COOLING & HEATING

INDUSTRY SPOTLIGHT
Electroheating
For a clean, energy-efficient industry

TECHNOLOGY FOCUS
Clean tech for cooling and heating of buildings
New approaches to cut energy consumption

High-tech games
Technology omnipresent at 2012 Olympics

CONFORMITY ASSESSMENT
IECEE
Global labelling programme for energy-efficient motors
Focus of the month: Cooling and heating

Issue 06/2012 of e-tech focuses on the technologies used in the cooling and heating of buildings, including some of the London 2012 Olympic sites, and takes a closer look at electroheating. It highlights the work done by the relevant IEC Technical Committees that are directly involved in developing International Standards for those issues to ensure safety, reliability, performance and energy efficiency.
Summer has arrived in the Northern hemisphere, winter in the Southern hemisphere. It’s time to take a closer look at cooling and heating solutions for commercial, industrial and residential areas.

Buildings
The building sector is extremely greedy in terms of energy consumption. Heating is mainly provided by burning fossil fuels, whereas cooling and ventilation systems rely essentially on electricity. In the future, renewable energies are set to play a growing role for heating and cooling buildings. A number of IEC TCs (Technical Committees) and SCs (Subcommittees) are involved in the preparation of International Standards for components and systems used in heating, cooling and ventilation installations.

Industrial processes
As for electroheating, it is used in many industrial sectors, for the processing of many elements ranging from metals to glass, ceramics, polymers or natural fibres. In general it is more energy efficient than many other industrial processes, significantly cleaner and results in better quality products. IEC TC 27 prepares IEC International Standards in that field.

The London 2012 Olympics
Technology will play a key role at the 2012 Olympics in London at the end of July. And so will IEC International Standards. All venues will be equipped with state-of-the-art devices and systems, the best that modern technology can offer. Issue 06/2012 of e-tech takes you through some of the Olympic sites; describe their equipment, installations and systems and how they rely on standardization for safety, security, reliability, efficiency and performance.
Leaner and cleaner heating and cooling

Energy-efficient heating and cooling systems and renewables to cut consumption

The building sector accounts for more than 35% of the world’s total energy demand, “of which 75% is for space heating and domestic water heating”, according to the IEA (International Energy Agency). Heating is still mainly provided by burning fossil fuels, whereas cooling and ventilation systems rely primarily on electricity – the production of which is also largely reliant on the burning of these same non-renewable resources. Renewable energies are set to play a growing role in the heating and cooling of buildings as all countries try to cut their dependence on fossil fuels. A number of IEC TCs (Technical Committees) and SCs (Subcommittees) are involved in the preparation of International Standards for components and systems used in heating, cooling and ventilation installations.

No end in sight to demand

Worldwide energy demand for the building sector is projected to grow by more than 60% between 2007 and 2050. A significant share of this requirement will come from heating and cooling applications, with the latter expanding more rapidly from 2030 onwards, driven both by income growth and climate change.

In Europe, the final energy demand for heating and cooling (49%) is higher than the figures for electricity (20%) or transport (31%). Cooling, ventilation and refrigeration account for roughly 20% of the overall electricity consumption of a building, obviously depending on climate and geographic location.

Reducing energy consumption for both heating and cooling buildings is an important factor in slashing the world’s global energy demand.

Keeping heating and cooling demands under control

Cutting the energy consumption of buildings involves a variety of systems and actions. For machinery – such as lifts or escalators – and lighting, this can be achieved by installing more efficient motors and equipment as well as sensors, smart switches and energy-efficient light bulbs and appliances.

Reducing overall energy usage for heating and cooling is more complex, as it involves the building envelope itself as well as a number of other elements such as insulation and orientation. While cutting energy consumption for heating and cooling can be achieved fairly easily for new constructions, it can be complicated to adapt or retrofit existing building stock.

Introducing systems such as CHP (combined heat and power) and thermal energy storage and increasing the share of renewables like solar thermal will help cut the use of fossil fuel sources for heating and cooling and mitigate the impact of the anticipated increase in energy demand from the sector.

Rethink, new approaches needed

Heating and cooling requirements are obviously highly variable. In North America, for instance, heating needs are minimal or practically non-existent in southern states but cooling is required during many months of the year, while the opposite applies for northern regions of the continent. These distinct needs call for different systems or ones that can meet both requirements.

Heat pumps offer an interesting solution when both heating and cooling are required. They extract or add heat mechanically to a temperature source from the air, the ground or a circulating water loop within a building. In heating mode, they add heat into the building’s pipework systems from a source such as a boiler. In cooling mode they reject heat through a cooling tower or a fluid cooler, in the same way as a refrigerator does.

Heat pumps use external sources of power (electricity or fossil fuel), but are very efficient as they can supply as much as three times the energy that they

Renewable energies are set to play a growing role in energy supply (Source: DuPont)
consume. They can also be used all year round, providing both heating and cooling. This means that they can contribute to cuts in CO₂ emissions. According to the UIE (International Union for Electricity Applications), “The potential for CO₂ emissions reductions via residential, commercial and industrial heat pumps is about 6% of global emissions. This is one of the largest savings that a single technology can offer”.

**When heating is not needed**

In hot climates, where a heat pump’s warming ability would be little used each year, AC (air conditioning) systems can offer a viable alternative. AC installations may be central units that use ductwork to transfer cooled air to and from various locations in a building, or standalone appliances installed in different parts/rooms of a building.

The latter are good for houses without existing ductwork and cheaper to install than central AC. They allow temperature levels to be adjusted for each room but have high maintenance and running costs and are expensive to buy.

IEC SC 61D: Appliances for air-conditioning for household and similar purposes, prepares International Standards for electrical heat pumps, air conditioners and dehumidifiers.

**Additional solutions**

Heating and cooling buildings can be achieved using a variety of other methods such as CHP and thermal energy storage. CHP, or co-generation, produces electricity and hot water or steam simultaneously from the same power source. This method could, theoretically, allow fuel to be used to almost 100% efficiency.

As part of its activities, IEC TC 105: Fuel cell technologies, “prepares International Standards for stationary fuel cell systems, especially for distributed small power generators and CHP systems”. The IEC SMB (Standardization Management Board) has allocated to IEC TC 5: Steam turbines, the task of carrying out a study of standardization needs on CHP. IEC TC 5 will establish a relevant group that will liaise with TC 105 on CHP.

Thermal energy storage systems use a variety of means to store available heat in an insulated repository for use later in a number of industrial and residential applications, such as space heating or cooling, hot water production or electricity generation. One of the best-known and most widespread thermal energy storage systems is the domestic hot water tank. Other more efficient solutions may use salts or oils.

Thermal energy storage, used in conjunction with solar thermal systems, overcomes the disparity between demand for and supply of thermal energy and is thus important for the integration of renewable energy sources.

**Renewable energies enter the equation**

Renewable energy sources – solar thermal in particular, but also geothermal – offer a promising opportunity to cut energy consumption for heating and cooling buildings. In solar thermal systems, solar radiation is collected and the resulting heat conveyed using the medium of heat transfer. It can be used directly – for example to heat swimming pools – or indirectly, through a heat exchanger, for applications such as space heating.

IEC TC 5 and SC 61D prepare International Standards for turbines and heat pumps used in solar thermal and geothermal energy systems.

**The future will be more energy efficient and cleaner**

As heating and cooling equipment moves away from its current heavy reliance on fossil fuels to cleaner technologies and renewable energies, significant energy savings and cuts in greenhouse gas emissions can be expected. Forecasts from...
Lean, mean and green
Heating, cooling and powering the 2012 Olympics in a sustainable way

Some modern Olympic Games have been branded as extravagant and a waste of public money. Installations are costly and facilities in service for only a short period during the event – but are unsuitable for later use by the general public. Mindful of this, the London 2012 organizers placed sustainability firmly at the core of this year’s Olympics. The provision of heating, cooling and power in a sustainable way is at the very centre of this effort and should ensure a positive legacy long after the Games are over. Many IEC TCs (Technical Committees) and SCs (Subcommittees) prepare International Standards for components and systems that are being installed on the Olympic Park.

