28 SPRING/SUMMER 2012

Saft international

PAGE 4

SAFT NEWS
Li-ion factory up and running in Jacksonville

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In 2011 the recovery which began in 2010 continued and Saft registered strong sales growth of 7.1% at constant exchange rates, with an excellent performance in some of our markets such as stationary back-up power batteries and primary lithium for the electronics markets.

The year was punctuated by two key challenges. Firstly the launch of our Jacksonville, Florida, lithium-ion facility which is our most sophisticated and automated factory and also the biggest investment Saft has ever made. We began delivering products from the first line at the end of 2011 and the second line will be operational by the end of this year with further capacity coming on stream in 2013.

We needed this extra capacity for lithium-ion, as more and more customers are interested in the weight, space and cycle life benefits that this new generation of technology brings and we are seeing ever more applications emerging which require products from our Jacksonville plant.

For 2012 and for the foreseeable future Saft's positive evolution will continue. We benefit from established businesses which should show steady growth but additionally the advantages of a growing lithium-ion offer which should accelerate sales growth for the future. R&D spending continues to increase and we keep reinforcing our system integration skills, particularly for the new projects in energy storage systems, telecom, motive power and others.

Our manufacturing footprint is reinforced with the extra capacity in Jacksonville and Saft is very well-positioned to serve the markets of the future.

John Searle
Chairman of the Management Board
Saft Groupe SA

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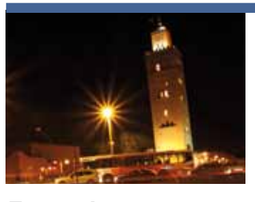

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Saft Corporate Communication, 12 rue Sadi Carnot, F-93170 Bagnolet. Ph: +33 (0)1 4993 1707. e-mail: jill.ledger@saftbatteries.com

First deliveries from Saft's U.S. "factory of the future" in Jacksonville

Just a few months after inaugurating its new high-tech Li-ion battery plant in Jacksonville, Florida, Saft is now ramping up production towards a potential $300 million in annual sales.

"Everything is running smoothly. The cells are rolling off the production lines and battery systems are being shipped worldwide," says Jacksonville Program Manager, Peter Denoncourt. "This confirms the sound foundations we have put in place: both the advanced production technology we have deployed and the top people we have brought in to run it."

In February, the Jacksonville team passed a big milestone: delivery of their first Intensium 20 container, to a customer in Philadelphia. "This container was 100% manufactured at this factory – cells, modules and container assembly," says Peter Denoncourt. "We are very proud to have accomplished this so soon after starting production." Five additional containers are currently in production for customers in California and Hawaii.

This high-volume, state-of-the-art factory is dedicated to building advanced Li-ion cells and batteries for energy storage, smart-grid support, broadband back-up power, transportation and defence applications.

The 235,000 sq.ft (23,500 m^2) plant is a unique example of technical innovation, using the latest laser-welding techniques, deploying totally flexible production lines capable of building multiple battery systems, and producing 1MW of solar power from the largest rooftop photovoltaic system in Florida. Saft has also set up a battery systems development unit (SDU) on the premises to develop local products.

The Jacksonville plant, Saft's 16th production facility worldwide and the world's most advanced automated Li-ion battery facility, was officially inaugurated on 16 September 2011 in the presence of local, state and Federal elected representatives. Saft's investment benefited from City, State and Federal financial incentives, including a $95-million grant from the U.S. Department of Energy under the American Recovery and Reinvestment Act.

Meeting growth in demand

The first line in the factory was operating at start-up, with a capacity of 620,000 cells per year. The plan is to start up a second line in the second half of 2012 and a third a year later. This will ramp up production to about 2.3 million cells per year, in several sizes including cylindrical and prismatic cell formats. By the end of 2013, Jacksonville will have 3 fully-automated cell production lines with a production capacity of 372 MWh per year.

"This will allow us to meet future demand from growing markets, particularly for broadband telecoms and renewable-energy applications that often need substantial amounts of energy storage," says Jacksonville Program Manager, Peter Denoncourt. The 3 lines for start-up will take up about half the available space, leaving room to set up 3 more lines once demand justifies it. The plant will employ around 300 people when fully invested.

Saft inaugurated its new factory in September 2011

Top priority: quality

The Jacksonville factory has a very high degree of automation, through cell assembly and beyond. From winding the jellyrolls and sealing them until after formation and OCV testing there is no human contact with the cells. From the winder, the jellyrolls are processed into completed cells, filled with electrolyte and then automatically transported to the formation building. The job of the operators is to monitor the process and keep the machines supplied with parts and materials.

"As we are producing high-tech products in high volume, Quality Control has been top priority right from the design stage", says Peter Denoncourt, who was also project manager for the plant's construction. "We insisted on Quality Plans from both the building contractor and our equipment suppliers. Now that production has begun, all workspaces have to comply with very stringent cleanliness standards so that Saft can guarantee customers a low self-discharge rate. Also, as lithium reacts strongly to moisture and this could have a strong negative impact on battery quality, therefore our Li-ion cells are manufactured in a carefully-controlled 'dry environment'.

Manufacturing and sustainable development

Saft's Jacksonville plant was designed to comply with the Leadership in Energy and Environmental Design (LEED) programme, and the plant was awarded Silver certification in February 2012 in recognition of the many sustainability and energy-conserving features of the building and landscape design. LEED features include: design elements to reduce the plant's carbon footprint; capture of rainwater for use in toilets and irrigation; native species in landscaping to reduce maintenance; motion-sensor light cut-off in offices; high-efficiency fluorescent lighting; and solar PV panels on the roof to help meet power demand. Of course the PV array will have energy-storage batteries manufactured on the site, and there are not many factories that do that! As in all Saft plants, raw materials are recycled wherever possible so as to reduce waste, and careful attention is being paid to controlling emissions and discharge.

Jacksonville delivers its first Intensium Max container

peter.denoncourt@saftbatteries.com

World's largest commercial constellation to be satellite powered by Li-ion

Saft Li-ion battery systems will be aboard the Iridium NEXT communications satellite constellation to be built by Thales Alenia Space and planned for launch starting in 2015.

