



e-tech

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Focus of the month: Transportation

This issue of *e-tech* takes a close look at maritime transport. Ships today are very advanced machines that rely ever more on electrical equipment and several IEC TCs prepare International Standards for reliable and safe electrical systems on ships and offshore units. EVs (electric vehicles, such as e-bikes, and car electronics are also featured.

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Editorial

Transportation relies heavily on IEC International Standards for safety and reliability



Claire Marchand,
Managing Editor e-tech.

Safety has always been a major issue in transportation, at the heart of every invention, innovation and technological development over the centuries. Considering the millions of people throughout the world who every day drive their car, take the train or the bus to go work, fly to a business meeting or to well-deserved holidays, saying that modern transportation is safer than ever is not an exaggeration.

On the road and in the air

Nowadays, cars depend extensively on electrical and electronic equipment, onboard computer systems that provide invaluable assistance to drivers, give them a greater insight into their vehicle's performance, status and safety. The same is true in aviation where avionics plays an increasingly important role in flight control, monitoring and management.

This in turn makes IEC standardization and conformity assessment work vitally important to the automobile and aviation industries.

At sea

The era of sea travel is well over, with the exception of leisure cruises. Maritime transport today is at the core of international trade as tankers, bulk carriers, general cargo or container ships transport between 80% and 90% of all raw and finished products between countries. Safety of maritime crews at sea has been a concern ever since ships started transporting goods and people thousands of years ago. Ships have become very advanced machines that rely ever more on electrical equipment. Several IEC TCs (Technical Committees) work with the shipping industry, the International Maritime Organization and international bureaus or registers of shippings to prepare International Standards for reliable and safe electrical systems on ships and offshore units.



Maritime transport today is essential to international trade



Modern car dashboard

Safe shipping doesn't happen by accident

Electrical equipment and instrumentation play a key role

Maritime transportation is the most effective means of moving large quantities of cargo over long distances. Merchant ships transport around 90% of international trade (in terms of volume) – from raw materials and foodstuffs to finished goods, as well as some 2 billion passengers a year on ferries and cruise liners. Continuous efforts are made to improve safety, which relies primarily on electrical systems. Two IEC TCs (Technical Committees) are developing International Standards for electrical installations for the shipping and offshore industries, allowing them to operate reliably and safely in what can be very harsh conditions.

Self-contained power generation and distribution

Ships are like floating cities: they produce and distribute their own electricity in an environment in which they cannot get power from anywhere else. Electrical installations on ships and offshore units are indispensable for the operation of

machinery, propulsion, navigation and communication equipment, as well as for the auxiliary systems that provide essential services such as lighting, running water, plumbing, refrigeration and food preparation.

Power on ships is supplied by generators driven by the main engines. In case these fail, power is provided by batteries or emergency back-up or standby units driven by diesel or gas turbine engines. These ensure that essential machinery and systems, such as steering gear, fire-fighting system, navigation and emergency lights, communication and alarm systems continue to operate. When emergency and backup fail as well, as happened in two highly-publicized cases on board cruise liners in early 2012, ships are left at the mercy of the elements and external assistance.

Water and electricity don't mix

Water is an excellent conductor of electricity, so accidents and system failures can happen when the two meet, as may very well be the case on ships.

IEC TC 18: Electrical installations of ships and of mobile and fixed offshore units, prepares standards to ensure these installations are designed and built to minimize this possibility (see article on TC 18 in this *e-tech*). Its SC (Subcommittee) 18A develops international standards for electric cables for ships and fixed offshore units.

The IMO (International Maritime Organization), the United Nations agency with special responsibility for the safety and security of shipping, acknowledging the IEC's expertise, established a formal relationship with TC 18 to collaborate in the field of electrical systems for ships and offshore units. TC 18 standards chiefly concern factors promoting the safety of ships and of mobile and fixed offshore units and those promoting safety of life, in accordance with the SOLAS (Safety of Life at Sea) Convention, which forms a central part of IMO activity.

Off the rocks, safely

Accidents at sea happen for all kinds of reasons. They include equipment failure,



Transporting liquid natural gas... (Photo: BP p.l.c.)

human error and other factors, such as extreme weather conditions or natural disasters.

Mariners have always tried to chart their course to reach their destination safely, avoiding other ships, natural hazards such as reefs or treacherous currents and areas presenting a danger for other reasons (piracy, conflict zones, disputed waterways, etc.).

Until well into the 20th century, safe navigation and establishing the position of ships relied primarily on nautical charts and instruments such as compasses, sextants, telescopes or binoculars, and identification devices such as lights or foghorns. The introduction of electronic equipment like radars and sonars, initially for warships, greatly improved the accuracy and safety of navigation.

In recent decades there have been major advances in electronic equipment in the maritime world, making navigation even more accurate and safer.

They include BNWAS (bridge navigational watch alarm systems) and a computer-based navigation information system known as ECDIS (electronic chart display and information system) that can replace paper charts, using integrating position information from satellite GPS (global positioning system) and other electronic systems such as radar and AIS (automatic identification systems), has been introduced in ships. It became mandatory following a June 2009 IMO meeting.

It's good to talk

Communications between ships and from ship to shore are essential for the safety of navigation and for the rescue of ships and crews in distress. The first example of wireless communication used to call for assistance was recorded in 1899, while April 2012 marks the 100th anniversary of the best known ship disaster, the sinking of the Titanic, which was the catalyst for the adoption of the first SOLAS Convention in 1914.

Communication equipment has made significant advances as it has evolved from wireless telegraphy using Morse code to voice communication via HF (high frequency) and more recently to voice and data communication via satellite. The basic standards for radiocommunication are set by the ITU (International Telecommunication Union).

The IMO played a pioneering role in establishing, in 1976, the organization known as Inmarsat (International Maritime Satellite Organization) to provide emergency maritime communications. In 1979 the IMO adopted the International Convention on Maritime SAR (Search and Rescue). To complement the system, the GMDSS (Global Maritime Distress and Safety System) was introduced by the IMO as part of the SOLAS Convention starting in 1993. The organization described GMDSS and SAR as "crucial to maritime safety".

No navigation no communication without IEC standards

All maritime electronic navigation and communication equipment and systems like BNWAS, ECDIS, AIS or GMDSS, which play such an important role in maritime safety, rely on International Standards prepared by IEC TC 80: Maritime navigation and radiocommunication equipment and systems (see article on TC 80 in this *e-tech*). TC 80 took up this task in

agreement with the IMO, which does not generally produce detailed technical and test standards for such equipment and systems. TC 80 has produced some 50 standards so far, and works on new ones that not only support IMO requirements, but also more general ship and shore applications.

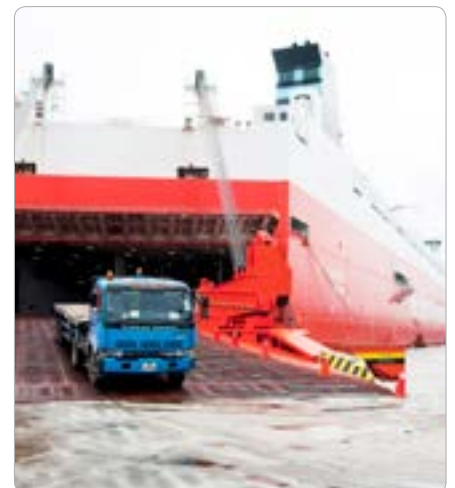
Clean up your act!

International shipping needs to become cleaner. Marine engines on most of the 50 000 or so international ships recorded by the International Chamber of Shipping & International Shipping Federation burn bunker fuel. This petroleum product has been described by the CEO of a Dutch-based leading shipping technology company as "just waste oil, basically what is left over after all the cleaner fuels have been extracted from crude oil. It's tar, the same as asphalt. It's the cheapest and dirtiest fuel in the world". Bunker fuel has a high sulphur content, 3 000 times more than the maximum allowed in the European Union for car fuel. Ship emissions are blamed for 64 000 deaths a year in the world, of which 27 000 are in Europe, according to a study from the University of Delaware.

Cutting these emissions in ports has become a priority worldwide and led to the introduction of HVSC (High Voltage Shore Connection) systems, which allow ships to shut down their diesel engines and connect to a land-based grid while



... passengers... (Photo: Cunard Line)



...or cargo, safely (Wallenius Wilhelmsen Logistics)



they are docked. Port Metro Vancouver, for instance, has cut its greenhouse gas emissions by 3 000 tonnes in 2010 by installing shore power for cruise ships.

TC 18 issued a PAS (publicly available specification) for HVSC systems in 2009, giving requirements for such systems. This has now been further developed into an International Standard in cooperation with ISO (International Organization for Standardization) and IEEE (Institute of Electrical and Electronics Engineers). Publication of IEC/ISO/IEEE 80005-1, Utility connections in port – Part 1: High Voltage Shore Connection (HVSC) Systems – General requirements is expected in the second quarter of 2012.

Another aspect linked to cleaner shipping concerns a shift towards increased use of electric propulsion, currently limited to hybrid solutions that use a combination of diesel engines or gas turbines, generators, batteries or fuel cells and motors to drive the propulsion system. TC 18 is currently updating its standard for electric propulsion and a revised edition is expected in 2013.

Health and safety

For electrical equipment on ships and offshore units, TC 18 does not concern itself with existing equipment standards issued by the TCs of relevant products, but only with standards for additional or alternative features required for use in a ship or offshore environment.

As a result, many other IEC International Standards not prepared by TC 18 or TC 80 are used in equipment on board ships. International Standards on sound level meters and sound calibrators prepared by TC 29: Electroacoustics, for instance, are referenced in IMO guidance on fatigue mitigation and management.

Human failings still a major risk factor

However well prepared standards are, and however safe and well designed technical systems are, human factors –

errors, deliberate actions or fatigue – will remain the main reasons why total safety in the shipping and offshore industries is difficult to achieve. Human errors are estimated to be behind some 80% of accidents at sea, as some recent events show:

- In January 2012 the Costa Concordia cruise liner hit rocks near the Italian coast and later capsized after her captain changed course. 32 died and 64 were injured in the shipwreck, and the USD 570 million ship was a total loss.
- A 130-metre cargo ship hit rocks in Messina, Sicily, Italy, recently, after her captain dozed off, with the ship running on autopilot (news agencies, 22 March 2012).
- Navigation of the Rena container ship by its officers was “absolutely appalling” as they took a shortcut and failed to accurately plot their course before she crashed into the Astrolabe Reef (off New Zealand) in October 2011, leading to a total loss, according to a Transport Accident Investigation Commission report (news agencies, March 2012).

Working together globally

Shipping and offshore exploration are such complex and international industries, implementing practices and a variety of systems developed over decades, even centuries, that they involve many bodies and organizations, national and international. These include the other two global standardization bodies, ISO and ITU, UN agencies such as IMO, other specialized bodies like the IHO (International Hydrographic Organization) and the many shipping registers and bureaus around the world.

With shipborne electrical installations and navigation and radiocommunication equipment playing an ever more important role, the IEC finds itself at the very centre of a complex web of relationships that ensure the shipping and offshore sectors will become safer.

Beaming at performance and safety

Geneva Motor Show displays widespread adoption of xenon and LED lighting

On the lookout for bling-bling, the flashy, extremes in performance, superlatives in whatever sense, some of the visitors to the 2012 International Motor Show in Geneva might have been disappointed to find few novelties and little innovation. It wasn't immediately apparent that they were witnessing the start of a new era or the culmination of many years of research and development destined to make the driving experience more economical, safer and easier. Some of the features that might once have been labelled "sensationalist" or "experimental" have reached the public at large.

More with less

Nearly every exhibitor had at least one economical or "green" automobile model or some sort of safety improvement on show. Most were claiming to deliver "more with less" and promoting increased energy efficiency with greater fuel economy. At the same time, there was a strong accent on using automated systems to provide ever improving levels of safety. Constructors had erected information panels showing the ratings and comparing the energy measurements of each vehicle on display. To improve energy use implies not only controlling the performance of the engine and making tuning refinements to cut down on fuel use, but – on a smaller scale – improving the performance of the growing number of additional electrical systems that are installed in a vehicle.

Improved lighting reduces cost

One of the areas in which energy efficient technological innovation has clearly made its way into the commercial market is in lighting. Less than a decade ago, only the top of the range vehicle was equipped with xenon lights and LED

lighting was still at an experimental stage. The first xenon headlights appeared in the European market in 1991 as an option. The normal household car still came equipped with standard traditional halogen filament light bulbs. In a period of just a few years, that norm has changed. There are two main advantages: one of energy efficiency, the other of security. Both are of benefit to all road users, not just to the individual vehicle owner and driver. Better lighting implies both seeing and being seen: a better view of the road ahead and also increased visibility for the oncoming driver. Better energy efficiency implies reduced running costs.

Xenon is an example of HID (high intensity discharge) lighting. The lamps work on the basis of an electric current that, in the form of a spark, ionizes a gas environment (xenon) and sets off an electric arc. It is the arc that provides the light that can then be reflected and beamed, while traditional halogen bulbs use the principle of heat to generate light from the tungsten filament.

The higher luminous efficacy of xenon

Xenon has the advantage of having a much higher lighting capacity than halogen. 30% of the absorbed electric

energy is transformed into light against only 10% for a halogen bulb. The result is that a xenon bulb will produce a luminous flux of 3 000 lumens with an electric power of 35 watts as compared to a tungsten halogen bulb that only generates 1 450 lumens with a power of 55 watts.

Longer bulb life

There is a second advantage to xenon lighting: that of bulb lifetime. The average lifetime of a xenon bulb is 2 500 hours against 500 for a halogen bulb. For halogen, many manufacturers also recommend that their bulbs be replaced every three years as a precautionary measure. Replacing bulbs with new ones ensures that the cut-off line set for the aligned beam of dipped headlights remains at the level required for optimum visibility and that there is no tilting that would affect visibility performance adversely. With xenon lighting there is no risk of tilting with time.

Improved colour temperature

Because the CCT (correlated colour temperature) of xenon lighting is higher than that of a halogen bulb, it is said to be easier to perceive and differentiate the colours that are illuminated. Some constructors even talk of "daylight



LED is an alternative solution to the traditional filament bulb



Xenon has a higher lighting capacity than traditional halogen lighting [source: Lincoln MKS]

colours” although this is not technically correct because the CRI (colour rendering index) is not as close to daylight as with halogen. What is certain is that being able to see objects more clearly offers an advantage when driving at night in dark conditions. Drivers are able to react faster and more accurately to external sources of danger.

Dealing with the dangers of visual colour perception in the half-light

In their paper, the first prize winners of the 2006 IEC Centenary Challenge, George Zissis and Stuart Mucklejohn, wrote about the dim half-light that occurs between day and night and in which the human eye is totally incapable of perceiving certain colours correctly. Under the title, *Standardizing mesopic vision conditions and incidences on light sources science and technology*, they argued that new standards need to be produced and are important as a safety measure, covering that particular type of light. They postulated that the lack of relevant publications is slowing down the development of new

describes how to construct a three-digit code in the form of a shorthand string that combines the nominal general CRI and the nominal CCT.

