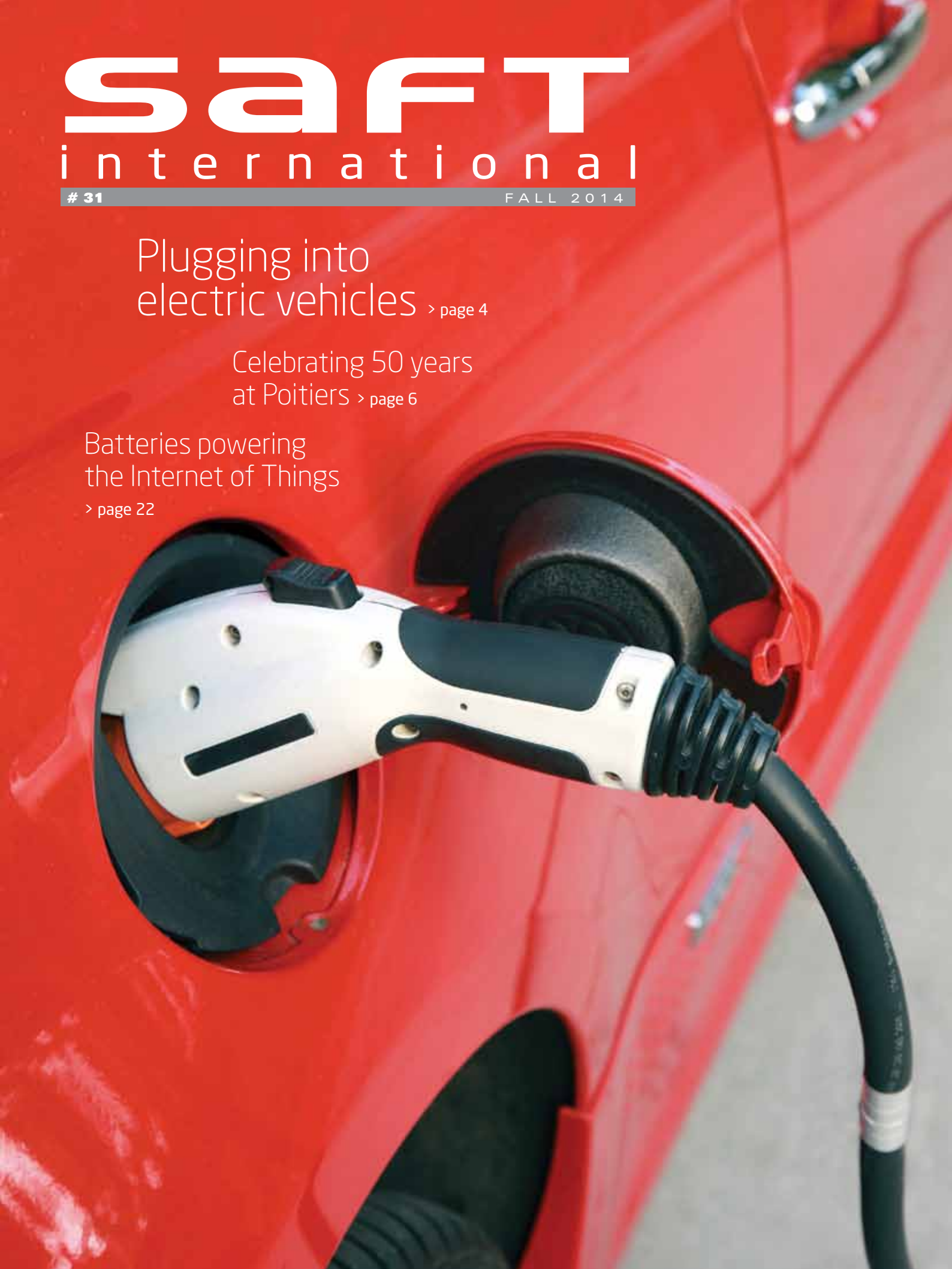
saft international

#31 FALL 2014



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Bruno Dathis
Acting Chairman of the
Management Board
Saft Groupe SA

It is with great sadness that I have to announce to you that John Searle, Chairman of Saft's Management Board since 2002, passed away suddenly on 24rd September. John had a unique vision and extraordinary insight of the advanced battery industry. He transformed the Company into the undisputed leader in its markets, accelerating its international expansion and successfully developing and deploying the lithium-ion technology. Those of you who met John know that his leadership, management style, perception and personality will be sadly missed both inside and outside of Saft.

Thanks to John, our group is uniquely positioned with its proven heritage technologies and its portfolio of advanced technology solutions for industrial markets.

As the year advances Saft has continued its strong progression with growth and successes for all its technologies around the world.

This balance and diversity gives us stability and enables us to benefit from opportunities in a wide range of industries, whether our customers are seeking tried and tested solutions or new products to help advance their own offering.

As you will read in this magazine, Saft Poitiers has just celebrated 50 years of existence, today serving the space and defence markets with ultra-reliable battery systems, and at the same time Saft's primary and rechargeable lithium batteries are being used in new applications in a huge range of interconnected devices with embedded intelligent technology in markets such as smart metering, e-call and intelligent buildings. These exciting technological advances are being more and more referred to as the Internet of Things.