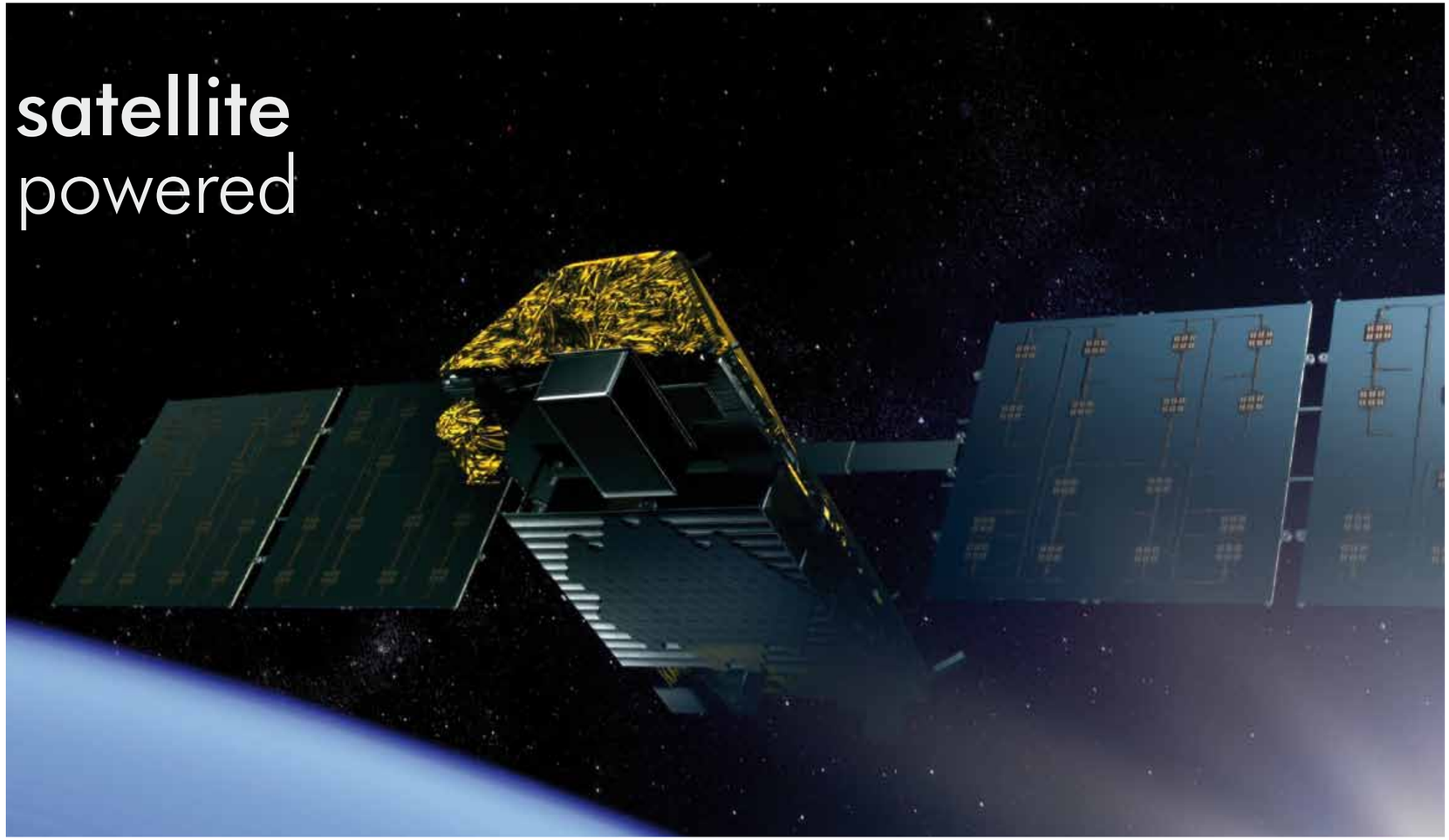
Saft has been awarded a multi-million-euro contract to supply 81 flight batteries for the Iridium NEXT low-Earth orbit (LEO) satellite constellation, the world's largest. This major contract further consolidates Saft's position as the world's leading supplier of advanced batteries for spaceflight applications.

Thales Alenia Space is the European leader in satellite systems and a major player in orbital infrastructures, supplying solutions for telecommunications, radar and optical Earth observation, defence and security, navigation and science.

81 satellites for 100% coverage

Iridium NEXT will maintain the same architecture as the current Iridium constellation, with cross-linked satellites covering 100% of the globe. However, it will enhance and extend Iridium mobile communications services by delivering higher data speeds, enabling powerful new services and devices, offering the advantages of IP technology, and providing backward compatibility with current handsets, data devices and applications.

"This is a very big contract for us and we couldn't afford to take any risks when selecting solutions and choosing suppliers," said Thales Alenia Space Purchasing Manager Julien Mourey. "We had to be sure our supplier could deliver 81 top-quality flight batteries in the short time frame specified by our American customer. We shopped around – we have several battery suppliers and it's a very competitive market – and Saft was ahead in terms of technical expertise and cost as well. In addition, Saft was the only candidate able to handle the whole chain from cell manufacture to battery systems, including electronics, at the same site. That way we're more confident about quality. Saft's space experience was the clincher: they worked with us on our Spacebus GEO and Proteus LEO satellites. Saft recently delivered the 50th battery for our Spacebus platform and we have full confidence in them."



Switching from Ni-H_2 to Li-ion

Thales Alenia Space needed a battery combining high performance with low weight and reduced volume.

"The current Iridium constellation of satellites is powered by Ni-H_2 batteries but we decided to switch to Li-ion for its energy/mass advantage. That was a key factor with Iridium NEXT," explained Power Sub-Systems Manager Vincent Michoud. "We also needed a battery with specific electric performance — there will be very strong power modulations at the bus that can have an affect on battery performance."

david.masgrangeas@saftbatteries.com

SPACE QUALIFIED BATTERY SYSTEMS

The Iridium NEXT battery system will comprise four modules based on Saft's MPS space-qualified prismatic format Li-ion cells developed to offer the ideal combination of robust construction, lightweight design, high performance and long service life for LEO satellite applications.

Offshore buoys and lighthouses around Scotland and the Isle of Man depend on Ni-MH reliability and long life

Following a competitive tender exercise the Commissioners of Northern Lighthouses operating as the Northern Lighthouse Board (NLB) has awarded Saft a 4-year framework agreement to supply state-of-the-art rechargeable nickel-metal hydride (Ni-MH) battery modules.

The agreement covers the supply of Saft's 12V NHE Ni-MH battery modules, with capacities ranging from 100 Ah to 3,000 Ah depending on the specific application. They will be installed by the NLB to provide energy storage for solar power systems and as standby power at mains-powered sites. Batteries have been provided for eight NLB locations in 2011, with the first installations at Barra Head lighthouse, the southernmost site in the Outer Hebrides, and Pladda lighthouse off the south-east corner of Arran.

Stringent charging and cycling requirements

Why Saft's batteries? Reliability of course, for NLB's life-critical lights, and long service life. But the battery systems must also be able to store sufficient energy from the solar PV modules in the summer and autumn months to ensure reliable operation throughout the northern winter. This calls for a battery with both low rate charging efficiency and high cycling capability. Saft has engineered a battery solution for this application based on its NHE Ni-MH battery modules. They provide excellent energy density combined with a high cycle life and offer an extended service life of at least 15 years that easily meets NLB's requirement regarding life expectancy.

NLB also wanted to reduce the number of service visits to remote and often stormy coastal and offshore sites. Saft's NHE module is sealed for life, requiring no topping up with distilled water. This significantly reduces the need for service visits, saving on maintenance costs and reducing potential disturbance to wildlife. These Ni-MH batteries are also fully recyclable at the end of their life.

Zero maintenance, ease of transport

NLB was also concerned about transport and installation. Ni-MH batteries are lightweight, compact and non-spill, and this makes them much easier and safer to transport to site by boat or helicopter than conventional batteries. They also take up less space within a buoy. NHE modules are around half the weight of a lead-acid battery that would be used for this application, so the potential saving in weight can be hundreds of kilos.

bill.mckenzie@saftbatteries.com

MAN-MADE NAVIGATION HAZARDS TOO…

Saft Ni-MH batteries have already been in use since 2009 as energy storage for solar-powered navigation-hazard lights on decommissioned offshore oil structures in the gruelling North Sea.

Containerized Li-ion energy storage for a **Hawaii power grid**

Saft's advanced Li-ion energy storage system (ESS) has been selected to support a big renewable energy project in Hawaii.

Saft's new containerized ESS package will support the "Hawaii Renewable Energy Storage System" project launched by local utility Hawaii Electric Light Company (HELCO) on Hawaii's Big Island. The project aims to accelerate the use of renewable sources by facilitating stable integration into the grid of increasing amounts of renewable energy and is partly federally-funded. Hawaii's Big Island is already a leader here, with more than a third of its energy coming from renewable sources such as hydro, geothermal, wind, solar.