Dangers of being dazzled

There are also some negative aspects associated with xenon lighting. Drivers of oncoming vehicles can be momentarily dazzled by the high intensity light it generates and the flashing effect that is created when a driver changes between raised and dipped headlights.

There's also a split second wait between the moment the light is turned on and when it obtains full illumination, which explains why certain constructors have chosen to install in cars dual filament xenon reflector headlamps known as BiXenon or BiHalogen projectors. These combine a single reflector with various methods for controlling the angle of light beam, depending on whether the light is dipped or full.

Higher voltage needed

Generating the electric arc of the xenon lighting requires a high voltage. The 12 volts of the classic car battery isn't sufficient, so the voltage needs to be converted and raised to 85 V. This requires the installation of an additional controller and transformer.

Further accessories may also be required with xenon lighting. Although more economical, safer and more reliable than traditional halogen, legislation designed to reduce glare sometimes makes it compulsory for the headlights to be equipped with a lens washer and an automatic beam height regulator. In cold weather, when there are snowy conditions, the heat generated by the halogen headlight simply melts away the icy covering while the xenon light continues shining brightly... but coldly.

Conformity assessment and recognized labelling important

Because safety is such an important aspect of lighting for road users, constructors and authorities underline the

importance of ensuring that any headlight installed in kit form carries the necessary approvals and recognized labelling, based on official conformity assessment. Some countries ensure that this is respected by carrying out official controls backed by vehicle certification when the vehicle is presented for its periodic check-up.

LEDs reduce energy consumption

Another lighting solution was demonstrated widely at the 2012 Geneva Motor Show. LED (light emitting diode) lights were evident not only as rear lights, but as headlights too. Installing LEDs as an alternative solution to the traditional filament bulb is another means of improving energy efficiency and lowering fuel consumption. LEDs use the light emission properties of particular semiconductor materials. They have a high luminous efficacy which is not affected by erosion, vibration or use.

In comparison to the halogen bulb's lifespan of 500 hours and the xenon bulb's 2 500 hours, an LED is estimated to have a lifespan of some 10 000 hours.

LEDs have a low power draw which makes them particularly economical. For an equivalent output of light intensity, LEDs use 80 % less energy than a halogen bulb and 60 % less than xenon lighting. In addition, LEDs light up 200 milliseconds (0,2 second) faster than incandescent bulbs, which, while it may not be fully perceived by the human eye, still provides an advantage when the lights are used as stop lights, by providing a split second of extra time in which to react. It also opens up new possibilities for providing intelligent automatic control when dipping and raising headlight beams.

A colour for every condition

Finally, LEDs offer a multitude of possible colour temperatures. The resultant light gives better colour perception of objects and thus a higher margin of safety. LED lights can be combined into different strips and so into different colour combinations that may be more suitable



Improved lighting reduces cost

product development and with it energy economies and means of sustainable development.

IEC TC 34: Lamps and related equipment, is responsible for a 2012 Technical Report, IEC/TR 62732, that

for coping with difficult light conditions such as fog or snow.

LED lighting is changing the general approach to safety. The likelihood is

that at one of the next International Motor Shows, visitors will find themselves confronted with a new safety arrangement of standard LED lighting – for example working in conjunction with

an infrared camera. Perhaps one day they'll be able to sit back and put their car on automatic pilot to drive them securely to their destination – while they shut their eyes and take a rest.

International partners

The IEC works closely with UNECE (United Nations Economic Commission for Europe), notably through WP (working party) 29: World Forum for Harmonization of Vehicle Regulations. This forum works on regulations covering vehicle safety, environmental protection, energy efficiency and theft-resistance and has the task of ensuring that regulations for vehicle design are uniform so as to

facilitate international trade. In this respect, UNECE also works with the IEC's sister organization, ISO (International Organization for Standardization) through ISO/TC 22: Road vehicles. A number of ECE regulations are directly concerned with vehicle lighting while for the US (United States) and Canada two further organizations are

responsible for national regulations: FMVSS (Federal Motor Vehicle Safety Standards) and Canada Motor Vehicle Safety Standards. The work of two IEC TCs is particularly pertinent to the work of UNECE's vehicle regulatory work. These are IEC TC 34: Lamps and related equipment and IEC TC 69: Electric road vehicles and electric industrial trucks.

From analogue to digital

Using modern technology to improve racing car performance

This is the success story of a family team of car enthusiasts who set out to win a vintage car race. They integrated modern technology into their 1929 racing car in order to be able to record and analyse precisely data about its performance. Using state-of-the-art sensors, they were able to fine tune and make additional adjustments and thus gain the necessary track advantage to win the speed race.

Utah's Bonneville Salt Flats

"Imagine a place so flat you seem to see the curvature of the planet, so barren not even the simplest life forms can exist. Imagine the passing thunder of strange vehicles hurtling by on a vast dazzling white plain. This is not an alien world far from earth; it is Utah's famous Bonneville Salt Flats," as described by Utah.com. Bonneville Salt Flats is home to Racing



The four Auto Meter analogue gauges that were used before setup of the digital data logger setup

at Bonneville, where attempts to break land speed records have been going on

since 1896. Since the late 1800s there have been racers out on the salt trying



Rear view shows wiring and sensors

to better their land speed record or that of their opponent in their class of racing. Through the decades of racing, the technology has advanced beyond the wildest dreams of those first racers at the Bonneville Salt Flats.

When the Volk Brothers Racing and MyRideisMe.com teamed up for Speed Week 2010 and World of Speed down the Bonneville Salt Flats, they realized that their Ford 1929 Model A roadster with its fuel-injected big block 1200hp (895kW)

Chevrolet engine needed a little modern technology to help it along its way.

The move from analogue to the precision of digital data tracking

That's when they decided to make the move from tracking the analogue data of the vehicle's 'old-school' gauges to the accuracy, speed and ease of digital data logging. Based on this more accurate data they could then modify and update their engine setup to enable the car to go faster and break a record.

"Our tuning for the last 40 years has been 'old-school'", says Dallas Volk, the son of Larry Volk. "We've been using analogue gauges for temperature and oil and fuel pressure. After every run we used to read plugs to check air/fuel condition (rich or lean), then decide if we needed to retard or advance timing. We'd rely on the driver's memory of the analogue gauge readings to give us oil pressure and water temp data throughout the run while trying to keep the 200 mph [320 km/h] rolling brick on a straight line for 5 miles. Needless to say, the data's not as accurate as an engine tuner would desire..."



Larry Volk (left) installing sensors and bundling the wiring alongside son Pat

It gave the Volk family an obvious reason to install a data acquisition system and

they carried out research and obtained guidance from suppliers before choosing a high-tech data logging system.

Faster and easier to read – safer too

First they had to manufacture a new dashboard to house the single gauge that replaced the previous four analogue ones. Then they installed an easy-to-read LED display Auto Meter data logger interface that allowed the driver to monitor up to four different inputs clearly while driving at racing speeds. The data logger also gave warning alarms for other critical measurements such as low oil pressure. Finally, they wired it up to the various sensors: two for pressure, one for oil and one for fuel at the nozzles, one water temperature sensor, one drive line RPM, and two O₂ sensors – one for each collector.

In order to use the race car data acquisition system they then had to programme the sensors in relation to the data logger. Analysing the data was tremendously helpful. Thanks to the precision of the sensors, they were able to see the mixture of air and fuel, the oil pressure, the water temperature, fuel pressure and the clutch slip recorded side by side throughout the entire run. Their driver also noted how really easy it was to read the digital display in the darkness of the cockpit rather than searching for a needle on an analogue dial.

Additional control

The team realized what they had been missing in using the old-school tuning and troubleshooting system. The new digital system provided them a means of programming an alarm to go off at a certain temperature so the driver knew when to turn on the water pump without having to monitor the temperature gauge, and another alarm for low oil pressure – a potential engine saver! Having these alarm features and the improved visibility of the tachometer allowed the driver to focus on driving – a great improvement both in terms of safety and performance.

In future, because the data logger can handle multiple sensors, they plan to add

O₂ sensors on each exhaust pipe rather than just at the collector, so that they are able to tune each cylinder. They will put another fuel pressure sensor onto the pump too, to compare between pressure at the pump and the nozzles.

Sensors – the first link in a chain of data communication

Normally one associates sensors and computerized systems with today's modern cars, which rely almost exclusively on them for the vehicle's

performance and real-time information. This story shows how sensors can also be used in a vehicle that dates back almost to the founding of the IEC itself. Yet, even in a vehicle of this age, they still provide state-of-the-art information and greater driver safety.

A great number of the components used to create sensor systems rely on IEC International Standards for their precision and measurements. These include the publication issued last

year, ISO/IEC 24753, which defines RFID protocols for sensor-based monitoring, and IEC 60747-14-1, *Semiconductor devices - Part 14-1: Semiconductor sensors - Generic specification for sensors*, which describes sensors made from semiconductors and is additionally applicable to dielectric and ferroelectric based sensors. In between there are a whole host of other standards detailing crucial aspects of sensor deployment, such as wiring, batteries and electrical connections.

First American in orbit

50th anniversary of first US manned orbital space flight

On 20 February 2012, NASA celebrated the 50th anniversary of the first manned orbital mission of the United States, launched from the Kennedy Space Centre in Florida.

In 1962, John Glenn piloted the Mercury-Atlas 6 'Friendship 7' spacecraft and completed a three-orbit mission around the earth, reaching a maximum altitude of approximately 260 kilometres and an orbital velocity of approximately 28 000 kilometres per hour. The mission, which landed near the Turks and Caicos Islands, lasted 4 hours, 55 minutes, and 23 seconds.

Technological challenges

NASA engineers were faced with the challenge of devising a vehicle that would protect the astronaut from temperature extremes, the effect of vacuum and space radiation. There was the need to keep the pilot cool during the burning, high-speed re-entry through the atmosphere.

The spacecraft was cone-shaped with a cylinder on top. It was 2 metres long,

2 metres in diameter, and had a 5.8-metre escape tower with a solid-rocket motor fastened to the cylinder. In a launch emergency, the rocket would fire, lift the capsule and parachute it into the ocean. With a volume of only 12 cubic metres, there was barely enough room for its pilot, who sat in a custom-designed couch facing a panel with 120 controls, 55 electrical switches, 30 fuses, and 35 mechanical levers. The cabin's atmospheric pressure was one-third of that on Earth and the cabin contained pure oxygen.

Among the electrical and electronic systems that made this first manned orbital flight possible were navigation and control instruments as well as autopilot, rate stabilization and control and fly-by-wire (FBW) systems.

The blunt end of the capsule, which would enter the atmosphere first, was covered with an ablative heat shield to protect it from the 1649 °C heat of re-entry into the atmosphere. This shield would burn off and dissipate the heat during re-entry and descent. Just before the spacecraft's impact with Earth, the



Launch of the Mercury-Atlas 6 'Friendship 7' spacecraft (Photo: NASA)



Astronaut John Glenn climbs into the capsule
(Photo: NASA)



Glenn during his first orbit in Friendship 7
(Photo: NASA)

heat shield would detach from the base of the capsule and release a balloon that would inflate to cushion the landing. Parachutes would further slow the descent.

Problems on board

Glenn encountered some problems during his flight. First, a yaw attitude control jet became clogged, forcing the pilot to abandon the automatic control system for the manual-electrical fly-by-wire and manual-mechanical systems instead of the automatic control system

Second, a reading from the sensor monitoring the spacecraft's heat shield and landing impact bag indicated that the impact bag had deployed. This could only happen if the heat shield had come loose. If this were the case, Glenn might be incinerated during re-entry.

Mission Control felt that the reading was most likely caused by a faulty sensor on the spacecraft, and that Glenn's heat shield was fine, but they couldn't be sure. After discussing the issue, they advised Glenn not to jettison his retro pack before re-entry. If the heat shield were loose, keeping the pack attached might hold it in place.

This strategy was risky. As the retro pack itself burned up, pieces could fly off and damage the spacecraft. The heat of reentry might also cause any fuel

remaining in the rockets to explode. As is the case with all space flights, there would be a temporary radio blackout during re-entry, caused by ionization of the atmosphere. Mission Control would not know if Glenn had survived until the radio blackout was over.

Mission accomplished

However, the telemetry data had been wrong. Glenn's heat shield was firmly attached, and Friendship 7 safely splashed down in the Atlantic Ocean, about 1 300 kilometres southeast of Bermuda.

IEC standardization work for electronics and avionics

Given the timing, it's likely that the electronic systems that equipped the Mercury-Atlas 6 'Friendship 7' spacecraft did not rely on IEC International Standards. Several IEC TCs (Technical Committees) and SCs (Subcommittees) cover electronic components, assemblies and systems, as well as avionics. They include:

- **IEC TC 47**

In 1962, IEC TC 47: Semiconductor devices, and its SCs were only two years old and developing their first standards. IEC TC 47 prepares international standards for the design, manufacture, use, reuse, and testing of discrete semiconductor devices, integrated

circuits, sensors, electronic component assemblies, interface requirements, and micro-electromechanical devices, using environmentally sound practices.

- **IEC TC 91**

Thirty years later, in 1990, IEC TC 91: Electronics assembly technology, was set up. The committee prepares international standards on electronics assembly (relevant) technologies and in the field of printed board assemblies, including the requirements for materials used to manufacture printed boards, electronic and electromechanical component mounting and optoelectronics assembly and attachment, as well as the electronic data format for describing these products and processes.

- **IEC TC 107**

IEC TC 107: Process management for avionics, was established in 2000 to develop process management standards on systems and equipment used in the field of avionics, including electronics for commercial, civil, and defense aerospace applications.

Conformity Assessment for avionics

The IEC also has put in place a conformity assessment system dedicated to the testing and certification of electronic components: IECQ, the IEC Quality Assessment System for Electronic Components. One of the IECQ Schemes deals specifically with avionics.

More specifically, IECQ has a scheme for the aerospace industry, IECQ ECMP (Electronic Component Management Plan), covering the component and assembly supply chain for avionics. This allows the aerospace industry to control the quality of the components it uses. IECQ is planning to use this Scheme in other high-reliability sectors such as railway and automotive industries.

Electric cycles gaining ground worldwide

Fewer wheels, lower cost

Peter Feuilherade

Sales of electric cycles are soaring in Asia and several European markets, with consumers attracted by the cheaper purchase and maintenance costs, absence of exhaust emissions and the reduced noise associated with these energy-efficient modes of transport in comparison with petrol-driven alternatives.

While most electric bicycles (e-bikes), scooters and motorcycles sold globally are used for short-distance daily commuting, other uses include deliveries of post, food orders or other goods, meter reading, police and security patrols, and transport around large sites such as airports, warehouses, factories and hotel complexes. Purchases by leisure customers in Europe and North America are on the rise too.

In town: four wheels good, two wheels better...