Early green commitment
When bidding to host the Games the LOCOG (London Organising Committee of the Olympic and Paralympic Games) made a commitment to meet 20% of the Olympic Park electricity requirements with new local renewable energy sources. These include advanced waste-to-energy technologies, PV (photovoltaic) panels, small scale wind turbines, bio-diesel generators and micro-co-generation for public lighting, venues, accommodation and electric vehicle power. All additional site electricity demand is to be met with off-site renewables, supplied by wind farms and marine current turbines.

Three IEC TCs prepare International Standards for renewable energy sources proposed for the 2012 Games. They are TC 82: Solar photovoltaic energy systems, TC 88: Wind turbines and TC 114: Marine energy – Wave, tidal and other water current converters.

The commitment to renewable sources was restated in the London 2012 Sustainability Plan. Furthermore, the ODA (Olympic Delivery Authority) set an overall target of cutting carbon emissions by 50% across the Olympic Park, in comparison with schemes constructed and operated using more conventional means. To achieve this it adopted a ‘Lean, Mean, Green’ approach:

Whatever the eventual savings might be, the IEC will have made a major contribution to improving the energy efficiency of the building sector, and of its heating and cooling equipment in particular. The work of many of its TCs and SCs and the strategy papers that identify principal and emerging technological trends and challenges, and the means to address them, will help manufacturers and legislators find the best solutions in the developing marketplace.
• Lean – minimizing energy demand by building energy-efficient venues
• Mean – supplying heat, cooling and power from on-site energy centres, further reducing their carbon emissions
• Green – generating heat and power from renewable sources.

**The right mean and green tools**

To provide heat, cooling and power on site, the organizers chose to build two flexible modular energy centres at Kings Yard (Olympic Park) and Stratford City. Each is equipped with a natural gas-fired CCHP (combined cooling, heat and power) unit and bio-mass fired boilers.

Using zero carbon renewable energy sources such as biomass will provide savings in carbon emissions of more than 1 000 tonnes per year in comparison with schemes employing fossil fuels. CHP (combined heat and power) plants are up to 30% more energy efficient than those using traditional means of generation. Basic demand for heat during winters will be met through the bio-boilers that burn sustainable biomass such as woodchips and pulp.

IEC TC 5: Steam turbines, has been asked by the SMB (Standardization Management Board) to carry out a study of standardization needs for CHP. The energy centres have a flexible modular design that will avoid overcapacity in the first phase of development but allow future technologies to be incorporated in the buildings as they are developed and as demand grows after 2012. They will provide an efficient, low-carbon heating and cooling system across the site for the Games and for the new community and housing projects that will be developed after 2012. Between them the two centres currently produce 92,7 MW of heating, 55 MW of cooling and 10 MW of electrical power. Eventually they will be able to supply a total of 194,9 MW of heating, 64 MW of cooling and 30 MW of electrical power to tens of thousands of homes and businesses.

The centres are interconnected and electrical power is distributed by 200 km of underground cables running through two 6 km tunnels. This underground network has replaced 52 pylons and 130 km of overhead cables.

IEC TC 20 prepares International Standards for electric cables.

A primary electrical substation forms the central part of the utilities network. It takes power from the upstream 132 kV electrical network outside the Park, ‘stepping it down’ to 11 kV to supply venues and buildings across the Olympic Park and Stratford City. Each 132/11 kV transformer is supported by 11 000 items of switchgear and auxiliary equipment.

Standardization for power transformers is the task of IEC TC 14, whilst TC 17 and its SCs prepare International Standards for high- and low-voltage switchgear and controlgear and associated assemblies.

**Energy-efficient designs**

To minimize primary energy use, both centres exploit recovered waste heat for their operation. They use energy-efficient systems and mechanisms to reduce the costs of heat supply. Ammonia-based chillers and electrical and absorption chillers enable the centres to meet the demand for cooling, while the site-wide heat network generates hot water and heats the Aquatics Centre swimming pools and other venues and buildings.

The roof of the Olympic Park Copper Box, the venue for various events, is fitted with 88 light pipes that allow natural light inside, reducing the demand for electric lights and achieving annual energy savings of up to 40% in comparison with a more conventional structure.

**Adjustments**

As with any major project, some adjustments were required late on in the process. As time constraints caused the installation of the preferred wind turbine system to be abandoned, the ODA had to revise down its target for cutting carbon emissions, from 50% to 43%. However, energy efficiency schemes in boroughs surrounding the Park have been introduced to make up for the shortfall and some small renewable sources, such as PV panels on the Media Centre and its car park and some micro wind turbines, have been added. Further efforts will also be made to deliver additional carbon savings by reducing electricity consumption during the Games.

**Electrical installations at the core**

Power generation and distribution are essential for the Olympic and Paralympic Games and will provide a beneficial legacy for the local communities. They are just two of the countless electrical systems deployed during the event that rely on IEC International Standards for proper and safe operation. A successful, lean, mean and green London 2012 implies an IEC success – albeit a discreet one.
A smarter way of using heat pumps

Evening out the load

by David Victor Tackie, 2011 Young Professional Leader, and Helena Segerberg, Consultant Engineer

David Victor Tackie is one of the three 2011 Young Professional Leaders. In collaboration with Helena Segerberg, a Consultant Engineer from Balslev who is working on a large Danish Smart Grid project, he talks of how heat pumps could be integrated into the intelligent system of the future. They would help deal with various coefficients of performance and in evening out power loads.

Reducing CO₂ emissions

One way to reduce climate change is by lowering CO₂ emissions. Much of the CO₂ we emit into the atmosphere comes from burning fossil fuels – gas and oil and coal – to generate electricity. In the developed world, some 40 percent of CO₂ emissions are caused by energy consumed either for travel or in the home. So, how can we help reduce CO₂ emissions?

Generating energy with heat pumps

When it comes to energy use in the home, a heat pump is one of the most efficient means of heating or cooling a building. Working on the basis of heat transfer, heat pumps only require a minimum amount of electricity to function. So, they can transfer heat from a source outside the home, such as the air or soil, and pump it to another area inside the building where it is heated or cooled over a circulating coil system and then transferred on to provide hot water or air conditioning. For heat pumps, the average COP (coefficient of performance – or power factor) is approximately three: energy output is three times the amount input.

Need for International Standards

Since heat pump control needs to meet several objectives, such as optimizing COP, information needs to be exchanged continuously between each heat pump and the Smart Grid. This means that the necessary intelligence is available about when and where power is needed as well as what power is available from what sources, including renewable energies. This allows the Smart Grid to make informed decisions and manage its power needs appropriately. It follows that there is a great need for International Standards.

Individual customers with heat pumps also need to be able to switch freely and easily between electricity suppliers. The emphasis is placed on an open platform, an authorized communication server and a secure gateway into the house.

One of the most popular International Standards Series in this respect is IEC 61850: Communication networks and systems for power utility automation. These publications are essential for Smart Grid management and the integration of IEDs (Intelligent Electronic Devices) into an SAS (Substation Automation System). Publications deal with all the elements of a power substation: its functionality, terminology, parameters, life-cycle management and the relevant communication structures.

Where data security is concerned, an IEC TS (Technical Specification), IEC 62351-8, released in September 2011, concentrates on the security aspects of computer-based applications where access can be both human, via local wired or wireless media access, and remote, via automated computer agents or control centres.

Danish Smart Grid research project

Denmark is one of the world’s leading suppliers of wind power and now it has initiated a vast research and development project called iPower. A “strategic platform for innovation and research in intelligent power”, iPower’s mission is to develop an intelligent and flexible energy system that can handle fluctuating power generation, particularly where renewable energy is concerned. By developing the present Danish electrical grid into a Smart Grid, a large number of distributed energy resources, methods of storage and energy-efficient devices can be incorporated. They include intelligent, regulated heat pumps, electric vehicles that can act as energy storage units when not in use and photovoltaic modules for the production of renewable energy.

Smart Grid solutions include heat pumps

One working group in iPower is studying how Smart Grid solutions can be used to secure sufficient grid capacity in the low voltage grid. [Low voltage is defined by the IEC as voltages up to 1 000 V AC or 1 500 V DC.] It has also been analyzing the effect of incorporating smart heat pumps using new control and communication technology.

Its analysis has shown that an increase in the number of installed heat pumps in the electric grid would cause grid capacity problems in many low voltage grids, primarily because the grid in many areas
isn’t designed for this scale of increase in consumption.