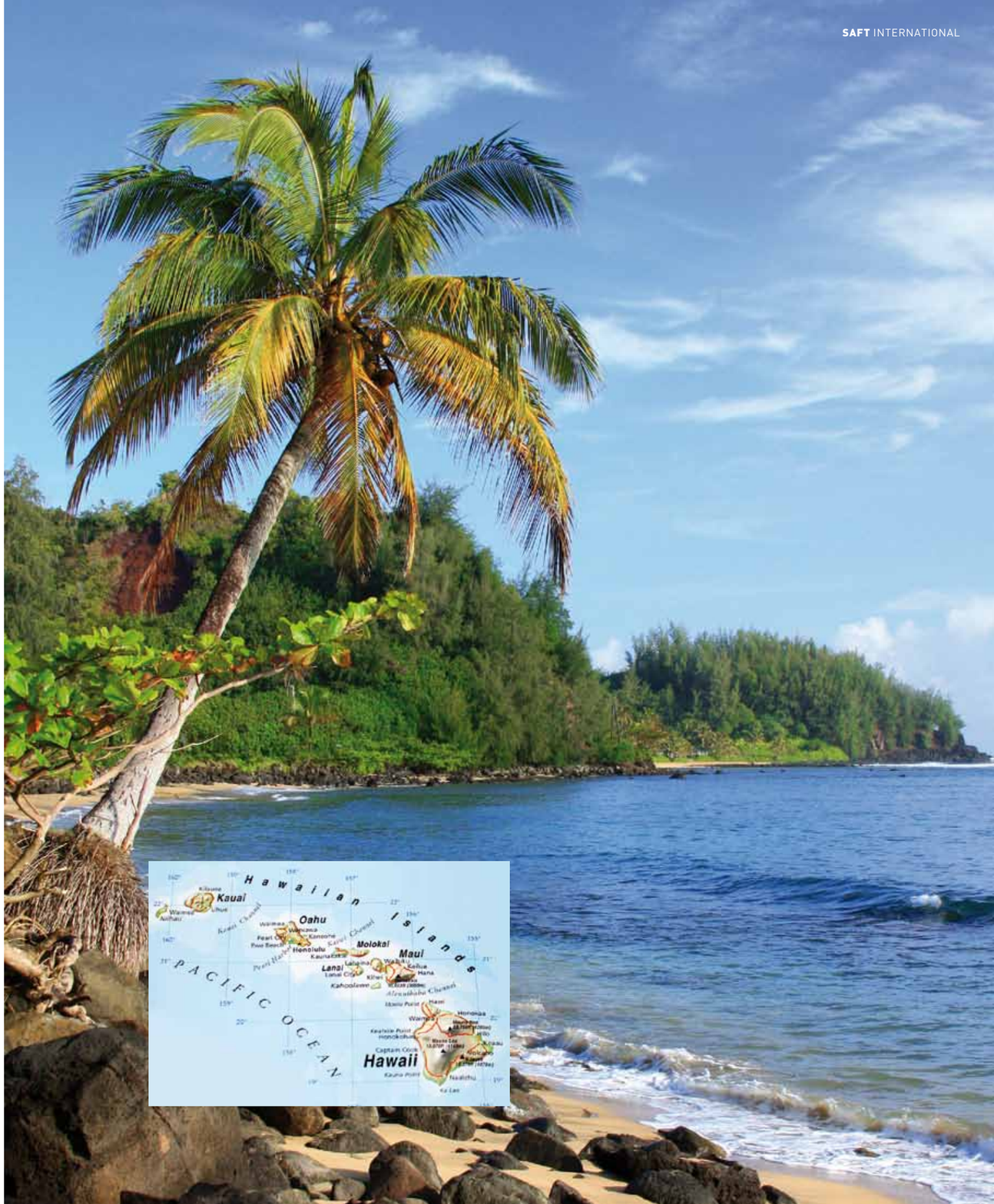
Saft's new technology has strong potential here. Hawaii has numerous renewable energy projects planned. The state needs renewables to reduce the cost of energy (Hawaii resident pay the nation's highest prices), reduce its dependence on imported oil and protect its environment.

Integrating renewable energy

The Intensium Max 20E unit is a 20-ft ISO container housing Synerion 24E modules based on Saft's VL45E energy cells. The two containers are part of a Saft turnkey solution that also includes an ABB PCS 100 power conversion system and a communications interface, as well as installation and commissioning features. Main functions include various grid support services – for example, the reduction of renewable output power volatility and optimisation of renewable power performance – as well as responsive charging and discharging, frequency regulation, autonomous operation and electrical output management.

The ESS is being manufactured at Saft's new plant in Jacksonville (Florida) and deliveries are slated to begin in April 2012.

blake.frye@saftbatteries.com



Light and compact batteries for **Bombardier dual-power locos**

Saft nickel-based MRX rail batteries are playing a crucial weight-saving role in the success of Bombardier's innovative ALP-45DP dual-powered locomotives aimed at operators in North America.

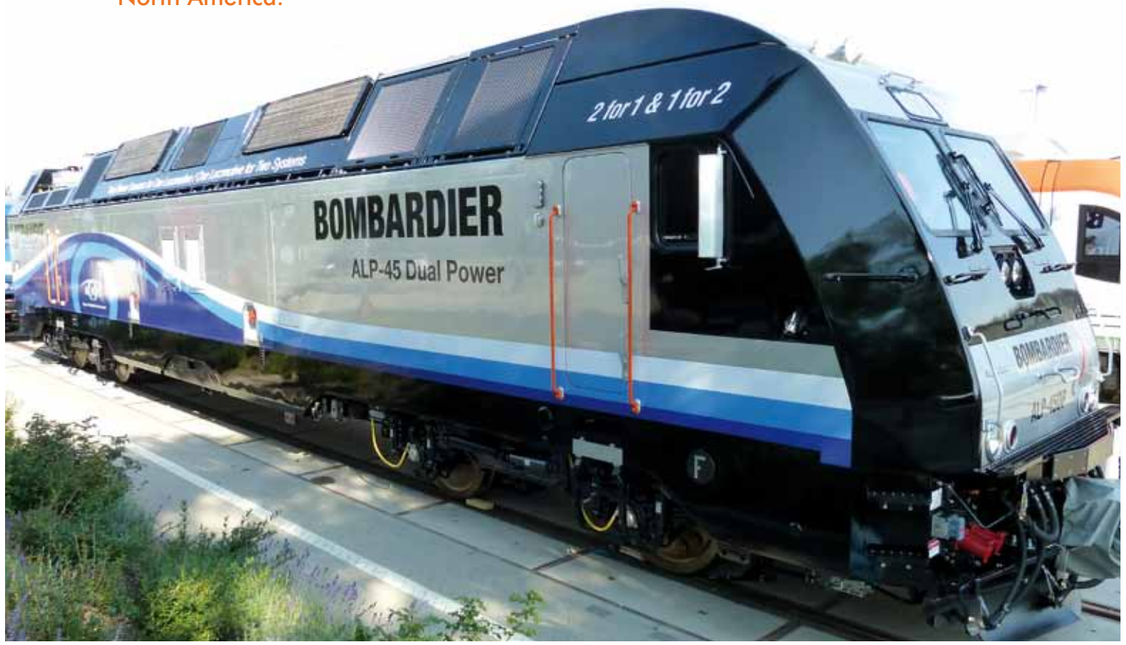
The ALP-45DP locomotive features Bombardier's MITRAC dual-power propulsion technology, which is ideal for partially-electrified networks. It enables commuter trains to operate in both electric mode with power from the catenary line and in diesel mode providing a 'one seat' ride that improves passenger comfort and reduces journey times. These locomotives can be used on the entire networks of the first purchasers, New Jersey Transit (NJT) and Canada's Agence Métropolitaine de Transport (AMT) in Montreal.

The German-built locomotives require a 72V battery system capable of meeting widely varying load profiles. Its primary functions are to ensure the continuity of all vital electronic control circuits and other vehicle loads while traversing neutral sections of the overhead catenary, and to provide cranking power to start one of the two 1,567 kW diesels.

Previous Bombardier locomotives in North America have used lead-acid battery blocks designed for NJT fleet use, but this was not feasible here. "All-up weight is a critical factor for the ALP-45DP since it has just four axles, and the need to carry both the electrical traction units and diesel engines was taking the design close to the maximum axle limit," says Bombardier Transportation System Engineer Ringo Klein. "The standard lead acid batteries weigh 1,100 kg, while the Saft MRX batteries are only 425 kg but provide equivalent performance. This 60 percent saving has proved vital in helping us bring the total vehicle weight down to our target."

By the end of March, Saft had delivered battery systems for 46 locos, 26 for NJT and 20 for Canada's AMT. Another 9 locos will be equipped by-mid-year.

frank.strunz@saftbatteries.com



Reliable back-up for **Bombardier's Electrostar rapid-transit trains**

Saft nickel-based MRX battery systems are providing back-up power on Bombardier Transportation's new Class 379 Electrostar EMU (electric multiple unit) trainsets operating express services between Stansted Airport and London.

This contract builds on the success of the identical battery systems installed on the Class 378 Electrostars operating on London's overground routes. Bombardier's Derby factory is delivering a total of 30 four-car Class 379 trainsets, which will also serve the route between Liverpool Street Station and Cambridge.