The new generation of electric bicycles features small, computer-controlled electric motors built directly into the hub of the rear wheel, or mounted in the crank and pedal area at the bottom of the frame. Compact high-capacity batteries that can be recharged in around two hours are attached to the frame or rear luggage rack. The machines can be used as normal bicycles, operating only on pedal power, or the motor can be used to provide an extra boost, allowing the rider to reach speeds of up to 40 kph. Powered assistance makes it safer to pull away from busy road junctions, and easier when riding up inclines and into headwinds.

Weight is one of the main drawbacks, with even lightweight e-bikes weighing over 18 kg. Electric motorcycles and scooters are powered by Li-ion (lithium ion) or other chemically-based batteries that are

charged from domestic wall sockets or by more powerful charging systems. They use significantly less energy than petrol versions, with some models reaching the electric equivalent of more than 200 km/litre. The range of travel per charge can vary from 40 to over 160 km, depending on battery storage capacity, vehicle design and riding conditions. Because they have fewer moving parts than petrol bikes, maintenance costs are relatively low.

The IEC plays a leading role in preparing International Standards for electrical drives and motors, and improving their efficiency.

Individual and collective mobility solutions

Sales of electric battery-powered mobility scooters have soared in recent years to meet the needs of ageing and mobility impaired populations, especially in North America, Western Europe, Japan, New Zealand and Australia. Prices have fallen correspondingly. There is a wide choice of basic portable three-wheeled mobility scooters, which are suitable for footpaths and shopping centres and can be carried easily in a car boot, while more powerful four-wheeled models are suitable for road use. Some countries, such as the UK, operate mobility schemes to subsidize purchase costs.

The US market research firm Global Industry Analysts forecast in a February 2012 report that the global market for wheelchairs (powered and manual) would reach eight million units and USD 5,5 billion by 2017, with the US dominating the powered wheelchair market. Battery-powered tuk-tuks, derived from the three-wheel motorized version of the cycle or pulled rickshaw commonplace in Asia and South America, are now on sale in Europe and the US. A Dutch company makes these using chassis parts from Thailand, engines from the US and

batteries from Germany. Although the Dutch tuk-tuks' lead-acid wet batteries weigh a massive 400 kg, its designers say they can get up to 80 km of average city use from a single charge. The vehicle can be configured for carrying passengers, delivering goods, leisure or advertising/promotional use. Three models are currently on sale in several EU (European Union) countries, compliant with all EU safety regulations.

In the US, another company offers an electric three-wheeled tuk-tuk with a stated cruising range of 200 miles per charge.

Storage: it's all about chemistry

The two main battery types are nickel-based or lithium-based. NiMH (Nickel Metal Hydride) is a well-proven battery type, and while it does not have the same energy storage capacity per kilogram as most lithium batteries, it is cheaper. Lithium-based batteries come in several variants, including Li-ion (lithium ion), LiFePO₄ (lithium iron phosphate), LiPo (lithium-ion polymer) and Li₂TiO₃ (lithium titanate). Lithium-ion cells are powerful and light, with a higher energy storage capacity per kilogram than more conventional battery types (see April 2011 article in



Velosolex ebike (Photo: Velosolex)



Electric "Tuk-Tuk" (Photo: Tuk Tuk Factory B.V.)

e-tech on tests for lithium-based batteries). E-bikes using these are either lighter or the same weight but with greater range when compared with e-bikes that use other battery types.

Batteries for e-bicycles should last three years on average. While they are still quite expensive, prices are expected to fall sharply in coming years. Among the factors that restrict battery range are extremes of temperature, bad weather, headwinds, hills and rough terrain, heavy loads and repeated stop-starts.

The IEC works extensively on developing International Standards for Performance and Reliability and abuse testing for lithium-ion cells for electric road vehicles.

Environmental impact

With zero exhaust emissions at the point of use, electric cycles are more ecologically friendly than cars or motorcycles, despite the environmental impact earlier in the chain because of the electricity used to charge their batteries. Some owners go off-grid by setting up their own small solar or wind-powered charging systems. The most obvious benefits of electric motorcycles and scooters are lower emissions, fuel savings and reduced noise pollution. Their main current shortcomings are battery life and the limited range offered between recharging cycles, although major improvements are expected soon.

Concerns over faster bicycles equipped with electric motors have prompted the EU to restrict their current legal maximum assisted speed to 25 kph. At present bikes can be powered by 250 W electric motors, but proposals now going through EU institutions would allow 500 W motors and a higher speed limit. Outside the EU the law varies from country to country. In China the speed limit for electric mopeds is 15 kph but modified versions can exceed four times that speed, and deaths from e-bike accidents are rising.

About 90% of the 30 million electric bikes made in China in 2011 use lead-acid batteries. The production, recycling and disposal of these batteries presents a serious public health issue, and the government has closed hundreds of lead-acid battery factories after a spate of poisoning cases.

Sales boom ahead

According to a January 2012 report from Pike Research, a firm that provides in-depth analysis of global clean technology markets, the vast majority of e-motorcycle and e-scooter sales in 2011 were in Asia Pacific (an estimated 17 million vehicles, compared with just over 30 000 for the rest of the world combined), but the market is "on the verge of major competitive changes over the next couple of years".

Pike Research also forecasts that around 47 million e-bikes will be sold in 2018,

42 million of these in China alone. Many key players are new manufacturers or new to the motorcycle and scooter market. Pike Research added: "One region stands out as an established market: China, where the market is highly fragmented with a large number of small manufacturers."

Chinese products range from rough-and-ready motorized bicycles to scooters that are sophisticated yet comparatively cheap in the West. But major motorbike and scooter manufacturers in Japan and European have also entered the market.

However, most electric motorcycle development is still driven by niche companies. Pike Research's ranking of the 12 leading manufacturers of electric motorcycles and scooters in the world shows the first international brand is ranked only seventh. However, such global companies will gain market share because of their immense marketing budgets, according to Pike.

Regional trends

The explosion in sales of electric scooters in China itself is a result of legislation that has banned petrol scooters in some of the country's largest cities. Buyers get cash incentives from the state, up to a maximum of USD 470 for a 1 kW two-wheeler costing up to USD 1 600. China also has more than 120 million electrically-assisted bicycles on the road. Most of these are low-powered units of 200 W fitted with reusable lead-acid batteries, typically costing less than USD 400, the average monthly pay of a Chinese worker.

China is the world's leading producer of electric controllers, DC (direct current) motors, miniature circuit breakers, brushless motors, batteries and chargers. Its sovereign fund, China Investment Corporation, has invested extensively in lithium mining and processing units in China, Chile, Argentina and Australia, and controls 70% of the global supply.

In Europe, Germany was the biggest market for electric bicycles in 2011, with 300 000 units sold. In second

place was the Netherlands, with 178 000 sales. Average prices in both countries were around EUR 2 000. European sales of two- or three-wheeled electric motorcycles totalled 15 000 in 2011, less than 1% of all motorcycle sales in Europe.

Requests from manufacturers of electric scooters and motorcycles for incentives to help promote the European Commission's aims of developing electric and alternative transportation to gradually reduce fossil fuel consumption have gone largely unheeded in the current economic conditions.

The electric bicycle market in Eastern Europe is about five to 10 years behind Western Europe, as the region has a buoyant car economy that takes precedence over "the enthusiasm for bicycles that existed under communism before cars were available", says an assessment by Electric Bikes Worldwide Reports.

The North American market for electric motorcycles and scooters remains tiny. In 2012, it will be about 3 000 vehicles. Between one-half and two-thirds will be electric scooters, and the rest electric motorcycles. Pike Research predicted that electric motorcycles sales in the US would rise from about 1 310 units in 2011 to 32 000 in 2017. Sales of electric bicycles in the United States remain below 100 000 a year.

IEC activity

Many IEC TCs (Technical Committees) and SCs (Subcommittees) develop standards for components and systems used in e-bikes, scooters and associated vehicles. These include:

IEC TC 21: Secondary cells and batteries, which prepares product standards for all secondary cells and batteries, irrespective of type or application. It forms part of the IEC's contribution to providing sound technical standards, upon which are based legislative decisions on the use and disposal of lead from lead-acid batteries.

SC 21A develops standards for secondary batteries for electric road vehicles. It also promotes the effective and economic use of material and energy during the manufacturing and use of secondary batteries and the disposal of spent batteries.

IEC TC 69: Electric road vehicles and electric industrial trucks, prepares, among other things, International Standards for road vehicles, totally or partially electrically-powered from self-contained power sources, including charging infrastructure. TC 69 has formed two JWG's (joint working groups) with TC 21 and SC 21A to prepare standards for lithium, lead-acid and nickel-based systems for automotive applications.

IEC TC 23: Electrical accessories, and its SCs, prepare standards for many accessories used in e-bikes, such as connecting and coupling devices.

Another IEC SC involved in preparing International Standards for components and systems used in e-bikes is **SC 47F:** Micro-electromechanical systems.

Prospects

As electric motorcycles and scooters with greater range are developed, and prices fall as production volumes increase, sales are forecast to grow in most world markets, particularly if the cost of fuel continues to rise. Pike Research estimates that sales in Asia Pacific, Latin America and Western Europe will have a CAGR (compound annual growth rate) of 5%, 43% and 63% between 2011 and 2017 respectively.

"In 2010, the world produced 60 million motorbikes that ran on fossil fuel and 32 million electric and hybrid two-wheelers. With a near average yearly growth of 20%, electric-powered units will close the gap by 2015, both producing 70 million units individually," according to analyst Sandip Sen (The Economic Times, India, 29 February 2012).

An increasing number of global car and motorbike manufacturers from Japan and

Europe are entering the market, but will need years to catch up with China, which has a developed infrastructure and huge domestic demand. China expects to produce 75 million electric-powered units per year by 2020.

Some companies have started offering kits to convert conventional bicycles or motorbikes to electric propulsion. More manufacturers of cars and four-wheeled electric vehicles are also set to enter the e-bike market, if only with concept cycles. A US car manufacturer has developed a concept e-bike using magnetostriction sensor technology from the world of Formula One to convert magnetic energy into kinetic energy, and vice versa. Other companies are developing fast electric motorcycles that can reach speeds of 280 kph on the racetrack. Advocates of sustainable commuting, meanwhile, foresee folding e-bikes running on renewable energy from solar-powered charging stations will form part of urban multimodal transit systems.

While the low-cost e-bike market prospers, rising fuel prices are boosting sales of more expensive electric motorcycles in affluent consumer markets such as the US. As major manufacturers get involved, prices should come down, but a great deal of consumer education is still required.



Pride Colt executive mobility scooter
(Photo: Pride Mobility)

No power: no ships, no offshore drilling!

Electrical installations in the maritime environment – a dynamic domain

Steam propulsion, which ushered in the era of modern ships, was introduced in the first decade of the 19th century. The next major technical milestone – electric power – was initially installed on passenger liners in the early 1880s to provide electric lighting, which was then viewed as providing a significant commercial advantage. As the benefits of electric power became apparent, all ships were soon being designed and equipped with it. Since then, electrical installations have become ever more important in the maritime environment. The IEC plays a central role in preparing International Standards for these.

Harsh environment

Ships and offshore drilling units rely on electrical installations for safe and reliable operation. The installations may be subjected to very harsh conditions and environmental or chemical hazards, but should still continue operating. To do so they must meet stringent standards.

IEC TC (Technical Committee) 18: Electrical installations of ships and of mobile and fixed offshore units, prepares such standards for the maritime sector; its SC (Subcommittee) 18A deals specifically with standards for electric cables. An IEC Committee of Action, meeting in Bellagio (Italy) in 1927, identified a need for standardization of electrical installations in ships. This led to the establishment of a specific Advisory Committee to work in this domain. This Committee subsequently became TC 18.

The provision of electricity is vital to the operation of any vessel and continuity of supply is taken for granted while the crew, sometimes with only the most rudimentary electrical training, must be able to operate a power station with an output of anywhere between a few hundred kilowatts to over 100 MW. At the 1986 meeting of TC 18 in Bergamo, Italy, it was decided to expand the TC's scope to cover electrical installations on board fixed and mobile offshore oil and gas exploration units, as it was felt that the existing standards for ships were not necessarily appropriate

to these environments. In 1988 it was agreed that a separate standard should be prepared to cover offshore installations.

Leading global adoption

IMO (International Maritime Organization), the United Nations agency with special responsibility for the safety and security of shipping, acknowledging the IEC's expertise, established a formal relationship with TC 18 to collaborate in the field of electrical systems on ships and offshore units.

A central part of IMO activity is to adapt the SOLAS (Safety of Life at Sea) Convention to changes in technology and safety requirements as they occur. This convention applies to all commercial international seagoing ships of 500 gross tonnes and above. Rather than opting to develop their own standards, most of the industry's bureaus or registers of shipping, such as the ABS (American Bureau of Shipping), Bureau Veritas, DNV (Det Norske Veritas), Lloyd's Register, the Korean Register of Shipping and the Russian Maritime Register of Shipping, to name just a few, rely on IEC International Standards as their preferred choice.



Transporting goods on container ship (Photo: Maersk Line)

IEC 60092, the current series of International Standards for Electrical installations in ships, the first edition of which was published in 1957, is referenced in the SOLAS Convention. Thus all the standards in the series are used extensively at a global level. Both the standards for ships and those for mobile and fixed offshore installations are implemented worldwide by naval architects, marine engineering design and consulting companies, and all industries involved in the shipbuilding and related sectors.

They are used for supporting regulations and as the basis for contracts, and often replace the statutory authority documents.

All installations, including fire safety

TC 18 standards cover all types of equipment and installations used on board ships and in mobile and fixed offshore installations. Previously, the standards gave specific requirements for equipment such as switchboards, rotating electrical machines, transformers and galley (kitchen) equipment. Today, reference is, as far as possible, given to existing equipment standards issued by the TCs of relevant products, and only those additional or alternative features required for use in a ship or offshore environment are given in TC 18 standards.

A major project underway within TC 18 aims at reducing the number of standards and at updating others to reflect the fast-changing pace of current marine technology.

Coping with increased power and computing

As the electrical power requirements of modern ships continue to increase, there is a tendency to introduce higher operating voltages for power consumers, propulsion and machinery auxiliaries.

Currently the most important technical developments in the shipbuilding and offshore industry relate to the increasing extensive use of computer hardware and software control and monitoring systems for machinery and the introduction of additional and more sophisticated passenger/crew safety systems. The latter include addressable fire alarm and low level lighting systems, as well as passenger and crew address systems.

Problems are already being seen with the increased complexity of systems on board vessels, which has outstripped the ability of shipbuilders and operators to understand and deal with the systems installed.

Fire

Fire has always been a major threat to mariners: they have nowhere to escape to and no external aid is available. Today there is a growing understanding not only of the dangers of fire but also of the consequences of the spread of fire and

of the risks associated with smoke. For these reasons, special attention is paid to characteristics such as flame retardancy, fire resistance, smoke emission, toxicity, corrosivity and halogen-free materials for both electrical equipment and cables.

Bigger, faster ships on the horizon

The current types of ship will continue to exist but will do so in parallel with new, larger and more efficient container and passenger ships. High-speed vessels of a variety of types and sizes will also be introduced, accompanied by requirements for a reduction in weight of all installed machinery and systems, including electrical installations.