**Even out the load**

Current domestic heat pumps operate according to the actual heating demand. In other words, the warm water in a domestic storage tank is reheated immediately after consumption and then the temperature in the tank is maintained throughout the day. As most people in a district have similar habits, the variation between the maximum and the minimum load for the whole district increases along the same lines. The following figure shows the electric load curve for a residential house with and without electric heating.

Smart heat pump control would enable the operation of heat pumps in a district to be coordinated in such a way that the total load curve for all houses would be smoothed out. The following measures would help increase the flexibility of operation time for heat pumps:

- increasing building insulation and size of storage tank used for warm domestic water
- heating up domestic warm water just in time for use or at an optimum moment according to the total load on the distribution network
- lowering the temperature at night time and when nobody is at home
- increasing the insulation of the building and the size of the storage tank will mean that the heat pump has to operate less frequently. The storage tank can, for instance, be placed on the roof or buried outside.

A simulation was carried out on 24 December for a typical Danish low voltage network dating from 1970, supplying houses with an energy consumption that corresponded to this period. The simulations showed that, by coordinating the operation time for the heat pumps, further heat pumps can be installed in a specific district without the need to reinforce the low voltage grid. This can be achieved without any change in comfort levels, i.e., the temperature in the house is maintained at 21ºC.

In the first simulation exercise, the heat pumps operated independently of one another. In this instance, heat pumps could be installed in 21% of all houses in the district. The size of the storage tank for warm water was 1 m³.

In the next exercise, the operational periods of the heat pumps were coordinated through direct control and the storage tank for warm water measured 2 m³. Here, heat pumps could be installed in 50% of the houses, resulting in the load curve being almost smoothed out. The main disadvantage for this network was the drop in voltage level for the houses at the end of the line.

**IEC International Standard due to be published later this year**

Another IEC International Standard that deals with the security aspects of heat pumps is IEC 60335-2-40: Household and similar electrical appliances – Safety – Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers. This publication is presently in CDV (Committee Draft for Vote) stage and due for finalization before the end of 2012.
Electroheating, the high-power heating of material using electrical energy, is widespread in many industrial sectors. It is used for processing elements ranging from metals to glass, ceramics, polymers and natural fibres. It is also widely employed in the food industry. In general it is more energy efficient than other industrial processes relying on fossil fuels as well as being significantly cleaner and offering better quality finished products as temperatures can be more precisely controlled.

Electroheating technologies have a highly significant impact on industrial electricity consumption, accounting for between 20% and 40% of use in the EU, according to UIE (International Union for Electricity Applications) data. As a result, improving the energy efficiency of these technologies is an important objective that figures prominently on TC 27’s agenda.

From arc to lasers...
A non-exhaustive overview of some electroheating technologies can give an indication of their importance in today’s manufacturing. A number of attempts to employ an electric arc to melt iron were being made as far back as the 19th century. Patents were taken out for EAFs (electric arc furnaces) in the 1880s and the first commercial EAF plant was 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. This can extend from around one tonne to hundreds of tonnes, allowing the establishment of mini-mills.

EAFs also allow steel to be made from 100% scrap metal, providing considerable savings in energy 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 to melt various metals including steel, copper or aluminium, or even precious metals. Their capacities range from less than one kilo to one hundred 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 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 is from 40%-80%, while that of an electric furnace can reach 95%.

However, measuring the emission of CO₂ 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.

From a practical angle, electroheating presents a number of advantages. For coating and curing surfaces of transformers, a Canadian plant found electric IR (infrared) systems to be more energy efficient and cleaner than gas convection ovens. Start-up and shutdown times were shorter, as long preheating and cooling periods were not required; the processing speed was doubled; surfaces alone were treated so the rest of the equipment did not have to sustain high temperatures unnecessarily. Similar findings were obtained when curing polyester coatings on light fixtures using infrared or gas convection ovens.

From surface to deep heating
If infrared or radiation heating is highly efficient in applying heat and curing surfaces, so-called dielectric heating – a term covering RF (radio-frequency) and microwave heating – is more effective for some other applications, since heating occurs inside the material. In both cases the material is heated by an electromagnetic field continuously reversing directions at very high frequency, between 10 and 100 MHz for RF and between 300 and 30 000 MHz for microwave.

As water heats up very fast, RF and microwave heating are used in many industrial applications, such as drying, fixing dye and controlling moisture content in the textile industry. These processes are also used for the sterilization of medical equipment; drying, cooking, heating and sterilization in the food industry and a variety of other applications in industries such as chemical, rubber, paper and wood.

Multiple advantages
Dielectric heating is much faster than conventional techniques: processing times are reduced by as much as 80% and pre-heating and cooling periods are not required. It allows for precise temperature control, resulting in higher product quality than that achieved using conventional heating procedures.

It is also cleaner as no fuels are burned at the production site and the lives of operators are therefore not put at risk. Microwave heating is also safe as electromagnetic waves are kept inside the heating chamber. Dielectric heating systems are smaller than comparable conventional systems, giving space savings of up to 90%.

IEC work essential for the industry
IEC TC 27, created in 1937, prepares International Standards for industrial electroheating and electromagnetic processing.

IEC TC 27 intends to amend existing standards to address EEE (Electrical Energy Efficiency), EMC (Electromagnetic Compatibility) and EMF (Electromagnetic Field) 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. All this points to a very busy agenda for TC 27 in the future.
The heat is on!
No rest in sight for TC 27 experts

Countless products we use, consume or even eat can result from employing electroheating techniques. Electroheating is the high-power heating of various materials using electrical energy. Steel or aluminium ingots, ceramics and ready-made meals may be produced using this process.

IEC TC (Technical Committee) 27: Industrial electroheating and electromagnetic processing, prepares International Standards for the many installations used in the sector.

Not so new technology, relatively recent standardization
Electroheating was known well before its first industrial application, in which electric arc furnaces were introduced to the steel industry in the early 20th century. An electric arc is a plasma discharge that forms when a high electric current passes between two electrically conducting materials or “electrodes” through a normally nonconductive medium such as air. The temperature within the plasma can be over 6 000 °C. In industry, this process is used for smelting and refining metals welding, plasma cutting and many other applications.

A number of other electroheating technologies, such as infrared radiation, induction, radio frequency and microwave, have emerged since electric arc furnaces were first installed. Electroheating is applied in generic industrial operations such as fluid heating, calcination, drying, evaporation, sterilization, heat treatment, metal and non-metal heating, melting, smelting/ agglomeration, curing and forming.

Such operations are used for producing or processing many different materials, which range from metals to glass and from natural fibres to polymers – but are also used to prepare paper and foodstuffs (see article on industrial electroheating in this e-tech).

TC 27 was established in 1937 “to prepare international standards for characteristics, safety requirements and test methods for industrial electroheating installations”. Its standardization work actually began in the 1960s. Its first standards, including IEC 60239, which dealt with dimensions of graphite electrodes for arc furnaces, were published in 1967.

The scope of TC 27 covers all aspects of industrial electroheating, including electroheat-based surface treatment technologies, and their combinations.

Broad customer base, far-reaching remit
Electroheating equipment encompasses a wide variety of heating methods. Users of TC 27 standards are to be found in a range of heavy to light industrial sectors. They include the iron, steel and non-ferrous metal industries; automotive and machinery industries and cement, glass, ceramics and chemical industries as well as the food industry.

Emerging sectors such as nanotechnologies, biotechnologies, optoelectronics, the PV (photovoltaic) industry and the re-processing of waste and dangerous products require precise or unique heating methods. They also open up new perspectives for electroheating processes and present the need for new or updated standards. New heating processes using, for instance, laser or microwave heating, may sometimes provide the only possible solution to meet the requirements of a number of disparate industries.

Nevertheless, standardization in industrial electroheating is of great importance for manufacturers of equipment and installations. These are mainly small and medium-sized enterprises and their
products are often individually-designed and custom-engineered according to the specific needs of end-users. Establishing common international standards for equipment with different characteristics and safety requirements may be difficult, but fully supports the trends towards global harmonization and the reduction of trade barriers.

Specific issues
Electroheating installations that use electromagnetic processing may prove to be sources of EMI (electromagnetic interference), leading the TC to address specific aspects of EMC (electromagnetic compatibility) and EMF (electromagnetic fields).