Saft has supplied 60 battery systems as turnkey, installation-ready, packages, assembled in rafts complete with control equipment and interfaces to communicate with the train systems. Two 96V battery systems, each comprising 74 MRX90 cells, with a nominal capacity of 90Ah, are installed below the floor of each trainset.

In the event of an interruption to the main catenary supply, the battery systems will maintain continuity of lighting, air conditioning, door operation and communication systems as well as operating the pantograph.

The level of autonomy provided by the batteries will vary according to the specific function: 90 minutes for main lighting, 60 minutes for standby lighting, traction and CCTV, and 180 minutes for 'non-switched' functions such as door opening and closing.

john.taylor@saftbatteries.com

Reliable, cost-effective Li-ion energy storage for Ausonia's hybrid off-grid telecom BTS power solution

Saft's Evolion telecom batteries have been selected by Italy's Ausonia, a world leading genset manufacturer, to provide energy storage for its innovative Hybrid Integrated Module (HIM) for powering off-grid telecom Base Transceiver Stations (BTS) or those connected to unreliable grids.

Ausonia, which supplies a range of turnkey solutions for industry (data-centres, black-out recovery, off-grid telecom sites...) developed its HIM in response to the growing demand from telecom operators for power solutions that ensure continuity of supply while minimizing Total Cost of Ownership (TCO) and environmental impact.

Hybrid solution for energy efficiency

The HIM concept integrates a variable-speed diesel DC generator with Saft's Evolion batteries to offer a more energy-efficient alternative to an AC generator operating 24/7. The generator simultaneously charges the battery and powers the site load. When the battery is charged the generator shuts down and the battery takes over as the primary source of power. By reducing genset runtime to about 4 hours a day this solution significantly reduces fuel consumption (about 74% compared with a standard genset). It also reduces CO_2 emissions and extends intervals between refuelling and also servicing.

In selecting batteries for this communication-critical application, Ausonia had very high expectations: "Our primary requirements in specifying the battery for the HIM concept were low weight and compact dimensions combined with fast charging, deep cycling capability, long cycle life and the capability to function reliably over a wide range of operating temperatures. Saft has developed the Evolion battery to meet all these criteria, so it was the ideal choice", says Ausonia Programme Director Francesco Di Noto. "Currently we manage over 80 percent of the Italian off-grid market with all four of Italy's telecom operators and we will swap all this fleet over to HIM. We are also preparing to replicate our Italian business model on the global market, where we see many opportunities for hybrid installations. Our plan at mid-term is to deploy more than 2,000 HIM systems per year". In addition to Europe, Ausonia will be targeting emerging markets such as Africa, Asia, Russia and South America.

HIM, a very flexible solution

The HIM is designed for fast handling and deployment. It comprises three independent packs (generator, battery, fuel tank), each weighing just 500 kg and sized for easy transportation. The packs are easily hot-swappable on site and provide a high level of flexibility and scalability to adapt to changing site needs. The design eliminates AC/DC rectifiers and battery packs inside the actual cabinet. As Evolion batteries can operate in extreme temperatures, this solution also reduces the need for air conditioning. Each 48V Evolion battery module has a nominal capacity of 77 Ah and the HIM is fitted with 4 to 6 Evolion modules connected in parallel, according to the site load.

In January, Saft delivered Evolion batteries for Ausonia's first set of 10 HIM installations and further volume shipments will follow over 2012.

The Evolion cells are now being manufactured at Saft's new Jacksonville (Florida) plant, which will have a fully-automated assembly line dedicated to Evolion batteries.

joel.brunarie@saftbatteries.com

EVOLION

The Evolion concept, which integrates Saft's Battery Management Module, offers a unique combination of float charging capability and high cycling performance while being maintenance-free. The 48V battery module delivers maximum performance in the limited space of telecom cabinets and operates reliably in a wide temperature range (-40°C to +75°C).
In addition to off-grid hybrid power systems like HIM, Evolion opens up new possibilities for creating compact, safe and reliable backup systems for a wide variety of telecom installations including outdoor on-grid sites and Distributed Power for Central Office (DPCO).

Saft develops Li-ion batteries +integration for KION e-vehicles

Saft has been working under a development contract from KION Group to provide Li-ion batteries suitable for integration into its Linde and STILL brand industrial handling vehicles as an advantageous alternative to lead-acid batteries.

Li-ion battery technology offers greatly increased power and energy density, enabling operators to enjoy a significantly extended operating range and reduced charging periods, as well as a longer service life and reduced maintenance for optimum total cost of ownership (TCO).

During development, Saft worked closely with KION Group to develop a tailor-made battery-and-integration solution, based on Saft VL cells, to provide optimum power and energy. The prototype battery system and integration solution is now fully operational and its performance was successfully demonstrated at the CeMAT intralogistics trade fair held in the Hannover Messe (Germany) in May 2011. Saft Li-ion batteries were featured on four KION vehicles making their début at CeMAT, the STILL CX-T electric tow tractor and RX 20-16 electric forklift truck, and the Linde E25 BR387 2.5-ton stacking forklift truck and T16 pallet truck. Saft is now gearing up for series production of these batteries by 2013.

holger.schuh@saftbatteries.com

Saft and **Linde Material Handling** in the Guinness Book of Records

Saft's Li-ion technology was also aboard the record-breaking E1 electric kart presented by Linde at the CeMAT trade fair. Just days before CeMAT, racing driver Andreas Wolf launched the e-kart, based on a class KZ 1&2 racing chassis, into the Guinness Book of Records by setting a new world record for acceleration – 0 to 100 km/h in just 3.45 seconds – during the ADAC GT masters race held at Motorsport Arena Oschersleben. The E1 kart is equipped with standard electric drive components also used in Linde's E20 to E50 electric counterbalance lift trucks. The kart was clever way to demonstrate the successful marriage between KION powertrain and Saft batteries in future Linde industrial handling vehicles…

Finland's high-speed train switches to Saft for improved service reliability

The operator of Finland's prestigious Pendolino tilting trains, VR Group, is switching to Saft nickel-based batteries to solve reliability and maintenance problems.

The Sm3 Pendolino train, which connects Finland's major cities at speeds of up to 220 km/h, had begun to encounter service reliability problems, which in turn tarnished the image of the prestigious inter-city service. So VR, the state-owned operator of Finland's rail network, decided to do a complete review of all on-board equipment. This includes the existing batteries that were experiencing premature failure in this heavy-duty application (Finland's winters are extremely harsh with temperatures that can drop below -30°C,). They also required frequent maintenance, such as topping-up with water.

In 2009, VR decided to review alternative batteries with a view to in-service testing. The operator chose Saft, targeting a service life of at least 15 years. "We have had excellent service from previous generations of Saft batteries on our older rolling stock, where they continue to provide reliable operation" says Hannu Ryyppö, head of electric safety for rolling stock at VR Group.

Trials with Saft MRX

The testing involved Saft's MRX nickel-based batteries, which are designed specifically to provide a compact and reliable high-energy solution for demanding rail applications. Three 96 V battery systems with a nominal capacity of 180 Ah – each comprising 80 MRX 180 cells – were installed below the floor of a six-car Sm3 Pendolino trainset. Following the success of the first installation throughout two years of operation, MRX battery systems were installed on a second Sm3 trainset in 2011.

The onboard batteries play a vital role in ensuring operational reliability and continuity by supplying back-up power for critical safety and passenger-comfort services such as emergency lighting, communications, door operation and heating and ventilation.

A vital boost to reliability and image

And the results? Field trials over two of Finland's winters have demonstrated that the MRX design offers excellent reliability and low maintenance to meet the heavy-duty back-up demands of the Sm3 Pendolino trains. So as each existing battery system comes to end-of-life, it will be replaced with Saft MRX.

"We are committed to building an excellent reputation for reliability on Finland's Pendolino services and changing to the Saft MRX batteries is set to play an important role in this process," adds Hannu Ryyppö. "The new-design MRX batteries have proved their capability in two trial installations, where we have been impressed by both their reliability and low water consumption. That's why we have selected Saft's MRX as the standard choice for all our Pendolino battery replacement projects for the following years."

trond.beyer@saftbatteries.com

UK Power Networks now implementing Li-ion energy storage technology

2011 saw the start-up of the first Saft Li-ion-backed grid stabilization facility connected to a distribution network in Britain.