Energy efficiency aimed at reducing greenhouse gas emission from ships is currently under discussion within IMO. This may lead to more efficient power generation and distribution systems, so TC 18 is closely monitoring developments there.

The increase in the size of vessels and of the installed electrical load is leading to the use of higher voltage systems. A return to electric propulsion systems coupled with advances in solid state power devices and the need for VSDs (variable speed drives) for auxiliary machinery has led to

stricter control of EMC (electromagnetic compatibility).

The problems caused by electromagnetic interference have grown in importance due to the increased use of computer hardware and software control and monitoring systems. This is reflected in the development of standards for VSD cables and the initiation of an extensive updating of the TC's EMC standard, as well as on-going work on a new standard to cover EMC for vessels with non-metallic hulls, which is expected to be issued in 2014.

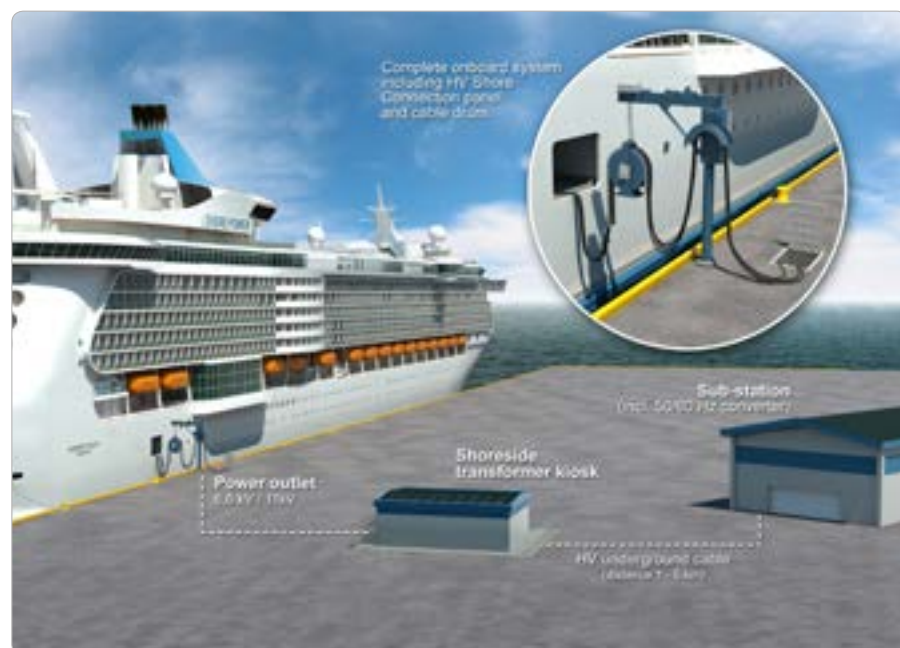
Ship to shore connections cutting pollution in ports

In order to cut heavy fuel consumption and reduce greenhouse gases, such as CO₂ and NO_x (nitrogen oxide), as well as noise from ships while in port, today there is a tendency to provide electrical power from shore to ships while in port. In 2009, TC 18 issued a PAS (publicly available specification), IEC 60092-510, *Electrical installations in ships – Part 510: Special features – High-voltage shore connection systems*, giving requirements for such shore connections.

This standard has now been further developed in cooperation with ISO (International Organization for



Offshore drilling in Azerbaijan (Photo: BP p.l.c.)



A cruise ship on a 10-hour stay in port can save 20 t of fuel with HVSC (Photo: ABB)

Standardization) TC 8: Ships and marine technology, and IEEE (Institute of Electrical and Electronics Engineers) Industry Applications Society Petroleum and Chemical Industry Committee, into an International Standard, IEC/ISO/IEEE 80005-1, *Utility connections in port – Part 1: High Voltage Shore Connection (HVSC) Systems – General requirements*. Publication of this standard is expected in the second quarter of 2012.

There has also been collaboration with IEC SC 23H: Industrial plugs and socket-outlets, which has prepared standards for plugs, socket-outlets and ship couplers for HVSC systems.

More environmental issues

Environmental issues are becoming more important with the rise in public and political concern over pollution and global warming. This is having an impact on national and international legislation and on the standards developed to support these.

TC18 is primarily concerned with the installation of electrical equipment and so the end of life disposal of installations on board the ship or offshore unit is beyond its scope. However, TC 18 is aware that

laws in different countries focus on the restrictions on the usage of hazardous materials, substances and processes. The committee is therefore conscious of the need to protect the environment and thus strives to ensure that the materials employed in the installations are environmentally friendly and cause the minimum of pollution possible.

Electrical propulsion

The shipping industry is also experiencing a shift towards electric and hybrid propulsion systems. This started in the cruise ship industry and is due primarily to the development of power electronics.

Hybrid solutions use a combination of diesel engines or gas turbines, generators, batteries and motors to drive the propulsion system; they will require improved and modified standards. A move to variable speed auxiliary drives is also being seen for the same reasons. The standard for electrical propulsion is now being updated and a revised standard is expected in 2013.

Mobile and fixed offshore installations

The first standard in the IEC 61892 series for offshore installations was issued in

1997. The series consists of 7 publications covering general requirements, system design, equipment, choice and installation of cables, mobile offshore units, installation requirements and hazardous areas. It was completed in 2007.

In the offshore industry there is a trend to use VSDs, instead of gas turbines, to drive large turbines and compressors. The power requirement of a production installation can be in excess of 60-70 MW. Normally, the power is supplied locally by gas turbine-driven generators, but depending on distance from shore and availability of power in the grid, some installations are supplied from shore via a cable. Depending on the distance and power requirement, either a.c. or d.c. may be used for supply from shore.

The offshore series is a referenced document in the IMO MODU Code (Code for the construction and equipment of mobile offshore drilling units). The standards are currently only referenced by 3 national regulatory bodies but are widely used by oil companies and major drilling contractors.

Multilateral cooperation

Even if the electrical system is an important part of a ship or an offshore unit, it is only one of a number of systems required for full functionality of the ship or offshore unit. This means that collaboration with other standardization bodies such as ISO or IEEE is necessary in addition to close cooperation with IMO.

As well as relationships with other IEC technical committees, TC 18 has liaisons with ISO TC 8: Ships and marine technology, ISO TC 67: Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries and ISO TC 188: Small craft.

Given the extent of its scope and the expansion and fast-changing pace of the shipping and offshore sectors, TC 18 has a busy schedule ahead, updating a number of International Standards and preparing new ones.

Standardization for safe global shipping

Increasing use of electronics at sea

Carrying an estimated 90% of world trade and billions of passengers every year, international shipping represents the life blood of the global economy. Safety, always a major concern for seafarers, has made huge advances in the last century. However, the massive increase in traffic in recent decades requires, among other things, new or better communication and navigation solutions to maintain and improve safety levels. IEC TC (Technical Committee) 80: Maritime navigation and radiocommunication equipment and systems, prepares International Standards to ensure this is the case.

Early adoption across borders

Shipping was amongst the very first industries to adopt widely implemented international safety standards. These cover equipment that may break down, catch fire or explode, and systems enabling a ship's crew to chart its way, know its position, minimize risks of collisions and groundings, communicate with other vessels and shore and stay informed about weather conditions.

Because of its inherently international nature, the safety of shipping is regulated by various UN (United Nations) and other agencies.

The IMO (International Maritime Organization), the specialized UN (United Nations) agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships, has developed a comprehensive framework of global maritime safety regulations which are enforced on a worldwide basis. Of particular importance is the IMO International SOLAS (Safety of Life at Sea) Convention. TC 80 cooperates with IMO and prepares standards for maritime electronic

navigation and communication equipment and systems.

Delegating standardization

There is a need for international agreement on standards in the shipping industry so as to avoid duplication and eliminate unnecessary barriers to trade as well as to ensure it is carried out safely, predictably and as freely as possible.

IMO does not generally produce detailed technical and test standards for maritime navigation and radiocommunication equipment and systems. Therefore, in agreement with IMO, TC 80 has adopted the role of producing these for maritime electronic navigation and radiocommunication equipment and systems.

From Morse code to satellite communication

Communication with ships was actually the first application of radio at the end of the 19th century. Ships started installing radio equipment for the ship's operations and gradually these also came to be used for distress and safety purposes.

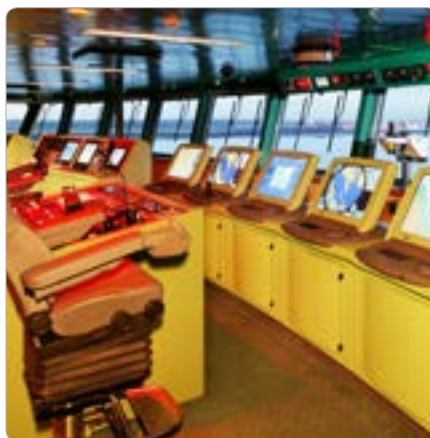
The distress and safety system relied on wireless telegraphy using Morse code,

the earliest and most famous example being the distress message sent from the Titanic exactly 100 years ago. Morse code was phased out 15 years ago in favour of a new system developed by the IMO called GMDSS (Global Maritime Distress and Safety System). This uses radio and satellite communication and equipment that enable ships to be able to communicate with shore stations from anywhere at sea and at any time. GMDSS requirements form part of SOLAS, making GMDSS an essential tool for SAR (search and rescue).

Navigation

For centuries, ships have relied on nautical charts and instruments such as compasses, astrolabes or sextants for safe navigation and positioning. Electronic equipment such as radars and sonars were introduced from the 1930s, initially on naval ships, to provide data on distance to and from other ships and shores and on navigational depth.

In recent years, significant changes have been phased in to the navigation equipment carried by ships. They now carry and rely upon improved radar equipment and automatic position fixing



Navigation and communication equipment on Queen Mary 2 bridge (Photo: Cunard Line)



Costa Concordia, January 2012: The best navigation equipment cannot prevent human error

provided by satellite navigation systems. This year also sees the start of a phase-in programme for the mandatory carriage of electronic charts in the form of an IMO system called ECDIS (Electronic Chart Display and Information System), a computer-based navigation information system that can be used instead of paper nautical charts and integrates information from satellites.

The first edition of IEC standards for ECDIS, IEC 61174, was published in 1998; it is now on its third edition, reflecting the increased experience of its use in the field and detailed changes to IMO's requirements. ECDIS is not only changing fundamentally the way that ships are navigating but has also highlighted the change in equipment on the ship's bridge. The equipment is becoming highly complex and software-dominated. The products require updates, with due attention being given to their update status.

The mandatory carriage of ECDIS is certainly highlighting the issues of software maintenance to the many shipping companies who still have a 'fit-and-forget' attitude to bridge equipment.

The IHO (International Hydrographic Organization), an intergovernmental organization representing the hydrographic community, recently updated its standard for electronic navigation charts and will complete work

on the next generation of standards for electronic navigation chart databases in the next few years. This will lead to more changes in TC 80 standards for ECDIS and presentation of charted information.

To see and be seen

An AIS (Automatic Identification System) has been introduced which allows ships to provide information about them automatically to other ships and to coastal authorities.

Regulations that come into force at the beginning of July this year require that AIS be fitted aboard all new build passenger ships of 300 GT (gross tonnage) and upwards and to new cargo ships of 500 GT and upwards. In both cases, the regulations apply to ships engaged on international voyages.

Voyage data recorders, comparable to the so-called black boxes found on commercial aircraft, have been installed to record and protect ship data and voice recordings which can be recovered and analysed after an accident.

This year sees the start of a phase-in programme for the carriage of a BNWAS (Bridge Navigational Watch Alarm System) designed to ensure that the bridge team is alert to the task and has not become incapacitated in any way. Automation of ship functions has resulted in ships carrying fewer and fewer crew; even large ships may now be crewed by as few as 13 personnel.

Recent and active TC

IEC TC 80 was set up in 1980 and has produced some 50 standards so far, not only supporting IMO requirements, but also for more general ship and shore applications. They also enable interoperability of equipment on different types of vessels which share the same radio spectrum and enable the interconnection of equipment on a vessel for the exchange of data.

The TC's objective is to publish standards that gain international acceptance as

suitable for type approval where this is required by the SOLAS Convention and ITU (International Telecommunication Union) certification when required.

By being represented in both IMO and ITU, TC 80 is able to influence the performance and technical content of those agencies' work. This is invaluable to manufacturing industry, in that the performance and technical standards represent the practical state of the current and emerging technology.

State-of-the-art systems for high-value assets

Ships are technically very sophisticated, high value assets (larger hi-tech vessels, like cruise ships, can cost over USD 500 million to build), and one of the fundamental trends in the maritime industry has been an increasing reliance on electrical and electronic technologies for navigation and communication. These technologies have moved well out of the mechanical era of the magnetic and gyro compass and into the electronic and information age. The bridge of a ship is now a dense concentration of navigation, communication and machinery control equipment, all of which has to work together.

Around 6% of the whole ship manufacturing cost is attributable to the navigation and communication equipment in the vessel. This gives a world market size of USD 1,7 billion for merchant ships, of USD 0,5 billion for fishing vessels and of USD 1,3 billion for pleasure craft.

Future trends improving collaboration

The major trend in technology is an increasing focus on improving collaboration within the bridge team, between the bridge team and pilot and with shore-side sources of information. Associated with this is the development of smarter interfaces between navigation sensors and bridge workstation applications. This is leading to new developments for data transfer via LAN (Local Area Networks) and for Bridge Alert Management for handling alarms.



Electronic chart display

Changes introduced by ITU in radio-frequency allocations and maximum acceptable levels of out-of-band emissions are promoting development of navigation radars not based on pulsed-magnetron designs.

IMO has now embarked on a major programme called e-navigation. This is intended to integrate existing and new navigational tools, in particular electronic tools, in an all-embracing system that will contribute to enhanced navigational safety and operational efficiency while simultaneously reducing the burden on the navigator and taking account of environmental issues

For safer sailing in the future

TC 80 expects to see a significant increase in new standards development and liaison activity. This will be driven by the increased mid-ocean coverage of broadband satellite communications, new capabilities of satellite systems in low earth orbit, the potential of eLoran (enhanced electronic navigation) as an affordable alternative technology backup to satellite navigation systems for position/time reference, and by the potential offered by digital radio for co-operative use of the radio frequency spectrum.

TC 80 will continue to support IMO with the development of new or updated standards for ship bridge equipment and systems and for such systems as GMDSS, AIS, shipborne equipment for LRIT (long-range identification and tracking). Work is currently under way on updating existing standards and preparing more than a dozen standards across all these systems.

This busy workload for the coming years and beyond will ensure shipping becomes even safer.

Wheeling along quietly, without interference

CISPR's work on behalf of the electric vehicle

One of the IEC TCs (Technical Committees) that deals with EMC (electromagnetic compatibility) is CISPR, the international special committee on radio interference. CISPR works to minimize interference, or rather the unwanted effects of it. The TC is facing new challenges in a world of increasing electrification where the use of EVs (electric vehicles) is becoming more widespread.