As electroheating technologies extend to more sectors and represent a large percentage of industrial electricity consumption – between 20% and 40% in the European Union, according to TC 27 data – EEE (electrical energy efficiency) becomes a pressing issue. This is despite the fact that electroheating is usually more energy efficient than processes burning fossil fuels, as it can be switched on and off immediately. It also offers more uniform heating temperatures.

To tackle the energy efficiency issue, TC 27 set up WG (Working Group) 29: Energy efficiency in electroheating installations, to “develop guidelines for determination of criteria […] for allowing fair comparisons and evaluations of the performance and efficiency within particular sub-categories of electroheating equipment / installations”.

TC 27 also established WG 30: Industrial infra-red electroheating installations, “to develop standards concerning safety and test methods for industrial infra-red electroheating installations”.

Multiple objectives
Noting an “increasing demand for energy savings, product quality and environmental protection” and that “application areas of electroheating methods are not only expanding but also becoming a must for many industrial sectors”, TC 27 lists as its objectives and priorities for the next 3-5 years:

- the revision of the 12 publications in the IEC 60519 series of standard that deal with the safety of industrial electroheating installations
- the preparation of additional parts covering particular industrial electroheating installations, such as those with infrared emitters or laser heating equipment
- the revision of the large series of test standards, which should be updated in view of technological developments and market needs. In addition to its revision work, TC 27 also intends to start work on new standards, while amending the existing publications, to address:
  - EEE issues (guidelines for the classification of equipment/ installation to determine the performance/efficiency of a given system and a comparison with other systems of that class)
  - EMC and EMF issues safety and test methods for different electro-heating installations, in particular new ones or those not covered by existing standards
  - safety and reliability aspects of combining heavy current electroheating equipment with sophisticated digital control methods

To take into account the predicted long-term evolution of electroheating technologies, TC 27 announces its intention to undertake new projects aiming at developing safety and test standards for:

- infrared heating technologies
- plasma arc furnace installations
- new casting systems
- electromagnetic processing of materials.

Widespread cooperation
To achieve this extensive range of objectives, IEC TC 27 recognizes the need to broaden its resources through the medium of specialists who prepare diverse electroheating standards. To do so it intends to collaborate with a number of international and regional industrial societies that deal with thermoprocessing equipment. They include the UIE (International Union for Electricity Applications), CEN (European Committee for Standardization) TC 186: Industrial thermoprocessing – safety, and the relevant ISO (International Organization for Standardization) TCs.

The development of current electroheating processes coupled with the emergence of new technologies, considered in conjunction with IEC TC 27’s objectives, point to the likelihood of an extremely busy agenda for this sector in coming years.
Ensuring the security of major global sporting events such as the Olympic Games or the World Cup represents a major challenge for organizers. The contests attract huge crowds and universal media coverage. Many of the technical measures that underpin the overall security system for the London Games depend on electronic devices and installations that rely on International Standards prepared by ISO/IEC JTC 1, the ISO (International Organization for Standardization) and IEC Joint Technical Committee that deals with information technology matters. ISO/IEC JTC 1 work is also widely used in systems introduced to help athletes and spectators enjoy the Olympic experience.

The end of innocence
No other event attracts as much attention as the Olympic Games. Extensive media coverage and the presence of athletes from around the world make them ideal targets for groups, particularly terrorists, that are seeking maximum publicity and for criminal actors that see them as opportunities for rich pickings.

At the same time host nations, cities and organizing bodies under the world’s spotlight must provide maximum security for competitors and spectators alike, a difficult and very expensive undertaking.

Ever since the tragic events at the Munich Games in 1972, security has figured at the top of the agenda of organizers, in particular during the summer Games which are notably harder to secure. And this concern is fully justified, as incidents in the runup of the 1992 Barcelona and the bombing at the 1996 Atlanta Games clearly demonstrated. Extensive technical security and surveillance measures were introduced during the 2004 Games in Athens for the first time, and for this year’s London Games all the agencies and organizations involved stressed that security would figure as one of their main priorities.

Spiralling costs for a multi-layered approach
The cost of ensuring the security of competitors and spectators as well as that of venues before and during the Olympics has been spiralling over the years. The security budget for the 2000 Sydney Games reached USD 180 million. Four years later it had multiplied eight times to reach USD 1,5 billion for Athens.

The provisional cost of the London Games security operations was set at USD 865 million in a March 2012 House of Commons Committee report, representing some 5% of the total budget for the Games and legacy projects.

The need to ensure maximum security for the events has gradually led to a multi-layered approach that integrates physical, human and technological resources. During the London Games, up to 27 000 private security contractors, police and military personnel will be deployed to control access and ensure the security of athletes, spectators and the Olympic venues. High-tech systems and installations will back up human resources.

ISO/IEC JTC 1 role in controlling access
Many of the technologies used to safeguard London 2012, in particular for controlling access for authorized personnel, the movements of individuals and other aspects of the Games, rely on standards developed by various ISO/IEC JTC 1 TCs (Technical Committees) and WGs (Working Groups).
The London ODA (Olympic Delivery Authority) in its series of tenders for the security plan clearly spelled out the need to use technological solutions to secure the site areas including “ACS (access control systems) comprising RFID (radio-frequency identification) token and biometrics”.

RFID is a wireless technology enabling communication between interrogating devices and embedded electronic tags. It can be used to identify and track people and any type of product. RFID standards are prepared by JTC 1/SC (subcommittee) 31: Automatic identification and data capture techniques.

Biometric hand and iris scanners were installed as early as October 2009 to let authorized workers enter and leave the Olympic Park site. Hand scanners provide access control for up to 5 000 workers an hour.

During the enrolment process all workers had their hand scanned to enable access to the Olympic Park. A 3D digital photograph of the hand was taken and the unique size and shape of the hand matched and linked to the individual’s smart photographic site pass to enable access. The data was encrypted, stored securely and used to provide access to the site during the construction work. Iris scanning was used on the same basis where required.

Biometrics is the responsibility of ISO/IEC JTC 1/SC 37, which as of July 2012 had published some 80 International Standards and reports covering applications, exchange formats and even societal, cultural and ethical issues related to use of biometric technologies for identifying people. Access for athletes and staff involved in the Games will continue to rely on these ACS for the duration of the event.

Contributing to the enjoyment
Focusing on security issues alone could provide a distorted image of the overall contribution made by ISO/IEC JTC 1 to the entire Olympic experience for athletes and spectators alike.

Many of the systems used to ensure the security of the Games have also been deployed to facilitate the stay of athletes and enhance the pleasure of spectators.

For instance, it was announced in June that German Olympians would be provided with an exclusive dual-interface Visa card for contactless and contact payment wherever the Visa standard for contactless payment is accepted.

There are thousands of contactless payment terminals in London, with another 3 000 planned for the Olympic Games alone. Some 8 000 London buses and 2 500 taxis will also be equipped with terminals to accept contactless payment.

Contactless NFC (Near Field Communication) is based on existing RFID standards and on the ISO/IEC 14443 series of International Standards for identification cards. These standards are developed by JTC 1/SC 17/WG 8: Integrated circuit cards without contacts. These systems should help reduce waiting times for payment as well as for transport for participants and members of the public.

Countless other systems that rely on ICT (information and communication technologies) will be installed in Olympic venues and in London itself, including many that will be deployed to support the sporting events themselves. All will depend on standards prepared by a variety of ISO/IEC JTC 1 SCs and WGs.

They will contribute to provision of the safest and best possible conditions for participants and spectators, allowing them to enjoy the Olympic experience to the full.
Growing populations and industrializing countries create huge needs for electrical energy. According to the IEA (International Energy Agency), projected world primary energy demand will increase by 45% between 2006 and 2030 – an average annual rate of growth of 1.6% – and doubles (i.e. a 100% increase) by 2050. Electricity demand will triple by 2050. The question is how do we cope with the increasing need for energy in the meantime? One option is to use less energy, which for some is not an option at all. How about using energy more efficiently then? Not much can be said against that and a lot is in the pipeline and ready to use.

Industry accounts for approximately 42% of the world’s consumption of electric energy. Two thirds of this is used to power electric motors. Increasing the efficiency levels of those motors by a few percentage points can have a significant impact on energy use, which not only reduces manufacturing costs but also CO₂ emissions.