The facility is a pilot project on a UK Power Networks 11kV grid near wind farms at Martham (Norfolk) using a 600 kW storage battery based on Saft's Intensium Flex system. The idea is to eventually devise sophisticated grid-management strategies in conjunction with a scientific body.

"The trial installation is now up and running satisfactorily, in a local context. The next step is to enable remote operation, which requires the commissioning of a secure communication solution. This will allow UK Power Networks to start to understand the impact of storage", says Peter Lang, Technology Development Engineer in the Future Networks team at UK Power Networks. The operator expects to have meaningful results by the end of 2012.

Up and running

At the same time, project partner Durham University is developing algorithms to control energy dispatch from the batteries. "Our simulation work has meant we can quantify ways that the ESS assists control of the network voltage and power flow. In the real system our algorithms will respond to flow measurements at various points in the network and decide how best to use the battery resource at each moment," says Neal Wade of the School of Engineering and Computing Sciences.

"The algorithms will be deployed as soon as the remote operation is functioning, starting with simple low-impact interventions. Then, as confidence builds, more complicated algorithms may be employed," adds Peter Lang.

Evaluating ES integration

Martham has one wind farm of ten 225kW wind turbines on an 11kV circuit, which includes the storage device, supplying a small area near the Norfolk Broads. UK Power Networks operates the local networks distributing electricity to the East and South East of England, plus the London area.

"This project will enable experts at UK Power Networks to study the impact and benefits that could be realised from integrating energy storage. It will also allow Durham University to simulate larger installations and determine the wider business case for energy storage," concludes Peter Lang.

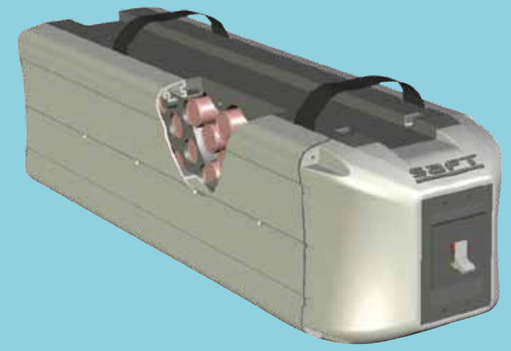
Coping with increasing renewable sources

Saft has supplied the energy storage system (ESS) that is a vital part of ABB's DynaPeaQ system, a grid interface electronics concept that opens the way to smarter grids able to handle significantly increased levels of renewable generation.

This concept resolves many of the issues raised by the addition of renewable energy generation (mainly wind and solar) to existing grids by helping to level out intermittent supply and to control power flow.

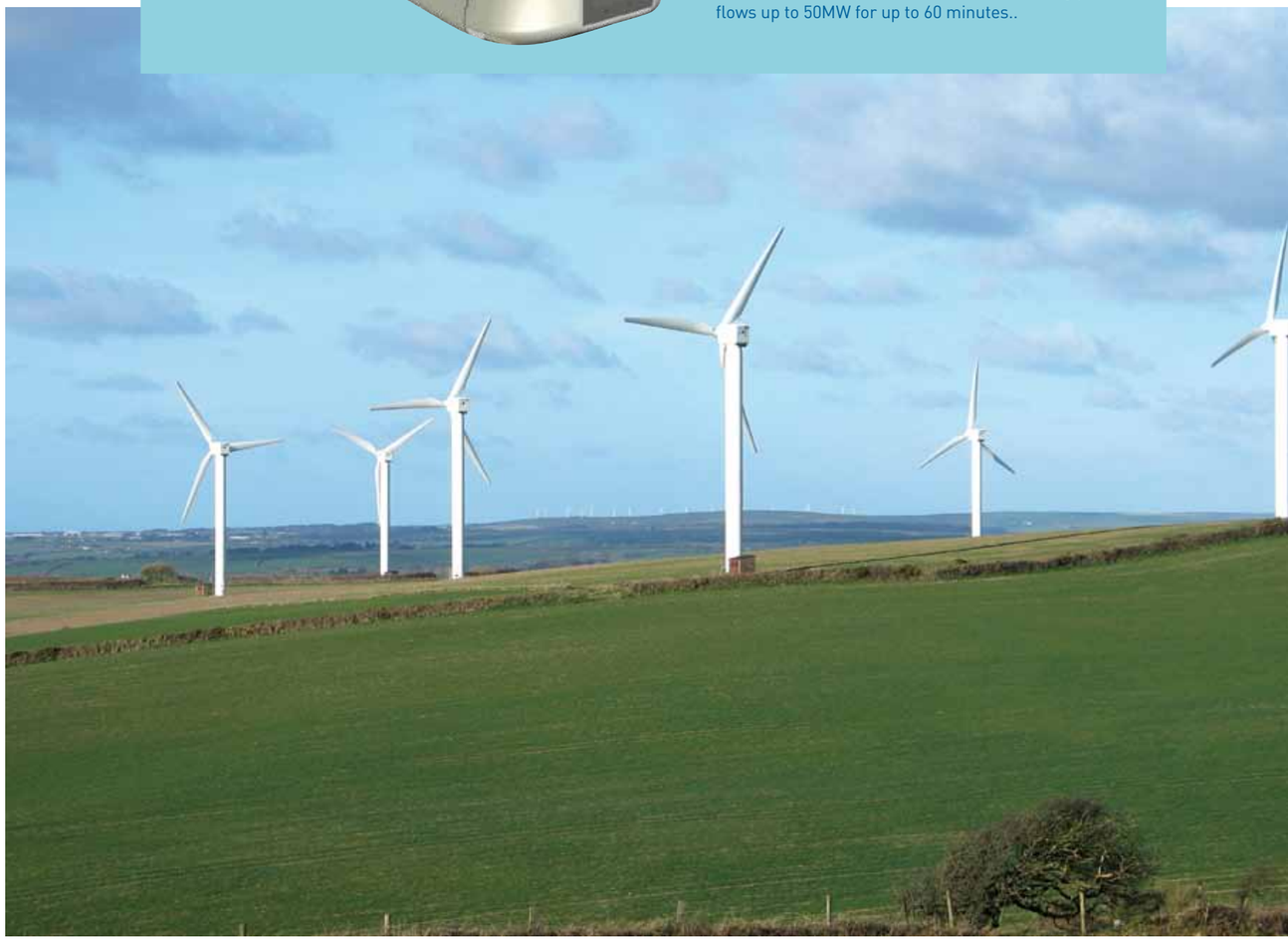
Combining an ESS with fast-acting grid interface electronics (using ABB's well established SVC Light technology) enables dynamic control of active as well as reactive power in a power system, independently of each other. Through the control of the reactive power, grid voltage is controlled with high dynamic response while the active power element not only provides primary frequency control and synchronised reserves, but also enables a number of new services to be added including black start capability and peak load support.