The emerging energy storage market holds huge potential for Saft, and projects are maturing around the world, as operators and generators recognise the value that these systems bring to their operations. Saft is working with many remote and island communities, but also on many projects where the reduction in fuel costs and value of the stored energy in the battery system are being, more and more routinely taken into account as keys indicators of the return on investment of the installation. Advanced battery technologies clearly play a key role in the new generations of communication, transportation, medical, energy and infrastructure industries and Saft already has a leading role in this rapidly-evolving landscape.

IN THIS ISSUE

Erratum: On page 23 of the spring 2014 edition of Saft International, #30, some incorrect information was provided in the article "Driving Domestic Self-Consumption". Caterva is not a subsidiary of Siemens but rather a collaborative working partner.

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Saft drives ahead with electric vehicle projects

Olivier Amiel, Director of Saft's Vehicle Business Unit, explains Saft's strategy for Li-ion electric and hybrid vehicle projects and introduces the Modul'ion module

The twin challenges of global climate change and dwindling fossil fuel reserves are driving the growing demand for electric vehicles (EVs) - including hybrid electric vehicles (HEVs) and plug-in hybrid electric vehicles (PHEVs). Efficient, reliable and cost-effective batteries are integral to the success of EVs. Saft is therefore ideally positioned to become a major player in the EV sector, thanks to our 20 year plus experience in the development and volume delivery of nickel-based and lithium-ion (Li-ion) batteries for fleet and serial programme for major European and US car manufacturers. Furthermore, Saft's involvement in the most demanding motorsports, including Formula 1, has put us at the forefront of high technology Li-ion vehicle batteries. These programme continue to provide a unique platform to develop, test and qualify innovations that we can feed through into commercial projects.

After a thorough market review, we decided to reorient Saft's EV activities, focusing on our key strengths and our key differences to address commercial and industrial vehicle markets. We found that what really sets Saft apart is the scope of our technology – with a variety of Li-ion chemistries available to suit applications ranging from high power to high energy, and our scope of supply that includes cells, modules and complete systems. And perhaps the biggest difference compared with other manufacturers is that, rather than regarding batteries as a commodity, we see complete fully integrated battery systems as a critical high value engineering component, alongside other vital elements such as the engine and transmission.

This philosophy provided the foundation for the creation of our new Vehicle Business Unit. Its focus is the creation of tailored Li-ion solutions, based on our patented SLFP™ iron phosphate technology, for specific applications where electric propulsion can ensure efficient and sustainable operation, helping reduce vehicle running costs throughout a long service life and optimizing Total Cost of Ownership (TCO). Initially, the unit is addressing two main sectors:

On the road for smart cities

There is considerable scope to replace conventional internal combustion engine vehicles operating in busy urban environments with electric powered alternatives that reduce emissions, noise nuisance and fuel consumption, helping cities to reduce their operating costs. Modern buses, delivery trucks and refuse collection vehicles offer sustainable solutions that cut pollution and enhance quality of life for city workers and residents. The trend to electric vehicles is being given added impetus by new legislation that impose fines on vehicles left idling in cities even for short periods or prohibits access to some areas of the city for fossil fuel powered vehicles.

Off-road for quiet and efficient industrial equipment

Li-ion technology has important advantages over conventional batteries when powering electric warehouse forklift trucks and AGVs (Automated Guided Vehicles). These include: opportunity and fast charging, higher energy efficiency, longer cycle life and reduced maintenance. Ultimately, Li-ion batteries can allow fleet operators to reduce downtime and its associated costs while keeping their operations running 24/7.

Even industrial vehicles, such as mining and farm trucks, are now integrating hybrid functions for specific environments where electric motors bring major benefits over hydraulic systems powered by internal combustion engines. Ground Support Equipment (GSE) in airports are showing more and more interest to electrification, while similar solutions are being introduced in seaports, with both these sectors under ever increasing pressure to reduce CO_2 emissions, fuel consumption and noise.

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Modul'ion® – a choice of power or energy

An exciting new product to emerge from the Vehicle Business Unit is the Modul'ion® range that provides the basis for the creation of flexible battery systems to deliver high power, fast charging and high energy density. The modules have synergies with the railways and regenerative braking and are available in 20 V and 40 V in both Medium and High Power versions. The modules incorporate Saft's well proven monitoring and control systems that ensure total safety and reliability.

Fifty years of production at

1964 2014 50 ans SAFT Poitiers

Poitiers staff gave visitors a warm welcome

In May, the staff at Saft's facility in Poitiers celebrated 50 years of battery production at the site. To commemorate the achievement, the site opened its doors to guests from the community, including employees' families, retired workers and local stakeholders and media.

The factory in western France is home to design, development and production of high-tech batteries for the electronics, defence and space industries. Since the first batteries came off the production line in 1964, the factory has become the world's leading manufacturer of lithium batteries for electronics and defence and the top European manufacturer of specialised advanced technology for defence and space, as well as the world's number one producer of Li-ion batteries for commercial satellites.

Since the 1980s, the team at Poitiers has focused its attention on developing and manufacturing lithium batteries for industry. This has secured Saft's leadership in lithium-based cell chemistries, and today up to 100,000 batteries come off its production lines every day.

Customers served by the site's 560-strong team include the biggest names in civil and military aviation, defence and space, including Astrium, BAE, CNES, DCNS, ESA and Thales.