**Energy efficient motors**

The good news is that leading manufacturers of industrial motors around the world have already adopted an energy efficiency classification that was put in place by the IEC and has been published as a globally relevant standard IEC 60034-30, *Rotating electrical machines - Part 30: Efficiency classes of single-speed, three-phase, cage-induction motors (IE-code)*. This IEC International Standard classifies motors into three levels depending on how efficiently they convert electricity into mechanical energy: IE1 is the base standard for efficiency, IE2 stands for high efficiency and IE3 for premium efficiency. The standard also mentions a future level above IE3 to be called IE4 super premium efficiency. Products in this category are not yet commercially available.

**National and regional initiatives**

The classification system has stimulated competition among motor manufacturers and generated massive technology improvements, and while IEC International Standards are voluntary, the EU (European Union) has adopted the IEC classification system and issued a Commission Regulation (EC) No. 640/2009, which came into effect on 16 June 2011. As of that date, only motors that meet or exceed IE2 energy efficiency levels are allowed to be sold and installed in the EU. In a second stage, from January 2015 all motors will need to reach IE3 efficiency levels (or IE2 combined with variable speed drives). Generally referred to as EU MEPS (Minimum Energy Performance Standard), the requirement covers most two, four and six pole motors in the power range of 0.75 to 375 kW (kilowatt) for AC (alternating current) power supply frequencies of 50 and 60 Hz (Hertz).

Other countries including Australia, China, Brazil and Canada have already implemented similar energy efficiency schemes and participate actively in the IEC.

**One step further**

In the USA, the NEMA (National Electrical Manufacturers Association) Premium Efficiency Electric Motors Program corresponded closely to the IEC energy classifications and NEMA motors had to be tested in accordance with the IEC testing protocol contained in IEC 60034-2-1, *Rotating electrical machines - Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)*.

**A global programme**

However, recognizing that standards are only one part of the equation and that assessment of conformity to energy efficiency standards is equally important, the IECEE and NEMA initiated talks that
resulted in the resolution to work together to possibly develop a programme that will be truly global and uses standards that are recognized and accepted everywhere: IEC International Standards.

In this respect, if the parties agree, the future Global Motor Labelling Programme will be inspired by and based on the existing NEMA Premium Efficiency Electric Motors Program but converted into an IEC Global Motor Labelling Programme (abbreviated GMLP), administered by IECEE, the IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components, under the umbrella of the IEC.

Benefits for all stakeholders

The GMLP will offer major advantages to all parties involved. The global label will be registered at WIPO (World Intellectual Property Organization), a United Nations agency. It will ensure that motor manufacturers’ testing laboratories participate effectively. The motor industry will also be represented at IECEE management committee level, this will enable it to make its needs heard insofar as policy and strategy matters are concerned. The GMLP will meet the expectations of government and national authorities, including those in developing countries, in terms of increased energy efficiency and environmental protection.

As part of the IECEE System, the IECEE E3 (electrical energy efficiency) GMLP may benefit from direct recognition by all IECEE member countries – of which there are 53 to date – or in the market place by direct recognition by regulators and national authorities, and beyond. Many non-member countries around the world recognize and accept the global value of IECEE certificates and labels.

Operating providers, testing laboratories and certification bodies will be registered under the strict control of the IECEE Peer Assessment Programme, ensuring the highest possible level of compliance with ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, and ISO/IEC 17065, *Conformity assessment – Requirements for bodies certifying products, processes and services*, as well as with all IEC Product Standards in terms of energy efficiency/performance and safety aspects. The IECEE E3 GMLP will be operated in accordance with ISO/IEC System 5 that includes testing, factory surveillance, certification, re-testing and market surveillance.

Once launched, the IECEE E3 GMLP will be the first truly global labelling programme for all types and sizes of industrial motors.

*To be published end of July.*
Personnel competence is key to safety

Baker Hughes chooses IECEx for equipment and personnel certification

Article based on an interview with Norman Ditrich, Baker Hughes

Safety in hazardous areas is non-negotiable. When equipment is not installed, maintained, inspected or repaired by competent persons and according to strict Ex standards, the outcome can be devastating. What may be tolerable 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.

Certifying competence and skills in the Ex field

To meet Ex industry’s needs and ensure that all safety aspects have been covered, IECEx, the IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres, launched the CoPC (IECEx Certificate of Personnel Competence) Scheme in early 2010.

The CoPC Scheme provides companies working in the Ex field with independent proof that a person has the required competence and capability (based on qualifications, experience and demonstrated ability) to implement the International Ex Standards and to work on, or repair, equipment located in hazardous areas. This can be especially important for consultants and contracted staff. The international IECEx certificate is personal, non-transferable and valid across international borders. As well as the certificate itself, IECEx-approved personnel are also furnished with a wallet-sized identification card with photo, providing instant proof of certification.

The CoPC complements the other IECEx Schemes – IECEx Certified Equipment Scheme and IECEx Certified Service Facilities Scheme – to ensure that equipment and people working in the Ex field operate in the safest possible conditions.

Since its launch 2 years ago, the CoPC Scheme has been thriving, with more than 100 certificates delivered to date. Of those, 15 were issued to Baker Hughes Incorporated, the highest number ever issued to one company. This number is expected to grow to 20 in a few months. The Chief Engineer’s Office of Baker Hughes is working to consolidate technical competence activities across the enterprise and the personnel certification process is a key element of the process.
Raising awareness and knowledge of explosion protection
For Baker Hughes, a global company operating in the oil and gas sector, with over 58,000 employees in more than 80 countries, safety is a must.

Back in 2009, a team of cross-functional subject matter experts – from a variety of areas including compliance, human resources, design and applications engineering and operations – was put together to enhance awareness and knowledge of explosion protection across the entire Baker Hughes enterprise. The early initiative taken by this small team met with executive approval to adopt the enterprise-wide Explosion Protection Policy by imposing training and competence requirements on various levels of personnel. The training was designed for anyone involved in the areas of operations, repair and maintenance, supply chain and engineering of equipment used in hazardous atmospheres.

This mandatory training consists of internally-developed online modules. In addition, there are internal/external instructor-led courses which include: awareness training for managers, supervisors and operations personnel and certifying technicians who repair or install hazardous area certified equipment and design engineers who are responsible for the safe design and regulatory compliance of equipment.

For a company operating worldwide, beyond compliance with regulations, competence for safety is a top priority. Says Norman Ditrich, Senior Regulatory Compliance Engineer, Baker Hughes Chief Engineer’s Office: “Not only is equipment certification important, but those who design, install, use, and maintain it must be competent to assure safe operations and give our clients the utmost confidence in our services.”

IECEx CoPC ‘best in class’
The IECEx CoPC Scheme was chosen as the ‘best in class’ programme to assure confidence that Baker Hughes personnel are well qualified and have the competence needed to perform their duties safely in the hazardous environments in which they operate across the globe.

Baker Hughes sees the IECEx System, which has been endorsed by the United Nations through UNECE (United Nations Economic Commission for Europe), as the premier hazardous area safety and certification system based on globally-accepted IEC International Standards. Ditrich explains that, “Because it is a true ISO/IEC Type 5 Certification System for equipment as well as personnel competence, it gives our clients added confidence that we can provide safe equipment and operations under the hazardous conditions of oil and gas exploration and development, wherever we are in the world”.

Ditrich adds that Baker Hughes sees IECEx as being integral to defining key criteria for competence: “Because personnel competence certification is so important, we have continuous training and certification programs being conducted throughout our community of professionals across the globe. We have many full time technical training and competence professionals to develop and deliver the training programs as well as technical mentoring that take place daily throughout the organization.”

Baker Hughes deploys an automated directional drilling assembly on a well in Canada
(Photo: Baker Hughes)
Invisible yet omnipresent, electronic components play a crucial role in modern technology. Found in parts as diverse as integrated circuits to resistors, capacitors, transistors, LEDs (light-emitting diodes) and switches, they are an essential part of all electrical and electronic devices, equipment and installations, including the heating and cooling systems that form the topic of this month’s e-tech.

While they are key parts of systems such as those that control and regulate heating and cooling in buildings, for example, electronic components are not themselves immune to overheating. They therefore require their own cooling systems in case of overheating, to prevent temporary malfunction or even permanent failure occurring.