jim.mcdowall@saftbatteries.com

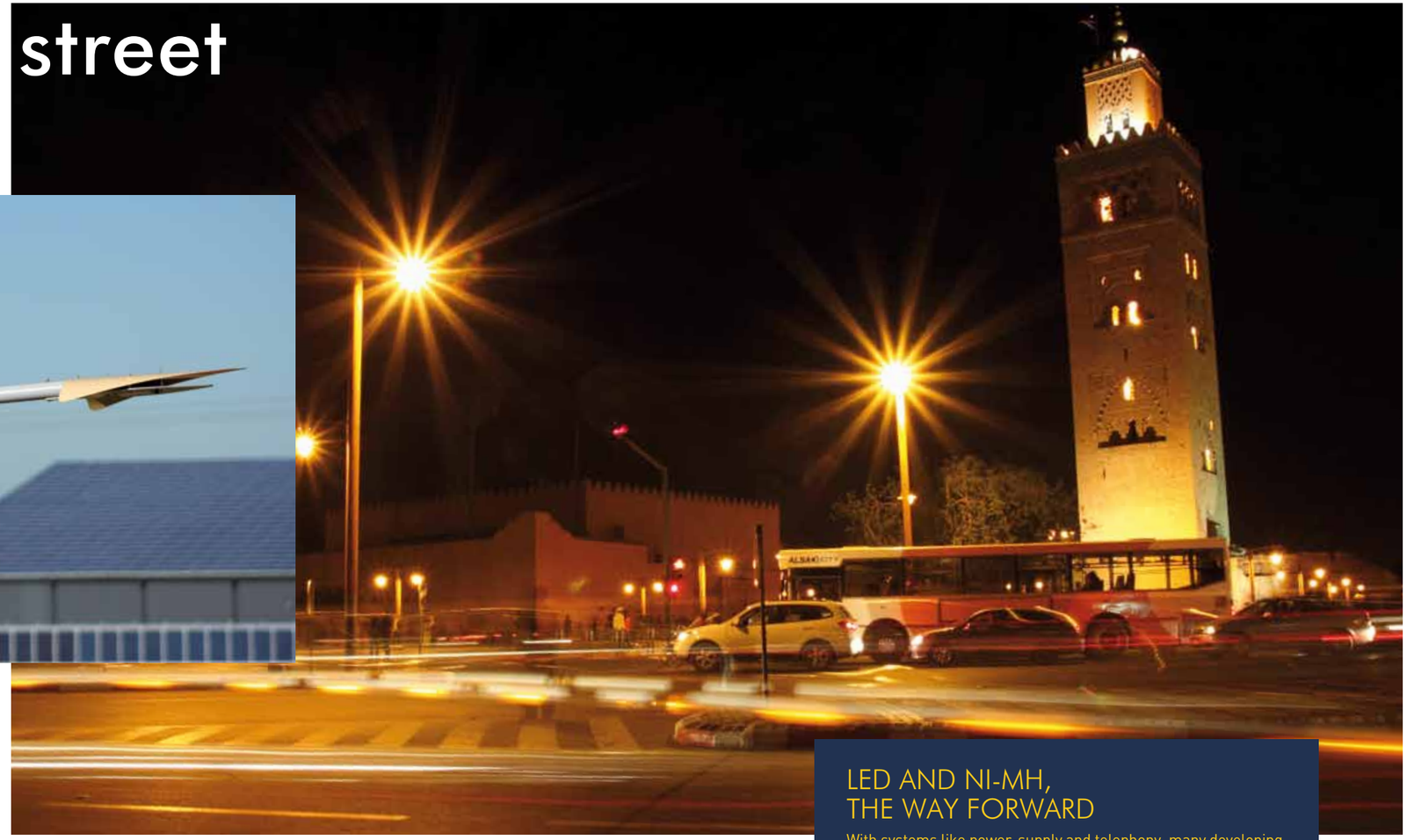


SCALABLE LI-ION TECHNOLOGY

Saft's Li-ion technology is an ideal solution for grid stabilization. It offers good cycling capability, long and predictable life and an intelligent, self-diagnostic design, high energy density, extremely high efficiency, millisecond-level response time and high-power capability both in charge and discharge. Saft's modular approach also makes the ESS highly scalable, and Saft is now developing a high-power system for ABB's future DynaPeaQ solutions, enabling power flows up to 50MW for up to 60 minutes..



Fonroche solar street lighting for Africa



Fonroche solar-powered street lamps are lighting the nights of off-grid Africa, thanks to Saft batteries. The latest units with interface electronics are a new generation of intelligent SSL.

About a year ago Fonroche, one of the leading French manufacturers of solar panels, decided to diversify into added-value solar-powered LED street lighting for use in zones like Africa and India not served by power cables.

First-generation street-lighting in Africa used lead-acid batteries, but many of the systems have broken down very fast, often because of the heat, which reduces battery life. "Fonroche decided to use modern technology. We turned to Saft because of their advanced expertise. We needed a no-maintenance battery with excellent charge-discharge efficiency, very long working life and able to withstand extreme temperatures", says Project Manager Olivier Guibert. "In addition, our customer wanted the batteries on top of the light poles which raised weight problems." Saft proposed a Ni-MH PV tubular module that could be housed inside the light pole, opening up new design possibilities. Furthermore, it can be connected directly to the solar panel, with no need for a controller interface. "Having batteries inside the pole raises the operating temperature, but Saft assured us the modules can withstand -40°C to +70°C."

Smart electronics interface

The next stage was to equip the streetlight with a custom-designed electronic management system linking the LED and the battery. This intelligent interface manages power consumption, reducing energy output when there is higher ambient light and also when the SOC signals when battery charge is getting low (about 10%). This extends the lighting period. Fonroche sees its new product, to be launched in first-half 2012, as: "the solar street-light of the future. Interactive management reduces power consumption so much that we can replace a lead-acid battery of 160 Ah with a Saft Ni-MH module of 20 Ah!"

The new units are currently being tested in the field. Fonroche is very satisfied with performance so far. "Saft technicians came several times to our plant in Agen to help us with installation and connection prior to shipping the units to Africa. They also trained the future project manager of Fonroche facilities in all aspects of the battery. Indeed, Saft worked closely with us throughout the development process and we are very happy with the result". Fonroche's customers are likely to be happy too: development agencies in emerging countries are learning that the slightly higher cost of quality technology is easily offset by system reliability and thus lower total cost of ownership (TCO).

stephane.senyarich@saftbatteries.com

LED AND NI-MH, THE WAY FORWARD

With systems like power-supply and telephony, many developing regions are "leap-frogging" a technology generation, rejecting construction of wire-networked systems in favour of stand-alone technology. First-generation SSL used lead-acid batteries, buried (a costly process) to reduce the temperature and fluorescent lamps whose consumption required a huge solar panel too big to fix to the pole. Solar lighting really took off around 2007 with the introduction of LEDs, which consume much less power and so can be powered by smaller panels (about 1 m^2). Early lead-acid storage solutions were also unreliable, so development agencies are opting for higher-quality, longer-life solutions.

Prize-winning innovation: a battery and a motor in a wheel

Saft has been chosen by the small French engineering firm ez-Wheel to supply Ni-MH batteries for their award-winning motorised wheel (itself called the ez-Wheel), designed to make pulling and pushing wheeled equipment easier.

As with many innovations, the concept is really quite simple: ez-Wheel makes self-contained motorised wheels to replace one or more wheels on equipment such as ambulance/hospital stretchers, postal delivery carts, large rubbish bins, warehouse/factory trolleys, and building-site carts, making life easier for the people who have to push or pull them around.

"The idea was born when I and two colleagues – we had all worked in factories – noted that workers handling these trolleys and carts usually found it tiring and often suffered from back problems," says ez-Wheel President Jerome Penigaud. "Why not make their job easier by letting the wheels do some of the work?" So he and his two colleagues started a company to do just that.

Reinventing the wheel

The result was the innovative ez-Wheel. The wheel itself contains a motor, made by Leroy Somer, and a rechargeable Ni-MH battery designed and manufactured by Saft. The user drives the vehicle via a wireless control system with forward-reverse options and speed variation between 0 and 18 km/h.

The company started by getting operators to retrofit motorised wheels on existing equipment, and then moved to first-fit agreements with equipment makers.

Close cooperation

The ez-Wheel is manufactured in the firm's plant in Angouleme, which has a capacity of 50,000 motorised wheels per year. "Saft began supplying us with batteries in 2011 and is continuing in 2012. We enjoy very close cooperation with our battery supplier. Not only did they advise us on the optimum batteries, based on their Ni-MH VHTF cells, but the batteries are also integrated into the wheel by the people at Saft's Nersac plant," explains Jerome Penigaud.

Ez-Wheel's ingenuity was soon rewarded by fame and fortune. The company has received several prizes, including a prestigious Best Innovation Award from the French Ministry for Research and Higher Education in 2011 and Best Innovative Start-up Company in Europe in 2011.

Innovation rewarded

As for fortune, sales are increasing steadily. "So far we have been targeting France, but in March 2012 we will start marketing in all 27 countries of the EU, via distributors. We're in growth mode: the firm started with its 3 founders, today there are 13 of us and by the end of 2012 ez-Wheel will be a company of 40 people," smiles Jerome Penigaud.