Around 65 of the team are specialist researchers who develop the next generation of the batteries. Saft also works in close collaboration with leading electrochemical and mechanical specialists and leading universities. And while the site is a centre of knowledge on aviation, defence and space, it also diversifies to overcome cyclical markets. This year, batteries for smart meters have been in high demand, with utilities installing around 100 million units worldwide.

Saft works hard to constantly improve its performance at Poitiers and the site is certified to meet environmental and safety standards of ISO 14001 and ISO 18001 as applied to lithium batteries, as well as space and defense products. Through a programme of internships and apprenticeships, Saft ensures that it attracts the brightest and best young engineering talent to maintain its technical leadership in the long term.

Philippe Jehanno, General Manager of the factory in Poitiers said: *"Battery technology and manufacturing have been transformed in the 50 years since Saft opened the facility in Poitiers. By investing in its employees, supply chain, and research and development, and by constantly working to improve production, Saft Poitiers will remain at the forefront of battery technology".*

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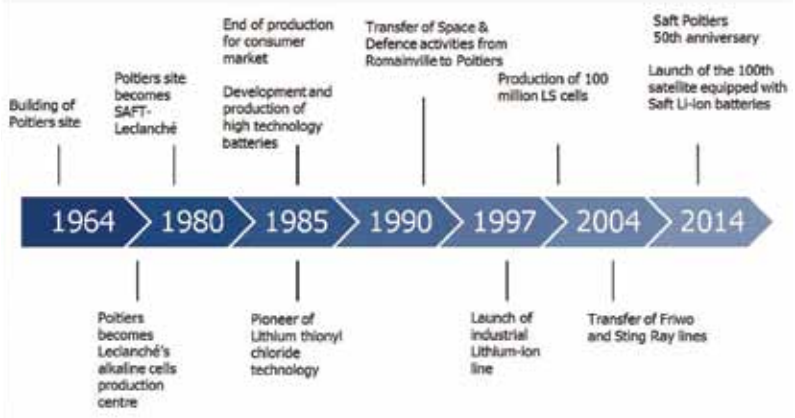
Poitiers: from consumer market to high-tech

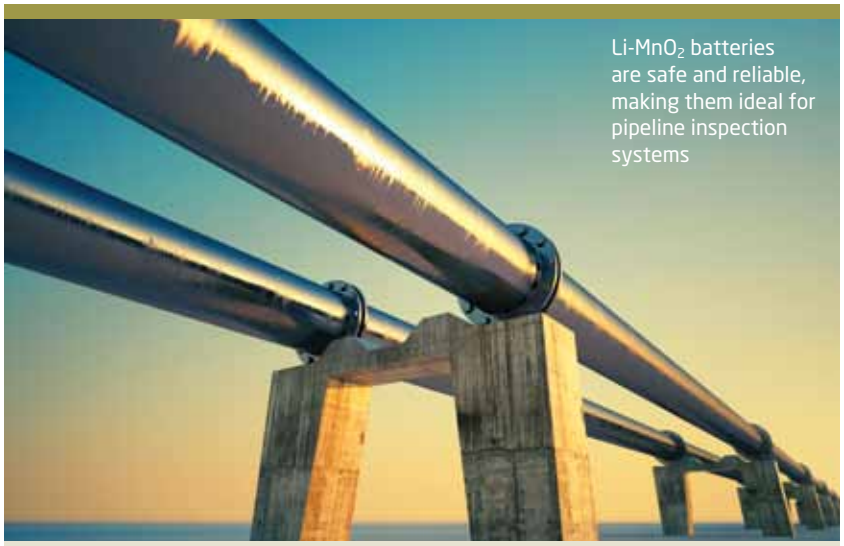


Poitiers

1964
the year Saft Poitiers started production

10
apprentices start their careers at Poitiers every year

100,000
batteries can be manufactured each day in Poitiers



Li-MnO_2 batteries are safe and reliable, making them ideal for pipeline inspection systems

Friwo to rebrand as Saft

Primary batteries produced by Saft's German subsidiary Friemann & Wolf are to be brought into the Saft brand.

The rebranding exercise will bring the lithium-manganese oxide (Li-MnO_2) technology into Saft's core product offering, as well as giving the product wider visibility with customers worldwide. The move will also improve awareness of Saft in Germany and will avoid any confusion with a manufacturer of power supplies that also uses the name 'Friwo'.

Until now, Li-MnO_2 batteries made by Saft's German subsidiary Friemann & Wolf have been sold under the Friwo brand, which started life in 1884 when the firm's founders manufactured safety lighting for miners. Since then, Friwo evolved into a manufacturer of inherently safe batteries for applications where high energy and reliability are required and limited space is available.

Saft's Li-MnO_2 chemistry inherited from Friwo's long experience combines high energy, high power with stable voltage under repeated pulses, and offers a low self-discharge compatible with 20-year applications. It is inherently safe and reliable even after long storage and in harsh environmental conditions. These attributes make the batteries ideal for civil and military applications such as smart meters, emergency transmitters, pipeline inspection devices, communication devices, in potentially explosive environments, and for manned space flight.

Nicolas Paquin, Marketing Manager said: *"By integrating Friwo products into the Saft brand, our customers will gain clarity and confidence in our products overall and Saft will gain the legacy and history of the Friwo name."*

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20 years
the operating life of a typical Li-MnO_2 cell

- 40°C to + 70°C
operating temperature range of Li-MnO_2

First on-board Li-ion for rail

At the Innotrans exhibition and conference in September 2014 in Berlin, Saft launched a new Li-ion battery system for the rail market.