New challenges include EVs and connection to the Smart Grid

CISPR (the international special committee on radio interference) came into being in 1933. CISPR's role as a special IEC committee is to set the limits for electrical interference to radio reception caused or emitted by all types of electrical appliances, so that different devices can function correctly within the same electromagnetic environment.

CISPR's original work tended to protect the early telegraph and radio operators

from the phantom signals that were generated by solar activity on the transmission wires of the times. Today, there are new challenges that involve the Smart Grid, with its fluctuating supply of renewable energies, and the advent of the EV as a means of personal mobility,

with its accompanying requirement for numerous battery charging points.

Steering committee on Smart Grid

The CISPR NC (National Committee) representatives present at their October 2011 plenary meeting in Korea approved the



Testing for EMC

motion to set up a Steering Committee Working Group on Smart Grids. Indeed, CISPR's primary standardization work lies in the control of radio frequency emissions above 9 kHz that emanate from devices. Much of this work concerns the overall magnitude of emissions appearing in Smart Grid systems. Applying CISPR standards ensures that the Smart Grid achieves its potential and serves a useful purpose without reducing the performance of grid-connected equipment or giving rise to complaints about radio frequency interference in these and other devices that rely on radio transmission and reception.

Coordinating EMC standardization efforts

Electromagnetic threats or disturbances can be caused both by AC connections and by surrounding apparatus. The generic immunity International Standard, IEC 61000-6-2, issued by the second of the IEC TCs that deals with EMC, IEC TC 77: Electromagnetic compatibility, describes a variety of indoor and outdoor environments encompassed by the standard. Many of this type of immunity standards are referenced in CISPR immunity standards. One of the objects of a working group will be to focus on CISPR technical activity and coordinate its EMC work with TC 77 and other IEC TCs in order to ensure a harmonized approach on EMC.

Quite apart from the need to ensure that the public has access to easy-to-use, fast-charging and economic methods of charging their own private vehicles, with standardized plugs, there is another aspect to deploying electrified transport. It concerns the overall challenge of continuing to maintain a steady flow of electricity globally around the grid without blackouts or surges while ensuring that there is sufficient power available to charge EV batteries at precise hours of high demand.

Intelligence of the Smart Grid relies on data transmission

In order to provide the Smart Grid with the necessary intelligence about when and where power is needed to charge EVs and what power is available from what sources, including renewable energies, the relevant data needs to be exchanged and communicated. This allows the Smart Grid to make informed decisions and manage its power needs appropriately.

EV charging involves millions of "bits" of data

The CHAdeMO Association set up by Nissan, Mitsubishi, Fuji Heavy Industries and TEPCO (The Tokyo Electric Power Company Inc.) for quick public EV chargers in 2009 projected that they would need millions of stations in order to satisfy public demand. That would mean managing millions of "bits" of information about the various charging needs and the

requirements of each individual charging station.

Dealing with peak demands

The distribution network – the grid – also needs to be equipped to deal with the peak demands – for example, when people return home after work and look to charge their EVs using their own domestic electricity source. Today's infrastructure is ill-equipped to deal with such surges in demand. That demands greater intelligence and more precision about the relevant data.

Sorting out the information

To be efficient, the data from the various charging points needs to be sent through broadband communication channels to a Smart Grid centre where it can be processed and entered into the system. However, to work correctly, the intelligence of the system needs to be able to differentiate the frequency and the voltage of the data signal sent along the broadband power line from any other extraneous electronic noise that also happens to be there.

This is where the International Standards from CISPR and IEC TC 77 on conducted and radiated immunity levels are so important.

Reducing load

The extra intelligence provided by a Smart Grid can help even out loads and optimize power distribution. It can also help a utility work towards reducing peak loads – for example by offering discounts or other incentives to encourage drivers to charge their EVs when overall electricity demand is lowest, typically in the early morning hours.

Opening the market

International Standards that define the frequencies and the relevant protocols for EMC will enable the Smart Grid to function properly. That will allow citizens to plug in their EV and charge up their battery in any country. It follows that by doing so the market will open up, allowing manufacturers to produce more competitively-priced vehicles for mass distribution.



*Future charging stations for EV
[source: Siemens]*



*Electric vehicle quick charger
[photo: P. Martin-King]*

Taking developing countries onboard

IEC Affiliate Countries can participate in IECEE activities as observers

Standardization and conformity assessment are complementary. While it is essential that products and systems comply with standards, this compliance has then to be verified and certified. This may be a given in industrialized countries; it is less obvious for developing and industrializing countries.

Electrotechnical standardization for developing countries

Since 2001, the IEC, through its Affiliate Country Programme, has offered developing countries the opportunity to start participating in electrotechnical standardization activities at international level and to adopt IEC International Standards as national ones. Eighty-one countries currently participate in the programme. IEC International Standards have been adopted nationally by about 40 Affiliate countries.

The WTO (World Trade Organization) has complimented the IEC on the creation of the IEC Affiliate Country Programme. This provides an appropriate tool to enhance participation in International Standardization from WTO Members in developing countries.

In its TBT (Technical Barriers to Trade Agreement), the WTO recommends its members, particularly developing countries, to use International Standards rather than regional or national ones whenever possible. International Standards are widely adopted at the regional or national level and applied by manufacturers, trade organizations, purchasers, consumers, testing laboratories, authorities and other interested parties. Since these standards generally reflect the expertise and state-of-the-art know-how of industry, researchers, consumers and regulators worldwide, and cover common needs in a variety of countries, they constitute one

of the important bases for the removal of technical barriers to trade.

The next step: conformity assessment

Most developing countries have little or no industry. Electrical and electronic goods sold locally are imported from all over the world. The main issue is therefore to avoid the dumping of substandard products on such countries and to guarantee that only safe and high-quality equipment reaches the local market. It is therefore likely to be in governments' interest to require compliance with standards for all imports.

IECEE Affiliate status

To help developing countries that have an interest in participating in conformity assessment activities, IECEE, the IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components, has now decided to grant IEC Affiliate Countries observer status in the IECEE System.

This status offers them a form of participation in conformity assessment activities without the financial burden of actual membership, allowing them to make full use of the IECEE 100% electronic environment.

The Affiliate Countries participating in IECEE activities are entitled to attend all IECEE meetings as observers, to make use of the IECEE rules, procedures and operational documents and to participate in the various IECEE training and workshops.

However, observers do not have the right to propose or vote on resolutions.

Removing trade barriers

The global reach of the IEC Affiliate Country Programme allows it to achieve increased awareness, use and adoption of IEC International Standards in developing and newly industrialized countries. It also helps develop trade with these new markets, as participants adopt IEC

International Standards and use the IEC Conformity Assessment Systems, in particular IECEE.

Benefits for all

Industry can export to and in some cases import from these areas with the assurance that their products and services will operate safely and efficiently.

Affiliate Countries can set the basis in their own countries for building the necessary Conformity Assessment structures to ensure that imported electrical goods rely on IEC International Standards in terms of safety and efficiency.



IEC Affiliate Countries benefit from the IECEE 100% electronic environment



Only safe and efficient products should reach the local markets

Fruitful IEC, ILAC and IAF cooperation

Canada's SCC recognizes IECEE CB Scheme qualified laboratories



Signing the MoU, from left: ILAC Chairman Daniel Pierre, IECEE Executive Secretary Pierre de Ruvo and IAF Chairman Randy Dougherty

When it was signed in October 2010, the MoU (Memorandum of Understanding) between IEC, ILAC (International Laboratory Accreditation Cooperation) and IAF (International Accreditation Forum) was seen as a cornerstone of enhanced collaboration for the three organizations involved. Now this agreement, which generated much interest in the CA (conformity assessment) community, is bearing more fruits.

One of the most important outcomes of the tripartite MoU is that a single

reassessment – instead of three – is accepted by all three bodies. The pooling of resources helps introduce significant reductions in cost, time and complexity for the reassessment of CBs (Certification Bodies) and TLs (Testing Laboratories) that are accredited by IAF and ILAC Member ABs (Accreditation Bodies).

Joining efforts

Recognizing the importance and reach of this agreement, SCC (Standards Council of Canada) announced in February 2012 that, following discussions with the IEC and other ABs, it would accept, under its Product Certification Body Accreditation programme, the use of IECEE – the IEC System for Conformity testing and Certification of Electrotechnical Equipment and Components – CBTLs (CB Scheme Testing Laboratories) for product testing, in compliance with CAN-P-1500M clause 4.3.2. The document, entitled *Additional requirements for accreditation of certification bodies*, outlines unique Canadian requirements for third-party product CBs accredited by the SCC.

As national economies become global, it is essential that countries work

together to facilitate international trade.

The IECEE CB Scheme provides a conduit for the mutual acceptance of test reports, among participating CBs and TLs, for a wide range of electrotechnical products.

And while SCC is a signatory to several agreements in the field of accreditation and certification, the recognition of CBTLs introduces a truly international dimension, a significant factor for an organization that deals not only with standardization and conformity assessment but is also responsible for intergovernmental affairs and trade.

The SCC decision brings further proof, if need be, of the historic value of this cooperation agreement.

Global value of IECEE

It also highlights the ever growing importance and recognition of IECEE in the conformity assessment community worldwide. As national economies become global, it is essential that countries work together to facilitate international trade.



Under the IECEE CB Scheme, test laboratories can perform all types of electrical testing...



...for example circuit-breaker testing

About the MoU

Unprecedented move

This type of cooperative agreement is unprecedented in the CA (conformity assessment) world and builds on years of collaboration between the IEC and its CA Systems, ILAC (International Laboratory Accreditation Cooperation) and IAF (International Accreditation Forum). It has a direct and positive impact on the CBs (Certification Bodies) and TLs (Testing Laboratories) that are accredited by ILAC and IAF members' ABs (Accreditation Bodies) and operate as registered members of the relevant IEC CA Systems.

The programme put in place by the three bodies is now operational and the results of its implementation to date can be viewed on a dedicated website.

Common Steering Committee

A common Steering Committee was created and will be responsible for developing cooperation strategies, providing support and dealing with project issues and deliverables. The Committee is chaired by IECEE – the IEC System for Conformity testing and Certification of Electrotechnical Equipment and Components – Executive Secretary Pierre de Ruvo.

Talking the same language

Another objective set out by the MoU is to facilitate a coordinated application of ISO/IEC standards and guidance documents for the purpose of assessment of certification bodies and testing laboratories operating in the IEC CA Systems. This includes a common understanding of the technical issues and the harmonization of the respective assessment procedures. Provisions are also made for joint training and workshops for lead assessors, and when possible, joint work on the development of harmonized procedures and policies.

About SCC

SCC is a federal Crown corporation with the mandate to promote efficient and effective voluntary standardization. Located in Ottawa, Ontario, SCC reports to Parliament through the Minister of Industry and oversees

Canada's NSS (National Standards System).

The SCC mission is to lead and facilitate the development and use of national and international standards and accreditation services to enhance Canada's compe-

titiveness and well-being. Its vision is to improve Canadians' quality of life through leadership of the NSS. The work of the SCC falls into three principal areas: standards, conformity assessment and intergovernmental affairs and trade.

Building on experience

IECEX International Conference in Dubai addresses safety issues in the Ex field

The 2012 IECEX International Conference on Equipment and Services in Explosive Atmospheres took place in Dubai, UAE (United Arab Emirates) on 20-21 March. Holding about 10% of the world oil reserves and 20% of natural gas resources, the United Arab Emirates was a natural location for this conference.



The event was organized by the IECEX, the IEC System for Certification for Standards relating to Equipment for Use



in Explosive Atmospheres, and ESMA (Emirates Standardization and Metrology Authority), in conjunction with UNECE





(United Nations Economic Commission for Europe).

Highly motivated audience

The conference brought together more than 200 participants from the Ex industry, SDOs (standards development bodies) and CBs (Certification Bodies), as well as regulatory authorities from Arab, European, Asian and African countries, including Saudi Arabia, Kuwait, Britain, Germany, Russia, Australia, USA, France, Japan, India, Pakistan, Cameroon, Canada, Nigeria and of course the UAE.

High-level experts were able to share their experience and detailed knowledge of all matters pertaining to the Ex field, such as plant design, principles and practical applications of area classification, installation and repair in compliance with IEC International Standards. They also answered questions and provided advice and valuable information to a captive and highly-motivated audience.

Safety is UAE's top priority

The initial impetus of the conference came from ESMA. UAE authorities were looking at ways of ensuring the highest levels of safety for workers, installations and equipment in the oil and gas sector. In addition, ESMA expressed its intention to begin implementation of the UNECE's common regulatory framework, which lays out the key features of a regulatory system, and can be put to direct use by countries that either do not have regulations in this sector or are in the process of revising existing regulations.

While standards are already being applied extensively by local industry in the United Arab Emirates, ESMA is now developing mandatory technical regulation in the explosive environments sector. Mohammed Saleh Badri, ESMA Acting Director General, said that lessons learned at the Conference will contribute to shaping the new regulatory system. For him, the next step will be to promote awareness about the role and importance of standardization and certification

bodies and their activities in the oil and gas sector so as to ensure industry's compliance with international standards, protect facilities from hazards and prevent disasters and accidents.

Badri said the conference was in line with the UAE government's guidelines and UAE Vision 2021 for making the country one of the world's safest by 2021. It also coincides with the UAE strategy that aims to ensure security and public safety.

Key role of IECEx

In developing the regulation, ESMA will refer to international standards, most importantly those developed by IEC and used by business and regulatory authorities throughout the world. While standards are essential, they need to be properly applied. According to the Executive Secretary of IECEx, Chris Agius: "The mission of the IECEx system is to ensure that equipment conforms to the standards, that it is installed and repaired in conformity with industry best practice, and that all the personnel who work in these environments are competent."

Further interest from Eastern Europe

The conference was also an important point of reference for other attending countries that are developing regulations in this sector. These included the Customs Union of Belarus, Kazakhstan and the Russian Federation, which are developing joint technical regulations in this field, and were represented at the conference by NANIO CCVE, a Russian certification body.

Organizers, speakers and participants all agreed that the conference was a great success. For many who attended, it was a real eye-opener. Building on this, both IECEx and UNECE are considering the organization of similar events in other parts of the world. In addition, the two organizations will deliver a Joint Technical Paper at the 2012 PCIC Europe Conference, to be held in Prague next June.

Under control

IECQ helps manage electronic components in avionics systems

Avionics – a blend of aviation and electronics – comprises all electronic systems used in aircraft, satellites and spacecraft. It includes communications, navigation, flight and engine control, collision-avoidance and weather-based systems.

Avionics surfaced in the 1970s, driven by military aircraft development, and was soon adopted by civil airliners. The popularization of air travel in the second half of the 20th century and the emergence of low-cost airlines within the past decade have meant increased air traffic, tighter control of airspace and, consequently, the need for more sophisticated methods of controlling and ensuring aircraft and passenger safety.

Multiple indicators

The cockpit of an aircraft is a typical location for avionic equipment that consists of control, monitoring, communication, navigation, weather, and anti-collision systems.