Ez-Wheel is in diversification mode too: in the second half of 2012 they plan to launch a smaller model, with smaller motor and smaller battery, from Saft of course. And then who knows...

charles.bernasconi@saftbatteries.com

In the construction industry, workplace accidents and injuries often occur while workers are moving loads around the site. Ez-Wheel motorised wheels can provide power assistance for manual equipment such as A-frame trolleys and wheelbarrows (opposite).

Russian Winter Olympics shuttles rely on Saft batteries for top performance in the cold

Siemens has chosen Saft's SMRX railway batteries for emergency back-up and starting power aboard the 54 regional electric trains that will serve the Sochi Winter Olympics in 2014.

The 160-km/h Siemens Desiro RUS trains, going by the name of Lastoschka (little swallow), will transport athletes and spectators to the competition sites in the Alpine skiing area Krasnaya Polyana inland from the coast.

During the Winter Olympics, the first ever staged in Russia, the eyes of the world will be on Sochi, a resort city on the Black Sea coast near the Caucasus Mountains. So any logistics or organizational problems – such as unreliable transport – will generate very bad publicity for the city and the country. Sochi also plans to host the Russian F1 Grand Prix starting in 2014.

Top priority: reliability

The key factor in the choice of Saft's nickel-based SMRX technology was its proven ability to deliver reliable performance, even in demanding winter conditions with temperatures as low as -40°C. The batteries feature Saft's robust, lightweight Sintered/Plastic Bonded Electrode (S/PBE) construction. The cells, filled with a special electrolyte developed for extremely cold conditions, can operate at temperatures down to -40°C and can survive prolonged exposure to temperatures as low as -50°C without damage. The cells have been fully tested in order to meet all specified requirements including the Russian GOST standards.

The battery system, which was custom designed and engineered by Saft for this specific application, consists of 86 SMRX190 battery cells with a nominal capacity of 190 Ah, making this one of the largest rail battery systems ever delivered by Saft.

Essential back-up and starting power

Two battery systems will be fitted below the floor of each five-car trainset to provide emergency backup power to ensure the continuity of vital functions such as lighting, communication and door controls. The batteries will also play an essential role in starting the electric trains by powering the compressed air system that raises the pantograph as well as initiating the boot-up sequence for the train's computer.

Russian Railways (RZD) has ordered 54 Desiro RUS trains in two batches. The first 38 are being built in Germany and the last 16 are under construction in Russia by Train Technologies, a joint venture between Siemens and Russian rail manufacturer Sinara. The Desiro RUS trains, based on the reliable Desiro ML vehicle platform, have been further developed to withstand temperatures as low as – 40 °C and have been given a car body which is 3,480 wide, a floor 1,400 mm high and a bogie with a track gauge of 1,520 mm..
The first trains are scheduled to enter service in Sochi in autumn 2013. Then, in February 2014, they will provide transportation for the Winter Olympics.

frank.strunz@saftbatteries.com

New SRM+ launches at **TRAKO Railway**

Saft has now introduced its new generation SRM+ nickel-based railway battery developed to provide the ideal, compact cost-effective solution for high-energy backup applications on board rolling stock.

The new battery was launched at the TRAKO railway industry fair in Gdansk (Poland) in autumn 2011.

SRM+ delivers high performance, reliability and a 15-year-plus service life in a fully recyclable single cell package that has the same installation footprint as a block battery.

Visitors to the fair were able to see Saft's extensive range of battery systems meeting any current railway application including auxiliary backup (for passenger safety and comfort), fail-safe diesel engine starting and even hybrid traction application needs.

marc.genicot@saftbatteries.com

SRM+
- for optimized Total Cost of Ownership
- for complete reliability under the toughest operating conditions
- for more efficient use of onboard battery space
- for all requirements from single cells to integrated battery systems

Li-ion power for Formulec championship e-racers

Saft has developed batteries for a specialist consortium that has now built the world's fastest e-racer and is on the way to organising a Formulec world championship.

Saft has teamed up with French automotive engineering firm Segula Matra Technologies (technical manager of the project) and several other specialist companies to push e-motor-racing even further. Formulec technical partners include the Mercedes GP Petronas Formula One team (aerodynamics and thermal development), Siemens (electric motors), Michelin (energy-saving tyres), Hewland (transmission system), FCI (electrical connectors) and ART Grand Prix (operation of the e-racer).

Formulec has developed and trialled a first high-performance electric single-seater prototype, the EF01, that is easily mistaken for a combustion-engine F3 machine.

The world's fastest e-racer

Since its first test run in September 2010 the EF01, which took two and a half years to develop, has proved to be a top-performer with very high potential. The EF01 can reach 100 km/h in just 3 seconds and has a top speed of more than 250 km/h, equalling the performance of its conventional F3 cousins. That makes EF01 the fastest electric single-seater circuit racer in the world.

In developing the customized battery system Saft worked very closely with Segula on performance, mechanical integration and the safety aspects involved with this type of vehicle, with essential input from other Formulec technical partners. The Saft battery comprises 200 Li-ion latest-generation Li-ion cells (VL41M) configured in several battery packs.

Synergy for success

"With an exceptional project like Formulec, the secret of success is teamwork, and we have put together a dream-team of specialist partners," says Formulec Vice President Pierre Gosselin. "Of course the heart of any e-vehicle is the battery, and the consortium has been very happy with Saft's willingness to share information and expertise in our drive to optimise power and space in this very special vehicle".

The car is now being demonstrated internationally. At the invitation of Mexico's President Calderon, EF01 was a star attraction at the Cancun Climate Change Conference in December 2010. Then in 2011 is was displayed at Michelin's Bibendum Challenge in Berlin, the Moscow and Rotterdam F1 roadshows, and the prestigious Frankfurt Motor Show. Demonstrations are continuing in 2012.

Looking to the future

A Formulec monotype world series of 10 events per year is planned for 2013 and 2014, based on a new EF02 model whose specifications have now been finalised after trials with the EF01. Subsequently a world championship is expected to be organized, open to any car-makers who have developed an electric single-seater. The FIA has already expressed interest in the championship.

"But sport is not the final aim", adds Pierre Gosselin. "Motor racing has always been a laboratory for innovative technologies that are usually spun-off to the 'real world'. Formulec intends to become the sporting development platform for car makers and energy specialists seeking to increase the performance of everyday electric vehicles."

beatrice.lacout@saftbatteries.com

Li-ion energy storage for **railway energy recovery**

Viridity Energy chose Saft to supply megawatt-level Li-ion energy storage to trial energy recovery on a railway project in the U.S.

Saft has now delivered a containerised energy storage system (ESS) to a pilot Recycled Energy and Optimisation Project set up by the Southeastern Pennsylvania Transportation Authority (SEPTA). A strong pilot could lead to deployment at up to 32 SEPTA substations.

The pilot, managed by smart-grid specialist Viridity Energy, optimizes energy usage by SEPTA trains while also generating revenue through demand-side participation in power markets. This is the first dual-purpose trackside ESS in the U.S.

Saft's Intensium Max 20 Li-ion ESS, located at one of SEPTA's traction substations, captures train-braking energy and then discharges it back to the third rail to help power trains as they accelerate out of five nearby stations. The ESS, coupled with a power conversion system provided by alternative-energy specialist Envitech Energy, supports rail traffic while simultaneously participating in the 13-state PJM Interconnection market for frequency regulation. The fully-integrated Li-ion solution, from Saft's dedicated Jacksonville (Florida) plant, offers efficiency of greater than 95% and maximizes system availability.

"We chose Saft technology because of its proven performance and ability to meet the custom specifications of our energy management system," says Audrey Zibelman, president and CEO of Viridity Energy. "We needed a smart system that would easily integrate with our VPower™ software optimization system. Saft's Intensium Max battery met all our criteria." SEPTA concurred, feeling that Saft's experience with onboard train applications and trackside systems (signalling and switching) would benefit this innovative project.

The system was commissioned in March 2012 for a 2-year demonstration period.

blake.frye@saftbatteries.com

Energy storage actors in Europe come together to promote use of storage technologies

At the initiative of the European Commission, leading players in the energy sector have now set up a European Association for Storage of Energy (EASE).