Preventing overheating
Computer cooling removes the waste heat produced by computer components and keeps these components within permissible operating temperature limits. Such components include integrated circuits such as CPUs (central processing units) and GPUs (graphics processing units), chipsets and hard disk drives.

Keeping components cool
IECQ ensures safety and reliability of all electronic components

About Norman Ditrich
Norman Ditrich has a degree in Mechanical Engineering from Penn State University. His career spans over four decades and includes several companies involved in exploration, development, measurement, transportation, and the processing of hydrocarbons and chemicals. He has worked for Baker Hughes for more than 20 years and his current position is Senior Regulatory Compliance Engineer, Chief Engineer’s Office. He is responsible for electrical product safety approvals and certification of all product line equipment to the relevant global regulations for explosive atmospheres.

Ditrich is a member of the US National Committee of the IECEx System and one of the 15 Baker Hughes’ staff who have received their CoPC as of this publication.

About Baker Hughes
For more than a century, Baker Hughes has been providing services for the global oil and gas industry that help improve productivity as well as reduce risks and costs. The company creates added value from oil and gas reservoirs with high-performance drilling, evaluation, completions and production technology and services, integrated operations and reservoir consulting.

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A fan-cooled heat sink on the processor of a personal computer (Photo: Fir0002/Flagstaffotos)
Today, most electronic components are designed to generate as little heat as possible. Computers and operating systems may be designed to reduce power consumption – and consequent heating – according to workload. This is not in itself sufficient to prevent electronic components from overheating. Specific cooling systems are also needed to remove excessive heat.

**Heat sinks**

As electronic devices become smaller, the problem of dispersing waste heat becomes more difficult. In electronic systems, heat sinks are passive components that cool devices by dissipating heat into the surrounding air. They are used to cool high-power semiconductor devices, CPUs or graphic processors. They are also employed in optoelectronic devices such as lasers and LEDs (light-emitting diodes). They are heat exchangers that, although smaller, can be compared to those used in refrigeration and air conditioning systems or to radiators in automobiles.

**High quality required**

As with any other electronic component, a heat sink has to go through a battery of tests before it hits the market, to ensure that it complies with specific requirements. One single faulty component can have unfortunate consequences: from the malfunctioning of a device, system or installation to causing total failure, or, even worse, to putting human lives at risk.

**Safety inside**

Electronic component 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.

As a worldwide approval and certification system covering the supply of electronic components, assemblies and associated materials and processes, IECQ provides a certification system that enables manufacturers and suppliers to provide independent verification that the claimed specifications (including International IEC standards) are met. This gives manufacturers the reassurance of knowing that suppliers holding IECQ certification do not need stringent second party assessment or monitoring.

**covering a vast array of technologies**

Electronic components and processes covered by IECQ are used in all kinds of technologies, from the smallest device to the most complex piece of equipment.

At present, eight families of components are certified by IECQ:

- active components, including integrated circuits
- electromagnetic components
- electromechanical components
- electro-optic components
- hybrid integrated circuits
- passive components
- printed boards
- wires and cables

IECQ’s contribution to the existence of a safer and more reliable world can only increase, given the development of new technologies and state-of-the-art electronic devices.
Coordinating Smart Grid roll-out

IEC outlines how its work helps assure interoperability

IEC Immediate Past President Jacques Régis was invited by APEC SCSC (Asia Pacific Economic Cooperation Subcommittee on Standards and Conformance) to provide an overview of IEC Smart Grid work. The workshop, which took place in Québec, Canada, on 16 May 2012, aims to help APEC economies to avoid unnecessary obstacles to trade and investment related to Smart Grid deployment and to promote the use of interoperable Smart Grid standards. The event was attended by energy regulators representing all APEC economies and took place in parallel to the World Energy Regulators Forum, where IEC President Klaus Wucherer spoke.

Importance of stable electricity supply

Around the world, governments, businesses and private citizens are beginning to understand how important a stable supply of electrical energy is for the development of economies and the quality of life of individuals. Massive investments in grid modernization and Smart Grid deployment are driven by the need to meet surging electricity demands. Increasingly, power grids will need to integrate a broad range of energy sources, including renewable energy and distributed generation, while increasing efficiency and reducing carbon emissions. Interoperability standards will play an important role, opening bigger markets and lowering costs for infrastructure investments.

Adoption of Smart Grid interoperability standards

In November 2011, APEC Ministers and leaders endorsed the recommendation of the CTI (Committee on Trade and Investment) that APEC economies adopt Smart Grid interoperability standards to prevent unnecessary obstacles to trade and investment. These recommendations were based on the report of ARCAM (APEC Regulatory Cooperation Mechanism on Trade-Related Standards and Technical Regulations), which underlined this topic as an emerging regulatory issue for the APEC region. Many APEC economies are actively promoting – or consider promoting – Smart Grids as a central means to achieve objectives related to environmental sustainability, energy security and economic growth. Smart Grid pilot projects are underway in Australia, Canada, China, South Korea, Japan and the US. While there are differences between individual economies, overall needs are relatively similar.

IEC coordinating Smart Grid standardization efforts

In this context, Régis was able to provide an overview of IEC relevant activities in developing International Smart Grid Standards that can be used by regulators to update national grids. The IEC had also been involved in the ARCAM Smart Grid Dialogue that emphasized the need for interoperability. In his presentation, Régis underlined how IEC TCs (Technical Committees) cooperate and coordinate on Smart Grid efforts and the ongoing collaboration with other international organizations and standards bodies.
Participation and efficiency
PASC: Presentation of IEC work and strategy implementation

PASC (Pacific Area Standards Congress) held its 35th meeting in South Korea. The annual meeting is a key gathering of Chief Executive Officers and senior representatives from national standards organisations and industry experts in the Asia-Pacific region to discuss critical topics and trends on international standardization. IEC Immediate Past President Jacques Régis, IEC Vice President Hiromichi Fujisawa, and IEC-APRC (Asia-Pacific Regional Office) Regional Director Dennis Chew attended the meeting. Presentations were made on key IEC work, progress in Masterplan implementation and the importance of active participation to gain influence in the global standardization process. Their presentations were complemented by others that demonstrated the IEC contribution to energy efficiency and sustainability.

Korea assumes Chair of PASC
The annual PASC meeting was chaired by Kwang-hyun Seo, Administrator of KATS (Korean Agency for Technology and Standards) at the Ministry of Knowledge Economy. PASC counts 23 country members from the Asia-Pacific region, 17 of which are IEC Full Members, 2 are Associate Members and 4 are Affiliates. Joe Bhatia, President and CEO of ANSI (American National Standards Institute) was appointed Vice Chair of PASC.

Sustainability through standards
The theme of PASC 35 was the implementation of environmental sustainability standards. Several

Participation is key
Regulators heard how the IEC supports good regulatory practice and facilitates the development and roll-out of new technologies. Régis closed his presentation by encouraging them to start participating in the IEC process through their NCs (National Committees) to ensure that standards take their needs into account.

The report issued at the end of the workshop underlined the importance of International Standards in the development of Smart Grids and how they reduce trade barriers, increase economies of scale and reduce the risk in deploying new technologies.
IEC world 

presentations provided members with insights into IEC work in these areas.

IEC CB (Council Board) member, Dr. Junji Nomura, gave a presentation on renewable energy and the Smart Grid; China provided an overview on IEC PC (Project Committee) 118 on Smart Grid User Interface, and Korea, which holds the secretariat of the newly founded IEC TC (Technical Committee) 119: Printed Electronics, outlined how this TC can contribute to making better and safer use of resources.

IEC-APRC – 10th Anniversary 

IEC Immediate Past President Jacques Régis, provided insights into IEC work and progress in the Masterplan implementation. He congratulated IEC-APRC on its 10th Anniversary and encouraged PASC members to tap into this resource and provide feedback on how it could even better meet their needs. Malaysia took the opportunity to compliment IEC-APRC on the year-round training by the centre. The centre supports all IEC NCs (National Committees) in the Asia-Pacific region as well as more than 50 TCs and SCs (Subcommittees).

New Affiliate Country Programme leadership 

Régis also mentioned the 10th Anniversary of the IEC Affiliate Country Programme and presented the new leader, Phuntsho Wangdi. Five countries in the region participate in the programme.