- **Automatic control**

Automatic flight control systems lighten the pilots' workload, especially at crucial times such as landing or in hover, and help eliminate human errors that might otherwise prove fatal

- **Monitoring**

Display systems provide sensor data that allow the pilots to monitor flight parameters at all times and thus to fly the aircraft safely. Most of the information that used to be displayed on mechanical gauges in older aircraft now appears on electronic displays

- **Communications**

Communications connect the flight deck to the ground and to the

passengers. On-board communications are provided by public address systems and aircraft intercoms

- **Navigation**

Navigation is the determination of position and heading (direction) on or above the surface of the earth. Avionics can use satellite-based systems, ground-based systems, or any combination of the two. Navigation systems calculate the position automatically and display it to the flight crew on moving map displays

- **Anti-collision systems**

As a complement to air traffic control, most large transport aircraft and many smaller ones use a TCAS (traffic alert and collision avoidance system), which can detect the location of nearby aircraft and provide instructions for avoiding a midair collision. Smaller aircraft may use simpler traffic alert systems which are passive and do not

provide information for resolving potential problems. To help avoid collision with terrain, aircraft have systems such as GPWS (ground-proximity warning systems), of which radar altimeters are a key element

- **Weather**

Weather instrumentation such as radar and lightning detectors is important for aircraft which fly at night or in meteorological conditions in which pilots cannot see the weather ahead. Heavy precipitation (as sensed by radar) or severe turbulence (as sensed by lightning activity) are indicators of severe disturbances, and these weather instruments allow pilots to deviate around such areas

- **Aircraft management systems**

The trend today is to have centralized control of the multiple complex systems fitted to aircraft, including engine monitoring and management



Airbus A380 cockpit



Automatic flight control systems play crucial role when helicopter is in hover



ATV (Automated Transfer Vehicle) cargo spacecraft on a mission to supply the ISS (International Space Station)

Safety and reliability through IEC International Standards...

While quality is important in all electronics sectors, it is even more so in transportation. One tiny faulty component in an airplane electronic system may endanger the lives of hundreds of passengers and possibly of people on the ground.

IEC TC (Technical Committee) 107: Process management for avionics, is responsible for developing process

management standards on systems and equipment used in the field of avionics.

...and certification

IECQ, the IEC Quality Assessment System for Electronic Components, takes it one step further, testing and certifying the widest variety of electronic components. In addition, IECQ has a programme specifically designed for avionics, the IECQ ECMP (Electronic Component Management Plan) Scheme.

Avionics certified

An ECMP is prepared by a manufacturer of aerospace electronic equipment in accordance with IEC/TS (Technical Specification) 62239, *Preparation of an Electronic Components Management Plan*. The International Standard describes the objectives to be accomplished by avionics manufacturers in managing electronic components in avionics systems.

The plan documents the avionics manufacturer's baseline processes to manage COTS (commercial off-the-shelf) components. The processes documented in the plan satisfy high-level objectives, such as component selection, application, qualification, quality assurance, dependability, data management and obsolescence management. After the plan is approved as compliant to IEC TS 62239, the plan owner is authorized to manage all aspects of the COTS components, in accordance with the plan. All components used in the plan owner's products must satisfy the requirements of the approved plan. IECQ ECMP Certification is used by:

- Aircraft manufacturers
- Manufacturers supplying assemblies
- Sub contractors
- Overall supply chain

In short IECQ ECMP Certification ensures that fundamental purpose of IEC TS 62239 is maintained, i.e. "... assuring industry and regulatory agencies that electronic components in equipment are selected and applied under controlled processes compatible with the end application..."

The IECQ ECMP Scheme is now responding to industry requests by looking into developing similar certification for other high reliability areas such as the automotive and railway sectors.

For more information on IECQ and the IECQ ECMP Scheme visit: www.iecq.org

Going global

CANENA's annual meeting puts regional standardization in a global context

CANENA, the Council for Harmonization of Electrotechnical Standards of the Nations of the Americas, held its annual meeting on 29 February-1 March 2012 in Mexico City, Mexico.



A forum for harmonization discussions

CANENA focuses on electrotechnical standards harmonization activities within the Americas, providing a forum for discussions among its various organizations, manufacturers, conformity assessment bodies and individual participants that make up its membership.

The theme of this year's meeting was "Putting Regional Standardization in a Global Context" with focus on Mexico. Hugo Gomez, President of CANAME, the Mexican electrical industry trade association, delivered the keynote address, offering an industry perspective on the needs in the continuing development of a standards infrastructure in Mexico. A forum of experts compared and contrasted safety fundamentals in national electrical codes of the region and provided a summary of the code making process. A session on practical processes for ensuring "Credible Technical Inputs in Consensus Building" featured the standards committee structure of CSA (Canadian Standards Association).

The meeting was also an opportunity for attendees to discuss best practices and the latest developments on national, regional and international implementation of energy efficiency standards.

Successful harmonization

One of the major outcomes of the meeting was that CANENA's efforts to harmonize requirements across Canada, USA and Mexico are bearing fruits. The organization has begun to see successes and is recognized by all participants as important and useful to their markets.

Presentations and discussions during the meeting also highlighted the fact that IEC International Standards are playing an increasing role in the work of CANENA and its harmonization efforts.

IEC activities key to industry and Conformity Assessment

IEC Vice-President James E. Matthews III provided an update on some of the key topics and activities of the IEC, introducing the new IEC TCs (Technical Committees) and Strategic Groups, presenting the two white papers published by the IEC: "Coping with the energy challenge" and "Electrical energy storage".

Matthews also explained how the IEC CA Systems were also growing in parallel with the standardization activities and how more countries and laboratories were joining and participating in all three systems. He presented the IEC CAB (Conformity Assessment Board) WGs (Working Groups) that have been set up to address the certification needs of two alternate energy areas: marine and tidal generation on the one hand, and wind turbines on the other.

The way ahead

Matthews then spent some time on the IEC's action plan for the coming years, outlined in the IEC Masterplan 2011. It states in clear terms what the next steps are for the Commission in terms of technology watch, positioning in the market, cooperation with other regional and international organizations, processes and governance and structure.

The Masterplan is the document on which all actions and decisions of the IEC are built. It shows the way ahead, emphasizes the capital role of National Committees in IEC operations and the part played by leaders and technical experts, as well as the importance of the IEC Family on the global scene.

Going global with IEC International Standards

In his conclusion, Matthews reiterated the importance of IEC International Standards in eliminating many obstacles to international trade in a world in which innovation is accelerating, technologies are converging and industries are increasingly global.



The CANENA annual meeting took place in Mexico City, Mexico



In his presentation, IEC Vice-President James E. Matthews III made ample reference to the IEC Masterplan 2011

CANENA celebrates 20 years of cooperation in electrotechnical standardization

CANENA is a volunteer-based organization focused on electrotechnical standards harmonization activities within the Americas, with the aim of facilitating trade.

Originally founded in 1992 by the electroindustry manufacturers associations of North America, CANENA was formed as a result of a negotiated trade agreement to foster the harmonization of electrotechnical product

standards, conformity assessment test requirements, and electrical codes.

Today, CANENA promotes, encourages and receives participation from leading industry organizations, standards developers, conformity assessment testing laboratories, regulators, and other interested parties.

CANENA acts as a facilitator for electrotechnical standards harmonization.

It provides a focal point for contacts within each country, information exchange, and a forum in which the technical harmonization committees can function.

While CANENA was initially created by the manufacturers associations of North America, it is a continuing objective that CANENA be open to participation by all industry organizations throughout the Americas.

Call for inspiration and creativity

Take part in the World Standards Day 2012 poster competition!

A competition open to all has been launched to design a poster for World Standards Day (14 October) on the theme, "Less waste, better results – Standards increase efficiency".

The competition is organized by the WSC (World Standards Cooperation), which comprises the IEC, ISO (International Organization for Standardization) and ITU (International Telecommunication Union).

The designer(s) of the best poster will win CHF 1 500, with the three runners-up receiving CHF 500 each.

To compete, designers should send their entries in .jpg or .png format to:

wsdposter@worldstandardscooperation.org.

Submissions will be accepted until 10 May 2012.

IEC, ISO and ITU representatives will choose the finalists. The shortlisted entries will be published on the WSC Website, and the general public invited to choose the winning designs. Voting will open on 14 May and close on 18 May, and the winners will be announced shortly after. People can follow the World Standards Day poster competition on Twitter and Facebook.

The WSC partners comment, "We hope this competition will fuel fruitful conversations about the value of standards for increasing efficiency, while promoting a spirit of openness and engagement with the public. We are very excited to see your inspiring creations!"

To help prospective World Standards Day poster artists, the WSC Website includes a number of resources:

- The World Standards Day theme
- Examples of previous World Standards Day posters

- Specifications for the 2012 poster.

Any questions about the competition should be sent to:

wsdposter@worldstandardscooperation.org, Twitter or Facebook.



The competition is jointly organized by IEC, ISO and ITU under the auspices of the WSC



The 2011 winning poster was designed by Caterina Fiorani of Italy

About WSC

The World Standards Cooperation was set up in 2001 to strengthen and advance the voluntary consensus-based international standards systems of IEC, ISO and ITU.

Each year on 14 October, the members of the IEC, ISO and ITU

celebrate World Standards Day, to recognize the collaborative efforts of the thousands of experts worldwide who develop the voluntary technical agreements that are published as international standards.

Tackling copyright infringement

The IEC continues to address issues of unlawful distribution of standards

The increasingly wide-spread access to the internet and electronic documents has made it easier and faster for users to find and obtain IEC International Standards. It has also, however, led to an increase in copyright infringement, often in the guise of unlawful selling or sharing of standards.

Taking action

While the IEC is committed to making International Standards as widely available and implemented as possible an important contribution to their continuous development comes from sales revenue which is compromised when they are reproduced or redistributed without permission. The illegal sharing and selling of the documents is also dangerous for those using them as the content may have been tampered with and can no longer be guaranteed. Another risk is that users end up working from out-of-date standards.

At the Marketing and Communication Forum, Guilaine Fournet, Head of Sales and Business Development at the IEC and Nicolas Fleury, Director of Marketing, Communication and Information at ISO (International Standards Organization) gave a

presentation to raise awareness of the issues at stake. They pointed out the significant rise in cases of illegal commercial activities, both deliberate and unintentional, and laid out the action plan that IEC and ISO have put in place in order to tackle copyright infringement.

For example, as of the beginning of 2012, the IEC has added a warning sign next to the usual copyright notice on all new International Standards, while digital watermarks on standards bought online ensure that the rightful licensee of the document can be easily identified.

What to do

When coming across a pirate site or standard being illegally sold or shared online it is important to secure evidence by taking a screenshot, as the pages are often changed or deleted, and then inform the IEC Central Office and any members directly concerned. It is also essential to raise awareness amongst stakeholders about where standards can be obtained legally; a list of authorized distributors can be found on the IEC website.

More information about copyright infringement of International Standards and preventive measures can be found in the brochure *Copyright, standards and the Internet*.



Copyright infringement is a serious issue facing standards organizations

Warning!

As of 2012 the IEC has added a warning sign to all new standards



International Standards are under attack from information anarchists

Getting to know Frans Vreeswijk

IEC Deputy General Secretary talks to *e-tech*



Frans Vreeswijk

Frans Vreeswijk became IEC Deputy General Secretary on 1 March 2012. He will assume his full role as General Secretary and CEO at the 2012 Oslo General Meeting in October. Prior to joining IEC Central Office, he worked for 30 years for Philips. He was President of the IEC Dutch NC (National Committee) and served on the IEC CB (Council Board) and SMB (Standardization Management Board).

Question: What is your background?

Answer: I studied electrical engineering at Delft University, in the Netherlands and obtained an MSc. in 1982. Right after university, I joined the Philips research laboratories in Eindhoven. I worked for more than 12 years in research, first as a scientist, later on as Department Head. During those years, my work involved the development of systems for transmitting high-definition television signals. In that capacity, I was also a Dutch representative to ITU (International Telecommunication Union) from 1988 to 1994, my first introduction to standardization and to Geneva, Switzerland. I was also active in the DVB consortium and helped to develop the PALplus widescreen television standard.

When I left research in 1995, I went to the business side of the company and moved

to Vienna, Austria, as development manager in the field of consumer electronics, more specifically in charge of VCRs. This was new and very interesting for me because as I was heading a large development organization working closely with the factory, I had the opportunity to learn much about the production, logistics and management processes.

The next step for me was a transfer to the company's USA operations in 1997. I worked on digital television, first in Knoxville, Tennessee, and then in Briarcliff, New York. When I moved back to the Netherlands in 1999, I became responsible for the development of flat screen televisions, more specifically plasma screens, and later we developed the first LCD TV (Liquid Crystal Display). At the time, the plasma screens were about the price of a small car! They were really expensive but after the third generation, we managed to reduce the price to make it a more affordable high-end product.

Then I went back to research for a couple of years, in a management function, and then to IP&S (Intellectual Property and Standards), a corporate unit of Philips, where I was in charge of worldwide standardization for the company. As such, I was also involved in the Dutch IEC NC, of which I later became President. In those years I represented Philips in the Blu-ray Disc Association. From 2008 until the beginning of this year, I was responsible for intellectual property and standards for the Healthcare Sector.

On the personal level, I am married to Wils and we have one daughter, Charlotte, who is 28, and three sons, Frans, 26, Sebastiaan, 24 and Lucas 18. I speak fluent English, German and Dutch and have a reasonable knowledge of French. My hobbies include reading, running, cycling and ice speed skating.

What made you get involved in standardization and intellectual property?

After about 24 years in research and development, I knew it was time for a new challenge. There was a job opening in the Standards division within IP&S and since I had been actively involved in standardization, first in ITU and later on in several consortia, I felt it was the right move.

I joined IP&S in 2005 and was responsible for worldwide standardization. That of course included IEC International Standards. In that respect, I was dealing with the experts that were members of IEC TCs (Technical Committees) and SCs (Subcommittees). My job was to make sure that the Philips issues and positions were well represented in the various TCs, that the Philips businesses were aware of standards, and that the company had a good overall strategy and policy as far as standardization was concerned.

In 2008, IP&S governance was organized along the business axis. This meant that instead of having a division in charge of one type of activity, e.g. standardization or licensing, throughout the company, each Business unit was in charge of its own standardization, licensing and patents and so on. In that new structure, I became responsible for the Healthcare unit. This structural change was very challenging and it broadened my experience and expertise.

When and why did you become involved in IEC SMB and CB?

Considering my position at Philips, this was an obvious and logical move. When I became responsible for the company's standardization activities, I took over more than the business function. My predecessor was the Dutch representative in the IEC SMB and was active in the Dutch NC. Naturally, I inherited these roles and responsibilities as well.

I spent about 4 years in SMB, half a term because my predecessor retired mid-term and then a full second term. The same thing happened when I joined the IEC CB mid-term.

How did you perceive the IEC when you joined the management committees?