The on-board Li-ion technology will enable rail operators to capture and store rolling stock braking energy and reuse it for traction.

Based on a concept first introduced at Innotrans 2012, the system has the potential to save operators up to 30 percent of their energy costs and significantly reduce emissions.

Modules are scalable to meet the requirements of trams, streetcars and tram-trains, electric multiple units (EMUs), diesel locomotives and automated people movers (APMs). They offer high power and energy density, as well as maximum system availability. They can be supplied in battery boxes that are tested for resistance to shock and vibration and provide the interface with the vehicle systems.

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Czech website launched

Saft's subsidiary in the Czech Republic has just launched its website in four languages (Czech, Polish, Russian and English) to reach out to customers across Eastern Europe. Saft Ferak supplies Saft's full range of battery technologies as well as its own range of nickel-based batteries.

It is particularly strong in the rail sector in Eastern Europe and by launching its website in the four languages, it will help Saft communicate with customers in the region.

Ferak's manufacturing facility has a legacy of more than 50 years experience in the design, development, manufacture and support of pocket plate cells and batteries that complement Saft's own range.

Visit the new website at saft-ferak.cz.

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20 years
the life of VES batteries in orbit

1966
Saft's first space battery launched into orbit

5 kg
the mass of fuel used by ion thrusters annually

First fully-electric propulsion satellite

In a major milestone for Saft, Boeing has taken delivery of two flight battery systems that will be used on the first commercial fully-electric propulsion satellite.

Conventional satellites use liquid fuelled thrusters as well as lightweight electrically-powered ion thrusters to manoeuvre satellites. In Boeing's new 702SP (small platform), only ion thrusters will be used. This will eliminate a significant mass from the 702SP and means that two satellites can be launched on a single rocket, delivering cost savings for up to 20 percent for satellite operators.

While the satellites will be powered by solar panels under normal operation, Saft's space certified VES battery systems will ensure continued operation during periods of solar eclipse. VES batteries are reliable over a long life and can withstand the extreme environmental conditions of space.

Boeing is on track to deliver the 702SP satellites to ABS and Eutelsat Americas, ready for launch in 2015.

Craig Cooning, president of Boeing Network & Space Systems, said: *"We will be first to launch a commercial all-electric satellite, providing customers new flexibility and next-generation technology for increased performance. The all-electric propulsion design gives customers more affordable launch options and the ability to nearly double payload capacity."*

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Ultra Low Maintenance for

Two models of business jets built by Gulfstream Aerospace will feature Saft's Ultra Low Maintenance (ULM) batteries under two multi-year, multi-million-dollar supply contracts signed in late 2013.

batteries will feature on the Gulfstream G650® and Gulfstream G550®, which are two jets produced by Gulfstream Aerospace Corporation, which designs, develops, manufactures, markets, services and supports the world's most technologically advanced business-jet aircraft.

The G650® is an ultra-high-speed, ultra-long-range business jet with a range of 7,000 nautical miles and a top speed of Mach 0.925 (611 miles per hour) and the G550® is a large-cabin, ultra-long-range business jet that can carry up to 18 passengers over 6,750 nautical miles.

In service, the ULM® batteries will supply power for the APU (Auxiliary Power Unit) starting, emergency power, avionics and back-up for flight controls.

Originally introduced for the Gulfstream GV®, the ULM® battery reduces operating costs by significantly increasing the time between maintenance. The ULM® battery has a low Total Cost of Ownership (TCO) thanks to its reduced maintenance and extended life duration. It has a lightweight construction and meets more than 100 flight qualification criteria. Since the GV® and G650® were introduced in 1998 and 2012 respectively, Saft has been the exclusive supplier of the main batteries for the aircraft.

Gulfstream

Continued support to the Golden Eagle

60 ULM® batteries are currently in production for a variety of aircraft

611 mph the top speed of the Gulfstream G650®

75% of the ULM®'s components can be recycled

Saft has received an order from Korea Aerospace Industries (KAI) for the continuing supply of aircraft batteries for KAI's T-50 and A-50 aircraft. Known as the Golden Eagle, the jet aircraft are flown by the Republic of Korea Air Force as well as the military forces of Indonesia, Iraq and the Philippines.

Under the contract, Saft is continuing to supply its Aviation Maintenance-Free Batteries (AMFB®) throughout 2014.

Bruce McRae, Saft Aviation Sales & Marketing Director for North America, said: *"We look forward to continuing our relationship with KAI and advancing battery and cell technology for defence aircraft."*

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"Through this announcement, Saft will continue to supply reliable technology for a valued customer, Gulfstream Aviation," said Bruce McRae, Saft Aviation Sales & Marketing Director for North America. ***"This contract demonstrates Saft's experience and expertise in batteries for aviation and allows Saft to expand into a new class of business aircraft. The trust in Saft's ULM® technology is based on a foundation of proven industry success that began in 1995 with Gulfstream."***

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Building blocks for service

Saft has always been known for the quality of its products and technology.

Jean-Philippe Limal, Saft's Services Business Director.

And a new approach will complement these with quality and timely service of battery systems. The ultimate ambition is that Saft's customers will be offered training, installation, maintenance, fleet management, e-supervision and more under a 'Service' umbrella.

