase market relevance and acceptance and are the corner stone of global trade and development.

Your voice counts

If you are interested in the workshop, please take the survey now. Seize the chance to choose the topics that will be discussed next December.

For more information on the WSC Workshop on Conformity Assessment please go to: http://www.wsccaworkshop.com/

Making a good product no longer enough

Masami Yamamoto, President, Fujitsu explains why companies need to collaborate more than ever before with others

Claire Marchand

IEC Global Visions interviewed Masami Yamamoto, President, Fujitsu, a globally leading information and communication technology company. In 2013, Fortune named Fujitsu "one of the World's Most Admired Companies". In this IEC Global Visions interview Yamamoto explains how active participation in IEC work enables Fujitsu to accelerate product development and facilitates the integration of technologies from different providers into total systems solutions.

Global from the onset

Since the early days, Fujitsu has believed in a global strategy. Its policy has always been to provide products and services based on technologies that can be used anywhere in the world. Standards, in particular IEC International Standards, are indispensable to pursue this goal.

For Masami Yamamoto, business will always be global and technology will be used globally. To survive as a global company, participation in international standardization is and will be a must.

In the past, Masami explains, it was enough to make a good product and to have somebody use that product for a long period of time. Today, you need to make a product that a great number of people around the world really want, and you need do so very quickly because its shelf life is shorter and shorter. Speed is of the essence but cannot be achieved to the detriment of quality. It is essential to develop and manufacture good products in record time for a global roll-out.

Connection and cooperation

People are more and more connected, Masami continues, and so are businesses. “When cycles are this fast, you can no longer do everything alone and therefore you need to be able to collaborate with others. That’s where international standardization enters the picture.”

Yamamoto believes the world is increasingly horizontally, rather than vertically, integrated. In a horizontal business model, different players have different roles. Companies need to develop their core competencies, be unique and create products that are widely accepted. Fujitsu, Yamamoto says, provides services through integration. “To achieve this, we combine our own products with those from other vendors. With our know-how we are able to offer a total integrated systems solution to the customer.”

How standardization contributes to innovation

International standardization plays a major role in innovation and development. What a business can develop on its own is very limited today. For the most part, companies have to work with one another in a kind of “ecosystem” to build a product. For Yamamoto, “You need to know how to

Masami Yamamoto, President, Fujitsu

best leverage standards; this is both a challenge for companies and also key to their success."

Global products have to evolve and improve daily, technology and quality wise. Standardization provides a foundation on which further improvements can be made. As such it impacts product quality greatly. "I believe it is easier to innovate and develop new products based on the solid basis that is a part of Standards."

IP vs standardization

Yamamoto explains that for a company, intellectual property (IP) is a very important asset, but IP alone will not produce goods. "Of course we need to protect IP but on the other hand we also need to standardize and create an ecosystem so that products and services can be developed and can interconnect. The relationship between IP and standardization needs to be a balanced one. I believe it is important to use IP as a weapon to develop products based on Standards."

When participating in the standard-setting process, experts have to understand how to protect their company's IP. For Yamamoto, participating in international standardization work is crucial, the advantages in terms of volume and speed outweighing any potential risks.

What the future holds

Yamamoto sees a social role for IT in an aging society: "On the one side it will allow the elderly to stay in contact with those they care about, reducing their feeling of isolation. But IT will also allow them to lead a healthier more independent life for longer. Last but not least, IT will be an increasingly crucial component in providing better healthcare. With advancements in IT we can collect data and optimize care to patients. We believe there will also be a big business opportunity in providing elderly-friendly IT solutions."

Get involved to make better products

Yamamoto invites companies that are not yet participating in IEC international standardization to join in the standard-development process. "It would be difficult to make a globally-relevant standard yourself all the time … so, while sometimes it may be sufficient to use a Standard that already exists, other times it is better to participate in developing a global Standard with others. By using this approach you can advance more quickly and make better products."

Imagine a world without Standards…

The World Standards Day competition is back!

Already in its 17th year, the World Standards Day competition is back – with a twist! This year participants are being asked to submit a short video rather than the traditional poster.

International Standards – the world's common language

What would it be like to live in a world where International Standards were absent? Imagine if credit cards were different shapes and sizes and each needed a specific machine to work, or if manufacturers produced different sized light bulbs. What if graphical symbols such as the power symbol varied from country to country or from machine to machine…Have you ever wondered how your computer sends your documents to a printer from a different manufacturer? Standards set out common rules and parameters so that products can work with each other. Standard file formats like MPEG and JPEG enable users to share videos and photos with family and friends using technology from different vendors.

Standards are essential for products to work together smoothly and for people to communicate easily and they facilitate global trade. In a world without Standards, routine activities we take for granted, like making a call, surfing the Web or using our credit cards when we travel, would be much more complicated, nearly impossible.