I have to say that I was somewhat taken aback by the structure, the details and depth of the proceedings during my first SMB meetings. It took me a bit of time to work my way into the functioning of the SMB even though I had been briefed beforehand. As a result I wasn't sure how effective I was. But I learnt and came to appreciate what was done by the SMB. Being involved in the process, realizing what it was about, I saw that my opinion counted. I could engage in discussions, have some influence and make things happen. That definitely changed my perspective of the IEC.

Why apply for the position of General Secretary and CEO?

Having been involved in the IEC for a number of years, I could see the importance of the organization in the world. When the position was announced, my first reaction was that it was too soon for me. Then people around me started to ask whether I would apply. So I reconsidered and finally thought "why not, why shouldn't I?" Such an opportunity doesn't come along when you feel you are ready for it, so you have to seize it when it happens. Of course I discussed it extensively at home, with my family, and we all decided to give it a try. This is how the process started.

What do you think you can bring to the IEC?

I come from industry and recognize that industry can benefit from everything we do in the IEC, a very good organization that brings real value to the marketplace. The orientation and close link to industry is so evident, so clear, much more so than with other organizations. That was what drove me in the first place.



In the late 1990s, Vreeswijk was responsible for the development of plasma screens



In 2008, Vreeswijk became responsible for the Intellectual Property and Standards for the Healthcare Unit

I felt that my years in industry are a major advantage for the job because we are here to serve the needs of industry. Industry is the backbone, the platform on which we work. We have to ensure that the value and the linkage remain and even get stronger, specifically in areas where we are not yet well recognized. There is always room for improvement. As such I think my background will make a difference, facilitate dialogue and be an asset for future high-level discussions with industry.

I am very much looking forward to working not only with the IEC management and staff, but also with the IEC community at large. I want to make sure I have a broad set of contacts and can mobilize as many people as possible to help face the challenges of the future.

I do enjoy working with people. I am passionate about my work and want to ensure that everyone has a common goal to which end all devote their efforts and their drive. I am deeply convinced that together we can all make a difference.

Down under – very much on top

Living and sharing electrotechnology: from teaching to electricity generation and distribution

At the beginning of 2012, Ralph Craven, already one of the 15-Member IEC Council Board for the three-year period from 2010-2012, was appointed President of the Australian IEC NC (National Committee).



Ralph Craven, President of the Australian IEC NC

A man of considerable experience

You only need to look at the CV of Australian-born Ralph Craven to know that over and above his qualifications he's a man of considerable experience with a substantial working knowledge of international energy markets. After being awarded a first-class honours bachelor's degree in engineering at the University of Queensland, he obtained a master's degree, followed by a doctorate in electrical engineering, from the University of New South Wales. He's a Fellow of the Institution of Engineers Australia, a Fellow of the Institution of Professional Engineers New Zealand, a Fellow of the Australian Institute of Company Directors and a Chartered Professional Engineer of Australia.

Professionally, Ralph Craven has worked in a broad spectrum of privately-owned and state-run energy and resource sectors. In addition to electricity, these include coal,

gas and oil and cover Australia, Canada, New Zealand and Switzerland. He has held senior executive positions in energy generation, trading and delivery sectors, set up high-voltage electricity transmission lines and substations and managed large-scale system operations and national electricity grids.

Comfort reaped from standards

Craven is an independent Non-Executive Director and chairs a major electricity distribution corporation in Australia that covers 97% of the state of Queensland. He's also a Board Member of a major Australian global wind energy development company and a non-executive director of a major listed oil and gas company.

If you ask Craven what he finds attractive about the world of International Standards, he tells you that one reaps comfort from standards. "There's a lot of work that goes into preparing a standard," he says. "When you put all the pieces together and build something according to a standard, whether the object is technical, or related to the safety of people or the environment, or any of the other range of issues that come into play, standards offer real comfort in terms of support and technical safety."

Through making an application for one of Australia's new pilot Smart Grid city projects he got to learn about some of the challenges involved in making Australia smarter. "The work we put in for that submission taught us a tremendous amount about renewable energy, sustainability and energy efficiency," he adds.

Having worked in energy and resources and overall infrastructure, he has a good perspective on how all the bits and

pieces come together from a systems perspective – whether it's small or large. "I can appreciate the relevance of the IEC in fitting into the small parts of the big picture and how it is really fundamental in making the whole standardization process come together in an exact sense, as opposed to the hoped for sense", he says.

"It's like a Meccano set. If you have it all coming together and all the parts have been tested and everyone knows what they can or cannot do in terms of where their limits are, it all works out."

A strategist and a planner

"I've been through the entire process, from running national grids or large markets right down to very small systems and individual pieces of equipment," Craven says. "I've been responsible for lots of infrastructure, like building power stations, plants and transmission towers. You're there making things or delivering things to people. I see how all the pieces come together. The other perspective is in understanding how recommendations are made and approvals given in organizations. I've also been part of that process, from the moment of investment, the time of pre-feasibility studies through final investment to delivery on the ground. I'm basically a strategist and a planner. You have to put it all together, say what it's going to look like, how it's supposed to work and ask yourself whether it will deliver like it said on paper."

Differences in nomenclature not issues

Craven has travelled extensively and worked in many countries. When asked whether it gives him special understanding about people and on how to get consensus, he says, "No matter where parties sit globally, the issues are the same. They're just called differently.

"Whether you're Chinese, Korean, Australian or from Europe, you need to deal sensibly with the energy issues we're facing. There's a lot of rhetoric about doing the right thing for the climate and climate change. You need to make energy work for humans in a way that is efficient and effective. Smart Grids and smart cities are one of the ways now for people to think seriously about how we live in society and how we use our energy.

"Where you come from makes no matter. The frontiers are now between technologies and applications, and we need alliances between people and across frontiers where it's sometimes difficult to put the pieces together. It's all about how can we get the best out of technologies to which everyone has access because we're living in a global world".

The notion of electricity as a social environment

The new Australian President talks of energy as being our new social



The kangaroo is a major symbol in Australia, host country to the IEC 2011 General Meeting

environment. We can't live without it now, and it is that appreciation which is leading many decisions at government and country levels. "You can't live without electricity. So, if you're not aware of the use of electricity and other energy forms, and



World-famous symbol of Australia, the koala

how you interact, then you're not socially aware. Our way of doing things is going to be influenced by our move towards a more energy-aware society. We're all going to gain that consciousness."

Removing resistance!

Nomination of a new Chairman for IEC TC 90

One of two IEC TC (Technical Committee) Chairmen who began his term of office on 1 April 2012 is an expert in an area that has tremendous future development possibilities and scope. His committee is IEC TC 90: Superconductivity, set to revolutionize electronics by removing resistance.

Superconductivity

The Frenchman Christian-Eric Bruzek began his first term of office as the Chairman of IEC TC 90: Superconductivity, on 1 April 2012. His candidature was supported by

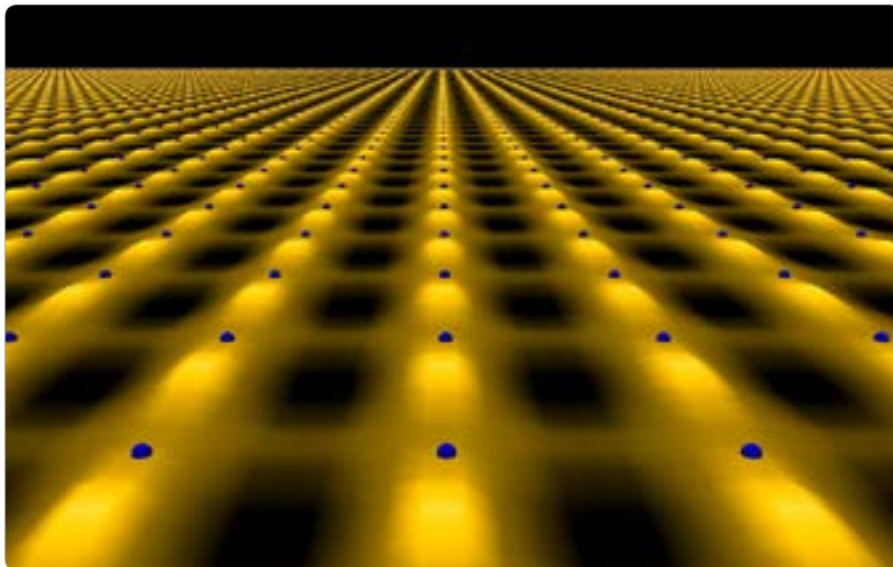


Christian-Eric Bruzek, Chairman IEC TC 90: Superconductivity

the Japanese NC (National Committee), holder of the secretariat of the TC.

Bruzek holds a PhD in metallurgy from the University of Lille where his thesis was entitled *Optimization of the manufacturing process of NbTi* [niobium-titanium].

For over 15 years Bruzek has been involved in the industrial development and manufacture of LTS (low temperature superconductor) and HTS (high temperature superconductor) devices and cables for a number of world leading industries and organizations including Alstom, LNE (Laboratoire national de métrologie et d'essais), the French national metrology laboratory and Nexans where, today, he holds the position of Superconductivity Expert and Project Manager.



The copper-oxide layer of a superconductor in the pseudogap phase. Source: Key Advance in Understanding 'Pseudogap' Phase in High-Tc Superconductors



Wendelstein 7-X stellarator

Big future for superconductivity applications

IEC TC 90 was established in August 1989 and is a particularly active committee with 9 International Standards developed over a period of 7 years and 10 projects that are currently active. Indeed, the TC is in the only body presently working on the standardization of superconductivity and the electromagnetic properties of superconductors that, with their wires,

cables and magnets, form the basis for applications, for example in the fields of health care, particularly as far as MRI (magnetic resonance imaging) is concerned, of transportation, material processing and electric power. In the near future, superconducting microwave components are also expected to be used widely in the field of communication and the market for such applications is predicted to grow substantially over the next 10 years.

At present, TC 90 is working on defining the terms and measuring methods for superconducting wires and films that can be used in a great number of applications. Due to the nature of some of the highly specific requirements for the latest high performance superconductors, some of the aspects of their standardization cannot be developed in advance by the TC but will fall into its work patterns as the technology progresses.

State of the art nuclear energy projects

Bruzek has worked on low temperature superconducting equipment and on the design and production of the strands and cables made of type II superconductors NbTi and Nb₃Sn (niobium-tin) that are particularly important for high field accelerator magnets.

He has been involved in high energy physical collider projects: the SSC (superconducting super collider) – a precursor to the LHC (Large Hadron Collider). He has participated in projects concerning the LHC dipoles and quadrupoles, the ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid) detectors – two of the seven particle detector experiments constructed for the LHC at CERN (European Organization for Nuclear Research) in Geneva, Switzerland – and on fusion reactors such as ITER (International Thermonuclear Experimental Reactor), the international project on nuclear fusion that is taking place in Cadarache in the south of France, together with the W7X (Wendelstein 7-X) stellarator, an experimental project being built at the Greifswald branch of the Max Planck Institute for Plasma Physics, to test an optimized magnetic field using stellarator nuclear fusion.

Bruzek is a member of several professional scientific congresses and organizations, a regular contributor of articles, owner of several patents and an international presenter on superconductivity.

Printed circuitry

Nomination of first Chairman for IEC TC 119



Alan Hodgson, Chairman IEC TC 119: Printed electronics.

April 1 2012 saw the start of the term of office of the IEC's newest TC Officer, the Chairman of TC (Technical Committee) 119: Printed electronics. Increasing demand for competitive methods to produce low-cost high-performance electronics makes printing an attractive solution with enormous potential.

First term of office in a new IEC TC

On 1 April 2012 Alan Hodgson began his first term of office as Chairman of the IEC's most recently formed committee, TC 119: Printed electronics. This committee was formally approved by SMB (Standardization Management Board) at the end of 2011 following the proposal submitted by the Korean NC (National Committee).

New field of standardization

Until now, there has been no other official organization devoted specifically to the field of printed electronics. Increasingly these are being used to produce low cost electrical and electronic devices; they also offer an economical manufacturing solution for flexible substrates. It is a technical area that, before the advent of TC 119, was

covered by a number of other IEC TCs. Each of them was responsible for a section from within their own specific areas – electronics assembly, design automation, multimedia, display devices and nanotechnology – but none had an entire overview.

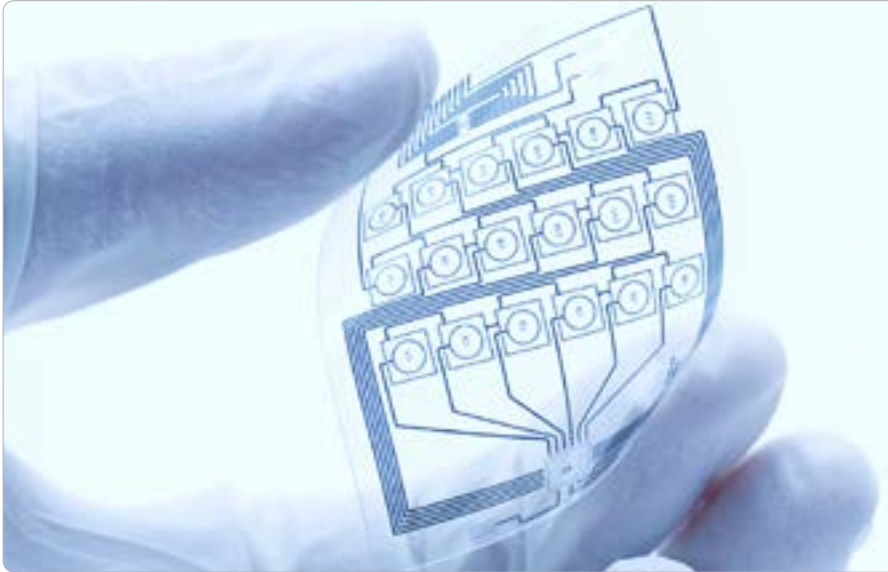
The role of TC 119 is to facilitate the rollout and industrialization of printed electronics. First the committee aims to set down formally the standardized terminology of electronic printing methods applicable worldwide. Taking a consensus-based approach to this international standardization work ensures that the technology can then be deployed on a global level with a minimum of investment. The scope of the committee covers standardization work on typifying the relevant materials, characterizing equipment, setting down test methods, reliability and repeatability, and any of the ensuing processes, paying due regard to the fields of health, safety and the environment.

Obtaining consensus on electronic printing standards

Heading the consensus work involved in agreeing to International Standards on all electronic printing aspects is a British former technical executive of a world leading imaging company. During the 22 years he worked for Ilford Imaging, Alan Hodgson held a mix of technical and commercial posts, working in R&D (research and development) as well as Marketing and Project Management functions. He has dealt with all aspects of photo printing technology, in particular that of inkjet, and led the group conducting comparative evaluations on printing heads, fluids and substrates. Hodgson has a BSc in chemistry from UMIST (the University of Manchester Institute of Science and Technology), UK (United Kingdom), where he specialized in the dyestuff chemistry that was later used in inkjet inks. Later he followed this with a PhD in Instrumentation where he focused on radio frequency electronics applied to spectroscopy in



The future of lightweight electronics: printing



Printing electronics makes it possible to use incredibly light, flexible substrates

chemistry and a postgraduate diploma in marketing from the Chartered Institute of Marketing.