By the end of 2014, four Service Units will be in place and responsible for delivering services in Western Europe, Northern Europe, North America and India. The capabilities and processes that will form the foundation of a standard service offer are under development.

"Saft recognizes that its customers are calling for more local support and expertise and this has prompted us to change our approach. We are now putting in place the building blocks that pave the way for us to deliver services consistently worldwide across multiple markets and battery technologies," said Jean-Philippe Limal, Saft's Services Business Director.

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e-supervision in the marine market

A new e-supervision service is helping customers monitor their batteries' performance in real time over the web. Available to any battery that has electronic management, customers in energy storage, telecoms, rail, marine, motive power and other sectors can use e-supervision to monitor batteries anywhere in the world and anticipate faulty situations and down times.

Saft is currently delivering e-supervision systems for Li-ion and nickel-metal hydride batteries for customers in the marine, railways and energy storage sectors. Data collectors integrated into Saft's batteries relay their performance back to Saft and the data is presented in an appealing format that lets operators see performance at a glance, as well as drill down to review patterns over time and even the battery's physical location.

End-to-end long-term service contract for energy storage

Saft's field service expertise can help operators ensure long-term economic operation of energy storage systems. The end-to-end service covers all aspects from installation, commissioning and training of local operatives, through a lifetime of preventive and corrective maintenance to refurbishment and recycling.

One example is the 10 MW energy storage system connected to a Photovoltaic farm that Saft delivered in Puerto Rico for the Spanish power electronic company GP Tech, expert in renewable energy plant integration and grid management.

In addition to installation of the system in summer 2014, Saft will deliver the preventive and corrective maintenance under an extended 10- year warranty package.

One key element is a fast response time, with a 24-hour emergency response capability. After year 10, when the battery capability is nearing the minimum requirement, GP Tech can call Saft in to refurbish the system as a whole, replacing ageing cells as well as other system components.

Nehat Doko, Saft's Service Manager, conducts a battery training session on installation, commissioning and maintenance in Jakarta, Indonesia.

Training customers on stationary batteries

Saft's training programmes not only help its customers maximize battery life but also extend its geographical reach so that customers across the world can call on a Saft-certified technician quickly.

One-day, two-day and five-day training sessions include a mix of classroom and hands-on training with evaluation at the end. Saft professional trainers deliver the workshops in a number of languages and courses can include attendees from multiple companies or be tailored to a single customer.

In 2013, Saft trained 550+ technicians and engineer students across the world.

As Saft International goes to print, Saft's office in Singapore is finalising the arrangements to train 14 individuals from seven industrial customers at a course to be hosted in Kuala Lumpur in mid- September 2014.

Rail mid-life refurbishment

Proactive maintenance in the rail industry also pays dividends by helping train operators make the most of their assets. Saft with its partner Emerson is currently delivering the planned overhaul of batteries from 29 electric passenger trains for Hitachi Rail Europe Ltd in the UK, each of which has three batteries.

In service, the batteries provide the power for traction and auxiliary systems in neutral sections on the electrified rail service as well as back up power.

A vital element of the refurbishment service is to ensure that the batteries are returned within a three-week window to minimize each train's time off duty. Refurbishment includes inspection, cleaning and testing of the batteries' capacity. Saft can also provide technical training on installation and maintenance.

Refurbishing on-board batteries ensures their performance

Introducing Seanergy® marine

Saft used its presence at Electric & Hybrid Marine World Expo in Amsterdam in June to launch its new Seanergy® modules for clean propulsion in the civil marine sector.

Based on the Li-ion technology Super-Iron Phosphate (SLFP) chemistry, the new modules offer proven safety, performance and reliability in a fully integrated solution for civil marine installations.

Seanergy® is designed to suit a range of fully-electric and hybrid electric applications, where batteries will work in conjunction with diesel generators or gas turbines and electric motors. Modules for Energy and Power offer flexibility and adaptability to create highly efficient, cost-effective battery systems for work boats, ferries, offshore support vessels, cruise-liners and cargo ships. Using modules, Saft can build up a system to suit any vessel, supplying up to 1,000 V and as much storage as required.

In developing the Seanergy® modules, Saft has called on over 20 years of experience in delivering Li-ion solutions in the exacting space and satellite sector. Because it is an 'end to end' manufacturer of cells, modules and systems, Saft can deliver total quality control of all aspects of its marine battery solutions.

modules

- **30%**
  target reduction in emissions from ships
- **6 hours**
  daily all-electric operation of hybrid ferries in Bordeaux
- **1,000 V**
  peak voltage of the Seanergy® range

Didier Jouffroy, Saft's Marine Products and Applications Manager, shares his view on using Li-ion batteries for new-generation marine propulsion systems.

Clean marine energy

Environmental considerations are at the top of the shipping industry's agenda just now. New targets brought in under the United Nations International Maritime Organisation's MARPOL regulations this January aim to cut greenhouse gas emissions from ships by 30% by 2025.

Of the battery technologies available, Li-ion holds particular promise. Already established in other sectors, it delivers high performance, long calendar and cycle life, zero maintenance and a low total cost of ownership. Plus, Li-ion's advantages of being lightweight, compact and scalable are highly attractive to naval architects.

On workboats, battery power has potential to boost available power when needed, for example during tug operations. Passenger vessels can benefit from quiet operation. Both benefit from savings on fuel and emissions.