Active participation: the key to achieving full benefits 

Régis strongly emphasized the importance of active participation to get a real advantage from IEC work: “Industry must be able to participate actively to gain influence in the standardization process. This can only be achieved through competent representation of their interests by IEC NCs.” He made the point that representing national interests requires more than voting and that it implies sending participating experts to the IEC working groups and projects teams. He informed the audience on processes that are being developed by the SMB (Standardization Management Board) with the aim to increase effective participation of P-members in TCs and SCs.

Update on IEC standardization and conformity assessment work 

Régis mentioned the foundation of 3 new TCs and new SGs (Strategy Groups) for mobility and assisted living and the universal labelling programme on electric energy efficiency and global efficient-motor labelling programme which are underway.

Prioritizing and guiding future standardization work 

In view of the strong interest in energy efficiency and sustainability in the region, Régis provided insights into the strategy behind IEC White Papers. He took as an example the White Paper on "Electrical Energy Storage", which was developed in cooperation with Fraunhofer Institute and several international experts and launched at the GM (General Meeting) in Melbourne, Australia. White Papers aim to prioritize and guide future standardization work and provide important recommendations on research and regulation. Storage, for example, is crucial because of the increasing need to add renewable energies, but, until now, a comprehensive overview of technologies and needs was missing. Several further IEC White Papers on other topics are currently being developed.

Masterplan implementation 

In this context, Régis mentioned the work that is being undertaken in SMB and CAB (Conformity Assessment Board) to put in place a systems approach. He also talked about the technology watch that was initiated by the MSB (Market Strategy Board) that will help the IEC identify where the next standardization needs arise. Furthermore, he outlined efforts that are being undertaken to increase awareness of IEC work among industry, regulators and academia.

At the end of his talk, Régis formally introduced Frans Vreeswijk who will become the next General Secretary and CEO in October 2012.
Growing an industry
Increasing reliability to build trust and bankability

IEC Global Visions recently interviewed Sandy Butterfield, Founding CEO and CTO of Boulder Wind Power, a small, venture-backed company that participates actively in the IEC. Butterfield is a pioneer in the wind industry. He talked about how IEC International Standards have allowed this industry to grow by helping manufacturers design more reliable machines and build the trust required to generate the necessary investment. Butterfield is the Chairman of TC (Technical Committee) 88: Wind turbines.

Participation as a strategic investment
Butterfield’s involvement in standardization predates the formation of Boulder Wind Power. When he became the CEO of the company, a precondition of continuing his role as chairman in IEC TC 88 was to demonstrate to his shareholders that this tenure was more than a mere expense but also represented a strategic investment. Venture-backed companies are hard-nosed entities, driven by economic concerns as well as by data. Butterfield was able to convince the shareholders that working within the IEC framework helps the company to understand the goals and needs of its customers better, as well as how its products will fit into the OEM (Original Equipment Manufacturer) design process. More obviously, it also helps Boulder WindPower to understand the standards better and to develop products more easily to fulfill certification requirements.

Easier access to global markets
Wind turbine manufacturers want to sell their products worldwide. They can’t possibly design them to accommodate a wide range of national standards.

More reliable machines
In their infancy, wind turbines were unreliable and had highly variable levels of performance. The machines started to improve when manufacturers started to test. That objective testing formed a part of the standards developed by the IEC. They provide a consistent set...
of measurements for performance and reliability and allow the industry to make objective comparisons of the performance and advancement of technologies and designs. Standards help to provide consistent data and build more reliable machines. They also provide the basis for conformity testing.

Building trust that results in investment

Standards have helped build stakeholder trust because they permit the objective comparison of different turbines. They have been key in reassuring the financial community and regulators that machines have been built to an objective third party process and that they have been reviewed according to rules agreed upon by the entire industry.

Managing expectations

Standards have also provided the industry with a common vocabulary. Today, any sophisticated buyer, owner, operator or investor in the wind industry speaks in terms of IEC terminology: a wind class, a turbine design class, turbulence levels, and so on. Everybody understands what is meant. As a result, the conversation is more fruitful and constructive and expectations are met more accurately and readily.

IP is safe

Standards enable innovation and ensure that different designs and technologies are able to connect and interoperate seamlessly. Butterfield underlines that he has never worried that his IP (intellectual property) might be revealed. Any standard that would allow such a thing is, in his opinion, simply not well designed.

Standardization’s strategic advantages: a learning curve

Butterfield readily admits that he didn’t immediately understand the advantages of standardization. At the start of his career, he and many of his peers believed that standardization was holding the industry back, that it constrained innovation and was not the path to provision of the most creative, reliable and lowest cost solution. When he founded his company in the 1980s, he started to realize that, without standardized criteria, technologies couldn’t advance and investment wouldn’t happen. Over time he also began to recognize the value of harmonization; that, far from holding back innovation, it gave the industry a more objective way of measuring the worth of its innovations.

Wind is everywhere

Butterfield is highly conscious of the environmental impact of our lifestyle and worries about what will happen to the planet if everybody uses fossil fuels to satisfy energy needs. “We just went past 7 billion people. Most countries have limited access to oil, gas, coal, and even hydro, but almost all have wind or solar. For many people in the world, wind energy is the cheapest form of energy available. Facilitating renewable energy is one of the key ways to foster sustainable growth. Wind energy will be a key component of that mix. It not only makes tremendous sense, it also represents a new economy.”

About Boulder Wind Power

Boulder Wind Power is a private company located in Boulder Colorado, the heart of US wind power. It is backed by New Enterprise Associates, Siemens, DONG Energy, Clipper Windpower, Horizon Wind Energy, General Dynamics and NREL (National Renewable Energy Laboratories).
This year IEC-APRC (Asia-Pacific Regional Centre) celebrates 10 years of promoting awareness of the IEC and providing support to TCs (Technical Committees) in the Asia-Pacific region and further afield.

In the beginning...
The creation of APRC was approved by the Council and Council Board at the 2000 General Meeting in Stockholm, following a proposal by then Vice-President Ryoiku Togei. Togei had highlighted the need to promote awareness and understanding of IEC activities among businesses and maximize the participation of IEC members in the organization’s activities in the Asia-Pacific region.

The official opening of the APRC office took place on 21 February 2012 with a high-level seminar attended by more than 150 delegates from 12 countries. The ceremony was officiated by then IEC President Sei-ichi Takayanagi and former Chairman of SPRING Cedric Foo.

Dennis Chew was appointed Regional Director and today 7 staff members are based in the Singapore office.

Providing support through close collaboration with TCs and regional bodies
Talking about APRC’s achievements since it was launched in 2002, Chew says ‘we have seen a significant increase in P-membership in TCs and SCs (Subcommittees) and a lot more participation in IEC CA (Conformity Assessment) activities from National Committees in the region, since we started out’. In 2004 APRC’s scope was expanded to include providing support to TCs and SCs. Other achievements include the acceptance of IEC International Standards by regulators under the ASEAN (Association of Southeast Asian Nations) Harmonized Regulatory Regime for Electrical and Electronic Equipment, to be implemented by 2015.

Chew and his colleagues regularly participate in forums and meetings organized by regional standards and regulatory bodies such as PASC (Pacific Area Standards Congress), ASEAN and APEC (Asia-Pacific Economic Cooperation). Since 2002, they have also collaborated closely with JISC (Japanese Industrial Standards
Energy-saving electroheating
New Chairman for IEC TC 27

The nomination of Sven Linow as Chairman of IEC TC (Technical Committee) 27: Industrial electroheating and electromagnetic processing has been approved by SMB (Standardization Management Board). Linow will begin his term on 1 August 2012 for a period of 6 years.

The APRC team is based in Singapore

1960s. Electroheating is used in the production and processing of a variety of materials, from metal and glass to paper and foodstuffs and is increasingly being chosen over fossil fuel processes for its speed, lower production costs and energy efficiency. Electroheating equipment also offers a broad variety of heating methods with a particularly wide range of power and frequencies that can be utilized in developing technologies such as nanotechnologies, optoelectronics, photovoltaics and re-processing of wastes and dangerous products which require unique or very precise methods of heating.

Sven Linow, new Chairman of TC 27 (Photo: Heraeus Noblelight)

A very promising process
TC 27 has been preparing International Standards relating to industrial electroheating installations since the

Electroheating is used for the processing of a large variety of materials; in this case, glass (Photo: CassoSolarTechnologies)

Related article
Find out more about APRC’s involvement in the promotion of energy efficiency in our March 2012 article ‘Standards for a Green Society’.