Having spent time working in optics and inkjet as an independent consultant for companies that ranged from multinationals to small start-ups, today Hodgson works as a Technical Development Manager for 3M. He plays leadership roles in the Royal Photographic Society, IOP (the Institute of Physics) and IS&T (Society for Imaging Science and Technology) where he particularly enjoys presenting their work on printed electronics and digital fabrication to non-technical audiences.

Other IEC TCs that also deal with printed electronics:

IEC TC 91:

Electronics assembly technology

IEC TC 93:

Design automation

IEC TC 100:

Audio, video and multimedia systems and equipment

IEC TC 110:

Electronic display devices

IEC TC 113:

Nanotechnology standardization for electrical and electronic products and systems.

Former Lord Kelvin Award recipient dies

Paul Sandell – first Chairman of IEC TC 23

At the end of February 2012, the French IEC NC (National Committee) announced the death on 9 February of one of their countrymen, a former Lord Kelvin Award recipient, Paul Sandell.

Associated with the IEC for decades

Paul Sandell's association with the IEC goes back many decades, to 1946. Indeed, he was the very first Chairman of IEC TC 23: Electrical accessories, a committee that was formed in 1934. Despite the fact that he was over 90, he had an active and rapid brain, and right up until a few months



Paul Sandell lecturing a group of TC experts in October 2009 (SC 23E, Grenoble, France)

before his death, was still taking part in technical matters, addressing meetings and participating in TC 64 MT 4: Effects of current passing through the body, and TC 64/MT 9: Disconnecting times and related matters.

Michel Dell'ova, Chairman of IEC SC 23E: Circuit-breakers and similar equipment for household use, remarked that he felt honoured to have known Sandell.

"I came to know Paul Sandell through our IEC standardization work and met not only an extremely professional person who was a real pleasure to work with, but someone who became a true friend. We'll all miss his



Paul Sandell receiving his Légion d'Honneur in 2006



Chevalier de la Légion d'Honneur– a silver medal of 40 mm in diameter attached by a red ribbon of 27 mm in width

sense of humour, his intelligence and his dedication.”

Awarded the French Légion d'Honneur

Ten years after he had been awarded the Lord Kelvin Award for his exceptional long-term achievements in his work with the IEC, on 22 July 2006 Sandell was made by Presidential decree Chevalier, which in English can be translated as ‘Knight’, in France's highest order, l'ordre National de la Légion d'Honneur.

The order was originally established by Napoléon Bonaparte in 1802 and rewards men and women, whether French citizens or foreign nationals, for their outstanding

achievements in military or civilian life. In 2006, 120 guests were present to celebrate the event. It was a tribute to Sandell's electrotechnical standardization work, both for the French nation and internationally.

The IEC was well represented at the ceremony and members, both Old Fellows (former IEC officers and senior officials) and active participants, presented Sandell with gifts, some edible and some of a more historical or cultural nature. He was also given the official greetings of the IEC President and its General Secretary, and those of the Secretary of the IEC Old Fellows group.

For the then 86-year old Sandell, the occasion was a moving one. In his speech to those present, he underlined the importance of the event, not only for him personally, his family and his village, but also as a demonstration of international cooperation and the hard work of so many people in different parts of the world. “I am particularly honoured by the gift I have received from the IEC Old Fellows,” he said. “For me, a Frenchman, the Meissen porcelain made by the German Royal Manufactory to celebrate the 1990 Berlin reunification has a very special significance.”

Former head of French delegation

Throughout his life, Paul Sandell, IEC Lord Kelvin Award winner in 1996, played a leading role, whether as a member or head of the French delegation, or President, in no less than 130 working groups, subcommittees and technical committees. In particular, his name will always be associated with the plethora of electrical accessories – cables, conductors, plugs, devices and so on – that are to be found today in homes, offices, hospitals and public buildings. Dell'ova adds, “Among these devices, his major and well known contribution was made in the field of residual current devices which play a premium role in protection of people against electric shocks.”

Sandell spent much of his life promoting European and international standardization on a global level. During the course of his travels, he visited 41 different countries and met with countless representatives in numerous locations. A humanist by nature, Sandell mastered French, Russian, English and German.

Forget semantics

Sandell advocated that much more could be achieved by sitting down and talking face to face than by arguing about semantics. Throughout his career, the motto he adopted to put a face on electricity was that of ‘Restoring the human element to the electrotechnical world’.



William Thomson, Lord Kelvin, was a Belfast-born mathematical physicist and engineer. He became the first President of the IEC in 1906

Drilling deeper but safely

Maintaining standards in a difficult environment

Offshore drilling is a particularly dangerous activity in which a harsh environment is combined with hazardous substances and operational equipment that is capable of causing fires or explosion. Safety on offshore installations relies largely on the proper and safe interaction of equipment and human factors. IEC TC (Technical Committee) 18: Electrical installations of ships and of mobile and fixed offshore units, prepares International Standards for the industry.

Equipment failures...

25 March 2012: a gas leak forces the evacuation of the Elgin offshore platform in the North Sea; all on board are evacuated. It may take up to six months to halt the flow of oil and gas from the well and will cost billions of dollars in lost production and clean-up, the operator says.

21 April 2010: an explosion on a semisubmersible offshore platform in the Gulf of Mexico kills 11 and injures 16. Some 5 million barrels of oil are released, costing tens of billions of dollars in compensation and clean-up expenses.

These two disasters, resulting from equipment or installation failures, illustrate the major risks and costs that may be encountered in the operation of offshore rigs. Many other less serious accidents, which do not halt production, cause environmental damage, result in many human deaths or inflict severe injuries, go largely unreported.

Thirst for fossil fuels fuels industry

Offshore crude oil production, which started in the 1940s, has grown 25-fold since the 1960s to become the main source of growth for world oil production. Onshore extraction from mature fields inland has essentially reached a plateau during the last two decades. Natural gas is the world's fastest growing fossil energy



*Deepwater Horizon offshore installation on fire, Gulf of Mexico, April 2010
(Photo: US Coast Guard)*

source; a significant share of production is also being met by offshore installations.

This expansion of the sector drives the construction of offshore units. In 2010, there were 767 rigs, with 59 more projected for 2011, according to the IUMI (International Union of Marine Insurance), the international body of national and marine insurance associations and professionals. Damage claims for losses are growing as a direct result of the surge in the construction of more units to meet the demand for deep-water drilling.



*Offshore platform in the North Sea
(Photo: Statoil)*

When safety is an issue: call in the IEC!

Proper electric installations are absolutely central to the safe operation of offshore units; IEC TC 18 develops International Standards for such installations in collaboration with IMO (International Maritime Organization). The seven standards in the IEC 61892, *Mobile and fixed offshore units - Electrical installations* series are "intended to enable safety in the design, selection, installation, maintenance and use of electrical equipment for the generation, storage, distribution and utilisation of electrical energy for all purposes in offshore units, which are being used for the purpose of exploration or exploitation of petroleum resources". The series "is based on equipment and practices which are in current use, but it is not intended in any way to impede the development of new or improved techniques".

Latest additions raise offshore safety

Two standards in the 61892 series were released in March 2012. The second edition of IEC 61892-2 contains provisions for all aspects of System design for offshore installations. The third edition of

61892-3 deals with Equipment, covering everything from generators and motors to transformers, from switchgear and control gear assemblies to secondary cells and batteries, or from communication and control to underwater systems, to name just a few.

The scopes for both International Standards indicate that they apply “to equipment in all installations, whether permanent, temporary, transportable or hand-held, to a.c. installations up to and including 35 000 V and d.c. installations up to and including 1 500 V (...).” Both also “set requirements for equipment, which are additional to the requirements given

in the product standard for the relevant equipment”.

Updated standards maintain standards

The 7 standards of the 61892 series meet the IMO's MODU Code (Code for the construction and equipment of mobile offshore drilling units) and are currently referenced by only 3 national regulatory bodies, but they are widely used by oil companies and major drilling contractors. The latest addition will ensure the series remains up to date and will contribute to greater safety in the offshore industry, at least in one of its aspects, as it depends on many factors other than electrical safety alone.



Andrew production platform
(Photo: BP p.l.c.)

Safety at sea from shore and space

Additional and improved international standards for maritime safety

Although crews and passengers are safer at sea than ever before as a result of technological progress, their swift rescue in case of accident is still paramount. This means access to immediate, reliable and accurate communication and location information and equipment, a relatively recent possibility thanks to the advent of satellite technology. The IEC prepares standards for all aspects of GMDSS, the global maritime distress and safety system that makes for much more effective and rapid search and rescue interventions at sea.

Always knowing and letting know where you are

For ships, knowing their exact position at all times is essential, and communicating that position can be vital in case of emergency. In the past, in case of serious difficulty, crews had to establish their exact position and communicate it by radio or telegraphy to other ships or shore-based centres in order to call for assistance. It was a system open to breakdown or that might provide incomplete or erroneous information.

The IMO (International Maritime Organization) is the specialized UN (United Nations) agency with responsibility for the safety and security of shipping. Of particular importance to IMO is the International SOLAS (Safety of Life at Sea) Convention, the first version of which was adopted in 1914, as a direct result of the sinking of the Titanic. The disaster represents the best known early example

of a distress signal being sent via wireless telegraphy using Morse code.

Search and rescue on an international scale

In 1979 IMO adopted the International Convention on Maritime Search and Rescue (SAR) so that, no matter where an accident occurred at sea, the rescue of persons in distress would be coordinated



RAF SAR helicopter rescuing injured fisherman in the South Atlantic
(© Crown Copyright/MOD 2010)



Radio and satellite communication aerials on a ship

by a SAR organization and, when necessary, by co-operation between neighbouring SAR organizations. The convention includes recommendations on establishing ship reporting systems for SAR purposes.

Recognizing that satellites would play an important role in SAR operations at sea, IMO established the International Maritime Satellite Organization, known today as Inmarsat, to provide emergency maritime communications. This led to IMO's member states adopting the basic requirements of GMDSS as part of SOLAS, and which is an essential tool for SAR.

In agreement with IMO, which recognized the IEC's expertise in the electrotechnical domain, IEC TC 80: Maritime navigation and radiocommunication equipment and systems, took on the role of producing International Standards for GMDSS.

Multiple standards for an integrated system

GMDSS is an international integrated communications system that uses safety systems based around different communications technologies. It is intended to perform many functions including signalling distress and coordinating SAR operations. It should ensure that no ship in distress can disappear without trace.

Under the GMDSS obligations, all cargo ships over 300 gross registered tonnes



Proton Breeze rocket launching Inmarsat 4-F3 satellite (photo: International Launch Services)

and all passenger vessels on international voyages have been required, since August 1993, to be equipped with satellite EPIRBs (emergency position-indicating radio beacons) and NAVTEX (Navigational Telex) receivers to automatically receive shipping safety information for navigational, SAR and meteorological warnings and urgent information. More equipment has been added since.

In order to cover different areas and ranges, GMDSS relies on MF/HF/VHF (medium/high/very high frequency) radio and on satellite-based communications, the latter via COSPAS/SARSAT, the international satellite-based SAR distress alert detection and information distribution system, and Inmarsat systems.

Inmarsat provides ship-to-shore, ship-to-ship and shore-to-ship voice, data and telex services that require different equipment and terminals.

TC 80 prepares the IEC 61097, *Global maritime distress and safety system (GMDSS)* series of standards for the various components of the system. Eleven standards have been published so far covering all aspects and technologies of GMDSS. One standard concerning NAVTEX equipment was released in January 2012. Two more, dealing with operational and performance requirements for Inmarsat ship earth stations, are at the FDIS (Final Draft International Standard) stage.

Latest standards for Inmarsat services

Satellite communications in all domains are constantly evolving to provide new and better services that then drive the need for new standards and the development of existing ones, as the latest FDIS documents that deal with Inmarsat components show.

The third edition of IEC 61097-4 covers Inmarsat-C SES (ship earth station) and Inmarsat EGC (enhanced group call) equipment. This is able to receive multiple-address messages and is designed for use in GMDSS and LRIT (long-range identification and tracking) applications. The standard lists all non-operational and operational requirements as well as the technical characteristics and methods of testing for both types of equipment.

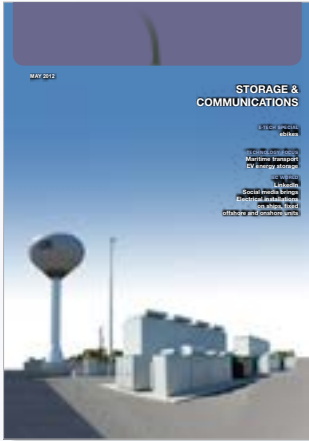
The first edition of IEC 61097-15 details the operational requirements as well as the technical characteristics and methods of testing for Inmarsat FB500 SES. These are stations "capable of transmitting and receiving distress and safety communications, initiating and receiving distress priority calls and transmitting and receiving general radiocommunications, using radiotelephony (voice)" for use in the GMDSS.

These new standards enhance and expand the capabilities of the Inmarsat element of GMDSS.

Evolutionary system requiring constant updating

The 61097 series of standards for GMDSS are based on IMO resolutions defining equipment performance standards for all components of the system. IMO is constantly reviewing these and adding new ones as more requirements are identified, particularly concerning security and piracy and increased interest in shipping traffic in polar regions, with the unique navigational and SAR concerns specific to these areas.

With the constant quest for increased safety and security at sea and as the system evolves to deal with the emergence of new risks, TC 80 is set to have a busy agenda in the future, producing updated and, when needed, new, standards for the GMDSS.



Storage and communications

Storing and electrifying

Issue 04/2012 of *e-tech* will focus on storage and communications.

Storing, connecting and communicating

The demand for electrical energy storage has grown tremendously in the past 10 or 15 years: for mobile electronic devices such as cell phones, tablets and computers; for transportation, with the development of hybrid and electric vehicles.

Electrical energy storage systems will be central to the development of smart grids and microgrids, to provide the most efficient and sustainable electricity services possible. Electrical energy storage is a central element of the functioning of the smart grid, enabling the management of peak demands, the reliability of the grid and the integration of renewable energy sources such as solar and wind power.

IEC advisory and technical committees are essential to these developments. The IEC MSB (Market Strategy Board) recently published a White Paper on electrical energy storage and several IEC TCs prepare International Standards on batteries and other types of energy storage.

In the cloud

Cloud computing has become a hot topic in ICT (information and communication technology). Storing and processing data, accessing information and applications in the cloud, anytime and anywhere, faster and cheaper than through conventional means has proved to be very popular. The IEC, through ISO/IEC JTC (Joint Technical Committee) 1: Information technology, has initiated standardization work in the field of cloud computing





e-tech

News & views from the IEC

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- Managing Editor *e-tech*: Claire Marchand
- Editor in chief: Gabriela Ehrlich

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

3 rue de Varembé
PO Box 131
CH-1211 Geneva 20
Switzerland

T 41 22 919 02 11

Contact: iecetech@iec.ch
For more information visit: www.iec.ch