When sizing a battery system for the marine market, Saft's engineers take account of the operational modes of the vessel and their duration as well as power requirements for propulsion and hotel loads. And by building up a battery system by adding standard sized modules, Saft can create a system with the voltage and energy storage to suit any vessel.

Saft has already supplied battery systems for all-electric passenger ferryboats in Stockholm and Paris and for a pair of hybrid diesel-electric shuttle boats in the city of Bordeaux.

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Boost for off-grid solar PV

Solar photovoltaic (PV) installations are benefitting from major technical improvements to the nickel-based Sunica.plus battery. Improved charging efficiency, higher cycling capability, extended maintenance interval and an increased capacity range all mean that the Sunica.plus technology is better able to serve PV installations in rugged and remote locations.

- **Up to 10,000 cycles** at 15 percent depth of discharge
- **6 years** – maintenance interval for topping-up (at 1.50V)
- **95%** charging efficiency
- **36 capacity steps** from 50Ah to 1,830 Ah

Predictable offshore performance

Sunica.plus batteries are powering the solar energy systems of an unmanned oil production platform 60 miles off the coast of Myanmar in the Andaman Sea, which is in the north east of the Indian Ocean.

The nickel based Sunica.plus can operate in temperatures that fluctuate widely from -20 °C to +50 °C. Because they are able to withstand fluctuating charging conditions and require minimal maintenance, they are popular with operators in the oil and gas sector both onshore and offshore, as well as transport, utilities and telecommunications operators.

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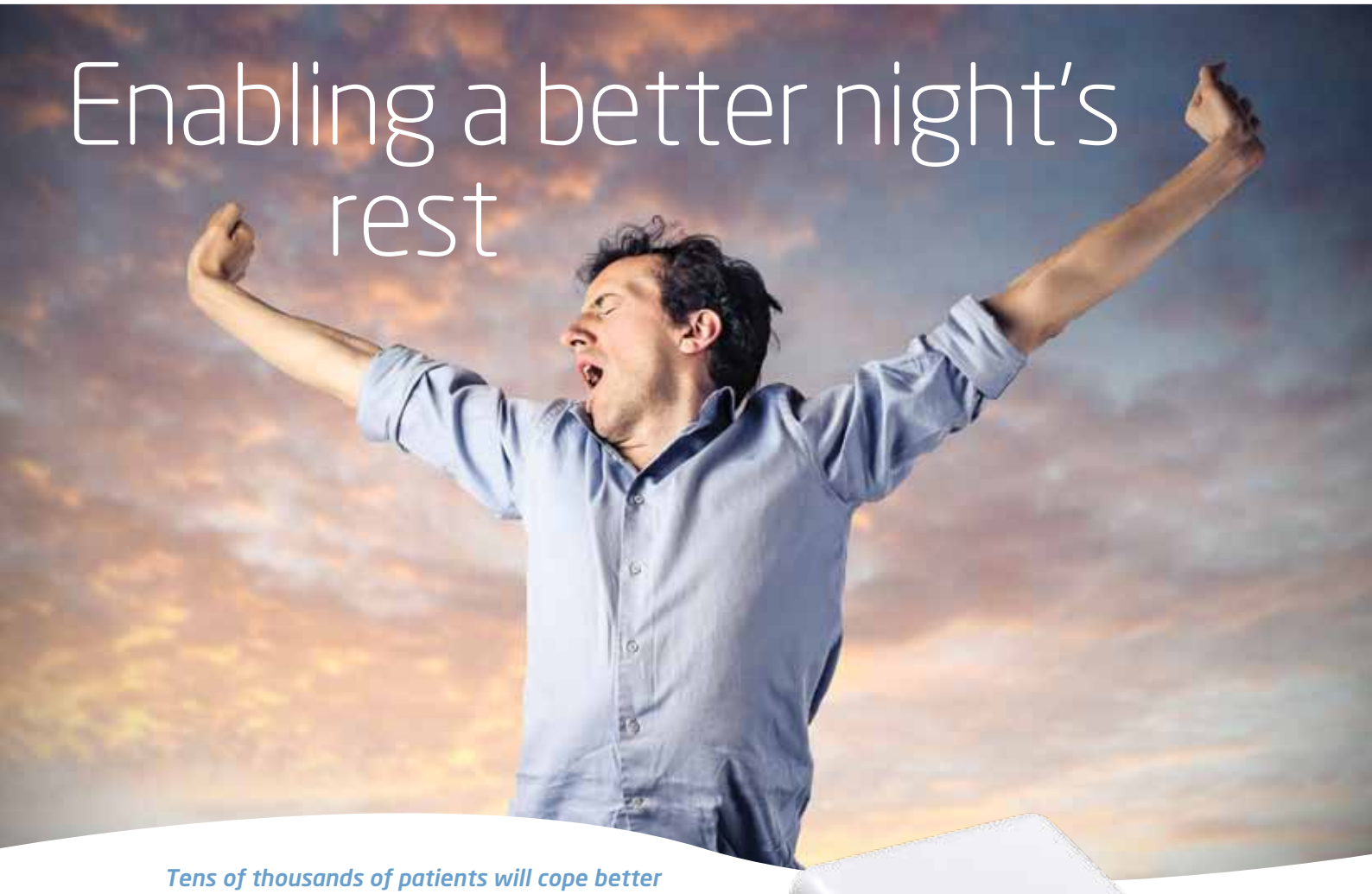
Enabling a better night's rest



Tens of thousands of patients will cope better with the effects of a chronic respiratory disease thanks to a telemedicine device that is powered by Saft's primary lithium batteries.