To celebrate a decade of successful activity a cocktail reception is being planned, to take place during the joint JISC/IEC/APSG Human Resources Development seminar in December 2012.
Smart ideas for the Smart Grid
New Swedish member to SMB SG 3

SMB (Standardization Management Board) has approved Claudio Marchetti as the Swedish member of SG (Strategic Group) 3. Marchetti replaces previous Swedish member Karl Elfstadius.

Moving the Smart Grid forward
SG 3: Smart Grid was set up by SMB to provide strategic guidance to all IEC TCs (Technical Committees) involved in Smart Grid-related work. The Strategic Group keeps abreast of the newest developments and technologies and has published the Smart Grid Roadmap which places existing standards and their application within the Smart Grid context and provides recommendations for future requirements.

About Sven Linow
Sven Linow is head of R&D in the Industrial Process Technology division of Heraeus Noblelight and holds a PhD in mechanical engineering. He is a member of DKE K362, the German national mirror committee of IEC TC 27 and contributes as an expert to WG (Working Group) 30: Industrial infrared electroheating installations and MT (Maintenance Team) 18.

Related article
Find out more about the work of TC 27 in this month’s e-tech article ‘The heat is on’.

Claudio Marchetti, new Swedish member to SMB SG 3

SG 3 looks at solutions for incorporating intermittent energy sources, such as solar, into the Grid.
Improving quality of life

New Belgian member to SMB SG 5

SMB (Standardization Management Board) has approved the nomination of Wim de Kesel as Belgian member to SMB SG (Strategic Group) 5: Ambient Assisted Living.

Providing strategic guidance for AAL

SG 5 was established in 2011 with the mandate to manage and coordinate standardization work related to Ambient Assisted Living. AAL refers to ‘methods, concepts, systems, products, and services supporting elderly people and people with disabilities in their daily lives’. SG 5 aims to engage key stakeholders and organizations interested in AAL standardization work and to define a structure for the coordination of cross TC/SC (Subcommittee) work.

About Wim de Kesel

Wim de Kesel is an electrical engineer, responsible for the coordination of worldwide standardization activities of the Legrand Group, which specializes in electrical and digital building infrastructures. De Kesel was honoured with the IEC Thomas Edison Award in 2011. He is an expert in the field of wiring devices and is Secretary of TC 23: Electrical Accessories and Convenor of SG 4: LVDC distribution systems up to 1500V DC. He brings years of standardization expertise to his new role as member to SMB SG 5.

About Claudio Marchetti

Marchetti holds a Bachelor of Science in Computer Sciences and brings a wealth of expertise to his new role. Since 2009 he has held the position of Global Application Manager for Smart Grid at ABB and is responsible for developing concepts and solutions within the Smart Grid area. He is also a member of the IEC SG 3 Mapping Tool Group.

Ambient Assisted Technology aims to improve the quality of life of the elderly (Photo: Siemens)

AAL also provides solutions to people living with disabilities (Photo: Sorensen Communications)

SG 5 experts help coordinate cross TC/SC work
Standard for portable heating tools

Hobbyists and professionals alike gain flexibility

**Electroheating, the high-power heating of a range of materials using electrical energy with specialist equipment, is widespread in industrial applications. However, a different kind of electroheating, designed for smaller tasks, requires portable electric heating tools, such as soldering irons for metals and plastics, paint strippers or glue guns. The safe operation of these tools is very important as they are widely used globally in domestic and professional environments. An International Standard ensures this is the case.**

**From hobbyists to professionals**
Portable heating tools are now available for all sorts of tasks: glue guns often replace conventional adhesives, while paint strippers and soldering irons for metals and plastics are used by DIY (do it yourself) enthusiasts, hobbyists and professionals in wide-ranging applications. Since they are not being deployed in an industrial environment in which there are specific protection measures, they need to meet stringent safety requirements.

IEC TC (Technical Committee) 61 “prepares safety requirements primarily for household purposes, but also for other equipment and appliances in similar fields where there is no IEC Technical Committee in existence”. This means that it develops International Standards for portable heating tools.

Earlier this year it published a consolidated version of IEC 60335-2-45, *Particular requirements for portable heating tools and similar appliances.***

**Wide range of appliances**
This International Standard applies to portable electric heating tools and similar appliances with a rated voltage not exceeding 250 V. It also covers appliances not intended for normal household use, but “which nevertheless may be a source of danger to the public, such as appliances intended to be used by laymen in shops, in light industry and on farms”.

It deals with the common hazards presented by appliances in and around the home and assumes these tools are being operated by suitably qualified and experienced persons. It does not apply to appliances intended exclusively for industrial purposes, those intended to be used in locations where special conditions prevail – such as the presence of a corrosive or explosive atmosphere – or to arc-welding equipment. In all these cases, other International Standards are applicable. Examples of appliances covered by IEC 60335-2-45 include:

- branding tools for marking wood, leather and other materials
- burning-in pens used for marking on wood, leather and other materials by means of a heated tip
- conduit-soldering tools used for joining metal piping by means of solder
- firelighters for igniting solid fuel such as charcoal or wood
- heat guns and appliances that produce a jet of hot air
- household film-welding appliances
- paint strippers for softening paint using hot air
- soldering irons with a heated tip for soldering
- thermoplastic conduit-welding tools – appliances for welding conduits by partly melting the thermoplastic material of a separate fitting

As can be inferred from this non-exhaustive list, the range of application for portable heating tools is extremely wide and covers use by lay persons, so the provision of proper markings and instructions is essential.

**Multiple environments, multiple risks**
Unlike environments in which equipment such as industrial tools is used by trained personnel and in which specific safety conditions are generally in force, portable heating tools may be used by individuals with insufficient training.
One click away

Immediate access to a wealth of information from the IEC News log page

Whether you are a first-time or frequent visitor to the IEC website, there is one page that you shouldn't miss if you are looking for information on the IEC: the News log page. From there, a wide selection of sections, pages and topics are just one click away.

The News log page is accessible from the home page. In the top menu, go to News & views and click on the 3rd item, News log.

To ensure these tools are as safe as possible to use, special attention must be paid to many aspects of that use. They include:

- protection against access to live parts
- power input and current
- heating
- moisture resistance
- endurance
- abnormal operation
- stability and mechanical hazards
- mechanical strength
- construction, including internal wiring, components, supply connection and external flexible cords, terminals for external conductors or provision for earthing
- resistance to heat and fire
- resistance to rusting
- radiation, toxicity and similar hazards

As these tools and appliances are used in all countries, national or regional differences and additional conditions required by various health and safety authorities may apply.

TC 61 decided that this standard would remain unchanged until its 2014 stability date when it could be reconfirmed, withdrawn, replaced by a revised edition, or amended.

The range of safety issues taken into account, as well as the continuous additions and improvements made by TC 61 experts to this International Standard, combined with the needs of users for such appliances, mean IEC 60335-2-45 will not be withdrawn but remain relevant and essential in the future for the manufacturers of portable heating and similar appliances.
Headlines
The News log page gives you immediate access to a wealth of information. Top left, you have the Headlines, with the latest IEC news releases. Just click on a title and you’ll have the full press release. To see older post, click on see all.

Events & Workshops, Videos
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The IEC from Melbourne to Oslo

Highlights of the past 12 months

Issue 07/2012 of e-tech will be distributed to all attendees at the IEC General Meeting in Oslo, Norway. It takes a look back over some of the previous year’s events and highlights in terms of technical developments, TC activities and strategic meetings.

Summary articles cover important TC work in areas as diverse as storage, lighting, maritime transport, or sensors, including MEMS (microelectromechanical sensors).

The technology focus of the August/September issue will be on interrupters and connectors.

Interrupters can be found everywhere, in many devices and installations in the home and industrial environments responding to overloads and short circuit and helping protect from dangerous electrical shocks.

In spite of the growing popularity of wireless connection in multimedia equipment, connectors that may come in all shapes and sizes are still essential to provide top quality sound and pictures to all devices.

IEC TCs (Technical Committees) and SCs (Subcommittees) are involved in the preparation of International Standards for both interrupters and connectors to ensure safety and reliability.