International Standards - the world's common language

Set your imagination free and take part in the 2015 WSD competition!

This year, the WSC (World Standards Cooperation) is asking participants to come up with a 15 second video showing one thing that would not work or that we could not do if International Standards didn't exist. All video submissions must be uploaded on YouTube and the link shared on social media with the hashtag #speakstandards. Read the full rules here.

The winning video will be awarded 1,500 Swiss francs, with three runner-ups each receiving 500 Swiss francs.

About World Standards Day

Each year on 14 October, the members of the IEC, ISO and ITU celebrate World Standards Day, which is a means of paying tribute to the collaborative efforts of the thousands of experts worldwide who develop the voluntary technical agreements that are published as international standards.

Making the Internet of Things a reality

Wireless Sensor Networks' key role

Janice Blondeau

A new IEC White Paper highlights the role of Wireless Sensor Networks in the evolution of the Internet of Things.

Integral part of modern life

Smart Grid, Smart Homes, smart manufacturing, smart water networks and intelligent transportation are just some of the infrastructure systems that connect our world more than we ever thought possible. Their deployment is inextricably linked to the Internet of Things and Wireless Sensor Networks.

From theory to reality

The idea of the Internet of Things (IoT) was developed in parallel to Wireless Sensor Networks (WSNs), and refers to uniquely identifiable objects and their virtual representations in an "internet-like" structure. While research on Wireless Sensor Networks started in the 1980s, it's in the last decade that they have generated greater interest from both industrial and research perspectives.

"Internet of Things: Wireless Sensor Networks" assesses needs for International Standards to achieve interoperability...

...among Wireless Sensor Networks from different vendors and across varied applications

The new IEC White Paper, Internet of Things: Wireless Sensor Networks outlines current needs for underlying International Standards and infrastructure that must be met before wireless devices can become as prevalent as predicted.

The big picture

Published by the International Electrotechnical Commission, this White Paper was prepared by the IEC Market Strategy Board (MSB) project team on Wireless Sensor Networks, in cooperation with project partner National Institute of Standards and Technology (NIST) of the US. Says Kang Lee, engineer at NIST and NIST project lead: "We hope this paper will be a useful resource for a large and diverse community of stakeholders. It provides a much-needed, high-level perspective on the technology's vast potential and on the standards-related tasks that must be accomplished so that we can realize it."

Improved cooperation

We've been told that the IoT would embed miniature computers in all manner of objects – from the most sophisticated, such as aircraft, to the everyday, such as clothing and household appliances. Each object would be uniquely identifiable and linked through an Internet-like structure.

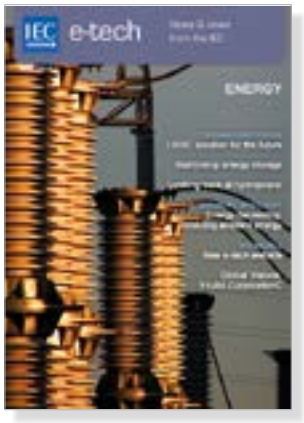
Given the growing number of uses of Wireless Sensor Networks, it's not surprising that many different standards organizations address various aspects of the technology, some in isolation.

Interoperability across the board

This White Paper calls on standards organizations to improve communication and coordination, make unified plans, optimize resource allocation, and reduce duplicative efforts. It also assesses needs for International Standards to achieve interoperability among Wireless Sensor Networks from different vendors and across varied applications.

The IEC White Paper, Internet of Things: Wireless Sensor Networks can be downloaded and paper copies ordered from the IEC website: www.iec.ch/whitepaper/

It relies on standards organizations to make unified plans, optimize resource allocation, and reduce duplicative efforts (Photo: David Berkowitz [CC BY 2.0], via Wikimedia Commons)



Energy

The need to power countless wireless sensors and objects being deployed in wearable devices and to support the Internet of Things is driving advances in all forms of energy harvesting, the process of capturing electrical energy from external sources, such as ambient temperature, solar, thermal, wind or kinetic energy. *e-tech* will look at various forms of energy harvesting and at practical applications.

As concern about the negative impact of burning fossil fuels is growing, renewable energies are set to make up a growing share of the global energy mix. In this context it is interesting to look back at the history of the oldest and still most important source of renewable energy: hydropower.

Low-voltage direct current (LVDC) is seen as an attractive solution to provide power in off-grid and other settings. The IEC SMB set up a Systems Evaluation Group (SEG 4) to evaluate the status of standardization in the field of LVDC applications and products and to recommend the architecture of any future standardization work programme. Its Convenor gives details for *e-tech.*

e-tech

News & views from the IEC

This is a special printout of IEC *e-tech* our electronic publication. You can find a link to *e-tech* on the IEC homepage, or you can access it at www.iec.ch/etech

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