The batteries provide three years of autonomous power for SRETT's T4P device, which enables remote monitoring of patients suffering from sleep apnea.

The T4P can be fitted universally to any CPAP (continuous positive airway pressure) device, which keeps patients' airways open during sleep using pressurized air. Using GPRS communication, the T4P automatically uploads patient data so that healthcare professionals can monitor performance and take action if necessary. Monitoring of patients improves their adoption of CPAP devices, leading to a better quality of life and reducing the likelihood of drowsiness during the day and of developing cardiovascular complications.

Saft's high power LSH batteries were selected for the T4P units because of their reliability, long life, low self-discharge and ability to supply power in pulses for GPRS communication. Tens of thousands of units will be fitted with the D-sized batteries over the next three years.

The LSH's lithium-thionyl chloride (Li-SOCl2) chemistry is suited to applications like telemedicine, where currents as low as 0.1 A provide power for monitoring and pulses as high as 4 A enable telemetry.

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Batteries power the T4P for three years

- **3-7%**

of middle aged men are affected by sleep apnea

- **3% maximum**

self-discharge per year

Island life

Saft is delivering its lithium-ion Intensium® Max energy storage systems to operators on a number of islands. The stark contrasts between the islands in question and their energy resources highlights how Saft's energy storage systems (ESSs) can serve the needs of islanders worldwide.

Kauai

Saft is supplying an ESS for a new 12 MW solar energy park on the Hawaiian island of Kauai, which is home to 65,000 and is a popular tourist destination as well as having a strong agricultural industry.

The Kauai Island Utility Co-operative (KIUC) is installing the new facility as part of its work to diversify its energy portfolio. It has ordered a battery system from Saft to store up to 4.63 MWh and provide 6 MW power to provide stability and overcome fluctuations in supply.

The BESS will be delivered in eight of Saft's Intensium Max 20 M containers as well as two containers housing an ABB 6 MW PCS (Power Converter System). It will be Saft's third lithium-ion BESS in the US state of Hawaii, the first two having been successfully operating for two years.

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78 MW

Kauai's all-time peak demand

Faroe Islands

Half a world away, Saft is also bringing energy storage to the Faroe Islands under a project to deliver Europe's first commercial deployment of a Li-ion energy storage system in combination with a wind farm.

The 2.2 MW, 720 kWh battery system will enhance grid stability and enable the Faroe Islands' energy company SEV to capture the full potential of the new 12 MW Húsahagi wind farm.

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Located half way between Norway and Iceland, the islands are an autonomous country within the Kingdom of Denmark and aims to increase its share of renewable generation to 75 percent by 2020. The country's abundant wind and hydro energy resources will help it overcome its dependence on oil.

75%

The Faroe Island's renewable energy goal

70%
self-consumption of solar energy achieved

13.2 kWh
energy can be stored

1 hour
of sunshine will charge the batteries

Fifteen year guarantee

Saft has launched the world's first long-term warranty option for domestic Li-ion energy storage modules. The optional 15-year warranty is available on Synerion® Storage Systems when integrated into Bosch's BPT-S 5 Hybrid intelligent energy management and storage solution.

The Bosch BPT-S Hybrid was launched in 2012 to improve the self-reliance of homes with solar photovoltaic panels. It integrates Saft's Synerion® battery and battery management module with an inverter in a single self-contained unit that monitors energy demand and generation.

Extended warranty gives assurance to homeowners

Solar panels will charge the batteries during the peak hours of sunshine. Using the principle of load levelling, homeowners can then draw on the energy generated throughout the day. By installing the system, homeowners will reduce energy demand from the grid and keep energy bills to a minimum, as well as support the environment by using the renewable energy they have generated locally.

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First megawatt-scale project for EDF

Alstom and Saft have joined forces in a consortium to develop a megawatt-scale Li-ion energy storage demonstrator for EDF (Electricité de France). The system will be installed in late 2014 on EDF's experimental "Concept Grid" at Les Renardières, south of Paris.

The system will be made up of Alstom's MaxSine™ eStorage solution connected to Saft's Intensium® Max 20M energy storage system.

It will have the goal of regulating the frequency of the grid and supporting grid stability. Normally, grid operators call on reserve power from power plants to regulate frequency but battery storage systems can allow operators to release or store energy within a few hundred milliseconds, thus controlling the frequency of the network.

"The battery energy storage system is part of the 'Nouvelle France Industrielle' project, a scheme launched by the French government in 2013," says Patrick Plas, Senior Vice-President, Smart Grid & HVDC at Alstom Grid.

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Heavyweight torpedo propulsion

An order for a seawater activated battery technology unique to Saft has reinforced the long-term collaboration between Saft and DCNS, the world leader in naval defence and energy. In June 2014, DCNS awarded Saft a multi-million Euro contract to supply the electrochemical stacks that will power heavyweight F21 torpedoes.

12
years storage life

Zero
maintenance requirements

90 km/hour
top speed of a heavyweight torpedo

The electrochemical stack based on silver oxide-aluminium (AgO-Al) technology will be installed in the F21, which is the most advanced torpedo on the market and which has range greater than 50 km and a top speed in excess of 90 km/h.

The stacks will deliver the high power essential to achieve a high maximum speed over an extended range and propel the 1.6 ton, 6 m long and 0.53 m diameter torpedo at different depths without any degradation. The stack will also power the onboard electronic control and guidance systems.

AgO-Al cell chemistry is a primary battery chemistry that is only activated when it comes into contact with seawater. This means that it is fully safe for long-term storage in submarines.

Under a separate contract, Saft also supplies rechargeable Li-ion batteries to DCNS to power unarmed exercise torpedoes. Unlike the single-use AgO-Al batteries, the Li-ion batteries can be recharged, delivering cost-effective power for training exercises.

'This latest contract to supply electrochemical stacks for the F21 torpedo is further consolidation of Saft's near-30-year relationship with DCNS and cements Saft as the world leader in electric propulsion batteries for heavyweight and lightweight torpedoes" said Serge Fouilhaux, Director of Saft's Space & Defence Specialty Battery Group.

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Batteries powering the Internet of Things

Wayne Pitt, Saft's Business Development Manager for lithium batteries, shares his views on the types of battery best suited to the Internet of Things.

The Internet of Things (IoT) is a hot topic right now. Its promise is that a multitude of interconnected devices will be equipped with embedded sensors and intelligent decision-making – for example, storage tanks that create an alert when they need filling, household appliances that manage themselves, agricultural fields that manage their own water resources and bridges that monitor their own structural integrity.

Powering IoT devices

To qualify for the "industrial" IoT, a device must have its own IP address and will most likely take the form of a remote sensor, made up of a single or multiple sensor types, energy management, microprocessor and a transmitter. There is scope for many millions of such devices to be embedded into their surroundings, feeding performance data back to central databases for monitoring.

Other devices acting as base stations or gateways will receive and relay data from these sensors and their more frequent transmissions will consume more energy.

A typical sensor will draw up to a few tens of microamps under normal operation, pulsing to 100 milliamps or so to transmit a handful of bytes of data. With sensors being located in hard to reach and often inhospitable locations, batteries will play an important role in providing power and it's important to select a battery that will deliver a long and reliable life.

Reliable power for 10+ years

A rule of thumb is that if a device will use more energy than can be supplied from two D-sized primary batteries over a life of ten years, then a rechargeable battery, charged from a harvested energy source is likely a more practical choice. At Saft, we have set this threshold at 90 – 120 Wh (Watt-hours), which is the energy stored in two of our LSH 20 or LS 33600 batteries.

The ideal primary battery for an IoT sensor has a long life, requires no maintenance, has an extremely low rate of self-discharge and delivers power reliably throughout its life. In

LS and LSH batteries are well-proven in sensing and telemetry applications

30+ years
the track record of Li-SOCl$_2$ batteries

-30 to +85°C
the operating range of Saft's NMC cells

10+ years
the average expected life of a sensor device

addition, because many devices will be located in harsh environments, cells should perform reliably in extreme environmental conditions.

Saft's LS and LSH batteries are already well-proven in remote sensors, smart metering and telemetry applications and are based on lithium-thionyl-chloride (Li-SOCl2) cell chemistry. Saft already supplies thousands of the primary batteries to leading OEMs in applications that are precursors to the internet of things.

High cycle life in tough conditions

Rechargeable batteries will also have a role and Li-ion batteries offer high cycling life and reliability in extreme temperatures. There are several families of Li-ion cell chemistry, which can be better suited to particular applications than others. Of these, nickel manganese cobalt (NMC) is particularly interesting because of its reliability and performance over temperatures between – 30°C and + 85°C. This means it can provide reliable power for devices installed anywhere from an arctic blizzard to a pipeline running through a desert or integrated into equipment in an engine room.

And while some Li-ion technologies suffer degradation if left on float charge (for example, consumer device batteries may degrade if left to charge continuously or for long periods), Saft NMC does not. This means it can be paired with a solar panel or other energy harvesting device and be left to charge day after day without undue loss of performance.

Field-tested technology

While IoT devices are not yet commonplace, battery technologies are already mature and available to power them effectively and reliably, thanks to Saft's extensive field experience in applications such as wireless sensor networks, machine-to-machine applications and smart metering.

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2014 - 2015 events

Saft will be exhibiting at a wide range of exhibitions, conferences and trade shows. Here are just a few of the events where you can meet and discuss with our experts in the coming months.

1 APTA Expo
13-15 October; Houston,TX, USA

2 NBAA
21-23 October; Orlando, FL, USA

3 European Utility Week
November 4-6,
Amsterdam, the Netherlands

4 Electronica
November 11-14
Munich, Germany

5 Medica
November 12-14,
Dusseldorf, Germany

6 Airshow China
November 11-16; Zhuhai, China

7 International Workboat Show, December 3-5
New Orleans, LA, USA

8 Distributech,
February 3-5; San Diego, FL, USA

9 GSMA
March 2-5; Barcelona, Spain

10 Middle East Electricity
March 2-4; Dubai, UAE

11 Hannover Messe
April 13-17; Hannover, Germany

12 Railtex
May 12-15; Birmingham, UK

13 Intersolar
June 10-12; Munich, Germany

14 Paris Air Show
June 15-21; Paris, France

15 DSEI
September 15-18; London, UK

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