A group of 13 manufacturers, utilities and academic bodies, including Saft, came together in Brussels on 27 September to sign the formal constitution of EASE. The Association is a non-profit body that will act as a coherent voice to promote the role of energy storage as a key enabling technology for Europe's transition towards a sustainable, flexible and stable electric power system. EASE covers all energy-storage technologies, not just batteries.

The power market is changing, with increasing penetration of renewable sources and distributed generation, changing regulations and stringent environmental targets. "Faced with a changing context, the European institutions were looking for expert guidance. They needed a consensual vision of the roles, technologies and potential applications of energy storage within the frame of EU energy and climate policy", says EASE Secretary General Patrick Clerens.

Expertise and advocacy

EASE will consult and represent all stakeholders, from grid operators and renewable-energy specialists to the scientific community, sharing information and knowledge and coordinating activities. In cooperation with relevant national and international bodies (such as ESA in the US, of which Saft is also a member). EASE will analyse and evaluate the benefits of using energy storage in the broader energy grid. It will develop storage technology roadmaps and assess storage applications as well as addressing financial, economic and regulatory issues.

"The final aim is to ensure Europe's successful transition to a low-carbon, safe and sustainable energy infrastructure and to help draw up a coherent master plan for the introduction of energy storage worldwide", adds Patrick Clerens. EASE is already at work preparing its first position paper related to the European Energy Road Map for 2050.

Saft, a driving force

Energy storage is an important market for Saft, which is already a major player, offering specialised Li-ion batteries for applications such as integration of large renewable sources (solar PV, wind), smart grid support, and residential PV and smart buildings. Anticipating market growth, in April 2010 Saft set up a dedicated Energy Storage Unit with teams in Europe and the US, to expand Saft's business in this developing market.

info@ease-storage.eu - www.ease-storage.eu

The 13 founding members of EASE are Alstom, DONG Energy A/S, EDF SA, EnBW AG, EnelS.p.A., E.ON AG, GDF SUEZ SA, Hitachi Power Europe GmbH, KEMA BV, RISØ DTU, RWE AG, Saft SAS, Siemens AG. Since its creation, the association has welcomed numerous new members, including Gaelectric, Elia, ABB, Bosch, Saint Gobain, Hydrogenics, Cener, Circe, FIAMM, Isentropic, Panasonic...

2012 E-Mobility customer event in Nice

On 6 January Saft, Siemens and Electricité de France (EDF) organised their second E-Mobility Forum for industry players.

At the Forum, held in the famous Negresco Hotel in Nice, the three partners invited their customers to learn about available solutions and new developments and to exchange ideas on technology, applications and future market expectations. The main themes were clean vehicles, public transport and energy storage.

Electric propulsion and network integration

Siemens is focusing on both vehicles (i.e. electric motors (and drive trains) and infrastructures. Siemens has been a pioneer in electric motors for nearly 160 years and is now looking at themes such as: integration of e-vehicles into smart grids; ways to recharge e-vehicles using renewable energies, innovative vehicles for airports and cities (last mile delivery); conversion of combustion-engine buses into hybrids; e-motorisation for boats; and using e-vehicles as mobile reserves of energy.

Clean fuel and recharging infrastructure

The role of France's state-run power utility EDF in the field of e-mobility is to ensure that e-vehicles have access to "fuel". A CO_2-free fuel that generates no atmospheric pollution during use. In short, EDF is encouraging the emergence of "clean" transport solutions. Providing fuel means putting in place recharging infrastructure, whether public or private, suitable for electric vehicles (EV) and rechargeable hybrids (HEV). To this end EDF has joined forces with car makers and local authorities in an ambitious full-scale experiment involving EVs, HEVs and appropriate recharging infrastructure.

Batteries for propulsion and smart-grid energy storage

As a world leader in high-tech batteries, Saft has been committed to e-transport in all its forms for many years. Saft has developed high-performance battery systems to meet today's growing demand for EVs and HEVs, and is also delivering innovative energy-storage solutions for stabilising the smart grids that will fuel e-mobility and also allow them to integrate more and more power from renewable sources. In short Saft is helping to drive clean and sustainable e-mobility.

Industrial synergy…

"In recent years there has been a lot of talk about "what's going to happen" in e-mobility. Well it's now happening," says Vincent Jauneau, Director Industry Sector at Siemens France. "The e-mobility scene is changing fast and we wanted to tell professionals what the trends are and show how we are responding to them, with concrete examples of projects carried out in 2011. The E-Mobility Forum was a great success. It showed how synergy between key players can drive progress. We'll be organizing another Forum in a year's time, at the Stade de France, hoping to accelerate progress even more."

… and strategic convergence

Michel Couture, Director E-mobility at EDF, shares his colleague's enthusiasm. "E-mobility is a vital vector for making city life sustainable. I am talking about efficient use of energy, but also about reduction of atmospheric pollution (above all particles) and noise pollution as well," he says. "Questions raised at the Forum showed how strong public concern about this is. To address these issues, and as one of the largest CO2-free electricity suppliers, EDF develops E-mobility added-value solutions and services. E-mobility is going to develop very quickly now, and it will be a key thrust of our Sustainable City strategy. It is very exciting to be contributing in such a strategic area, especially in close convergence with major players like Saft and Siemens".

catherine.jouatel@saftbatteries.com

SAFT POWERS THE ANDROS ELECTRIC TROPHY

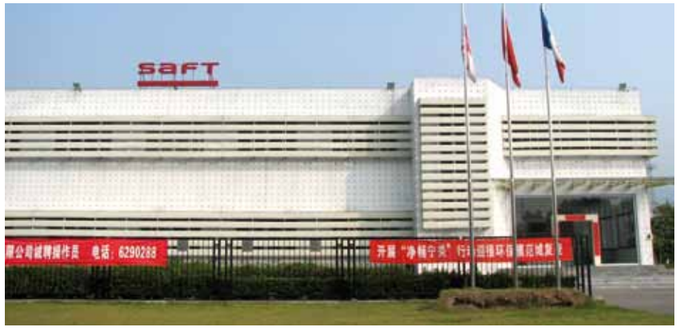
The 2012 E-Mobility Forum was planned to coincide with the Isola 2000 weekend (6 and 7 January) of the Andros Electric Trophy, an event for electric racing cars run on ice tracks, and the first of its kind in the world. The Electric Trophy comprises a series of races in French ski resorts. The cars are identical vehicles designed by French automotive specialist Exagon Engineering, equipped with electric motors made by Siemens and powered by Li-ion batteries developed by Saft. "Our cars have been using the same Saft Li-ion batteries for three years now," says Exagon General Manager Luc Marchetti. "They have proved totally reliable and safe during this tough competition, and above all they have given really top performance".

"E-MOTOR-RACING HAS A BIG FUTURE"

Saft also sponsored an Andros car in the final of the Electric Trophy, driven by Grégoire Demoutiers who has been involved in motor racing for 6 years and is now in his third year of GT3 competition. "I had never driven an electric vehicle before and was a bit sceptical about racing one, but I was really surprised by the car's performance with Saft Li-ion batteries", he smiles. "I have raced internal-combustion cars in Andros events and the e-racer compared very favourably. But I was a bit disconcerted by the silence. The organisation of the Andros Electric Trophy was really professional and there was a very good atmosphere. Very competitive. It's a good idea to make everyone race in identical cars, because then driving ability is what separates the men from the boys. I think e-racing has a bright future. For example, this year's Le Mans 24-hour Race will include hybrid racers for the first time. And e-mobility in everyday life has a big future too, especially for short-distance travel in cities."

Serving Asia from Asia

Saft is forging ahead in high-growth Asian markets, particularly China, largely thanks to its much-appreciated ability to manufacture, assemble and test battery systems locally.



Saft's Zhuhai facility

Recent battery orders for trainsets for the Malaysia KTM and Hong Kong rapid transit networks, added to other orders from rail OEMs in China for projects in Saudia Arabia, Argentina, Hong Kong and Thailand, are further proof of Saft's stronger position as a key supplier to the Chinese market, where it is already delivering major contracts for metros in Beijing, Nanjing and Shanghai. Saft's latest contract is for Shanghai's new line, (which will bring visitors to the future Disneyland) whose Siemens trainsets require batteries with emergency traction capability as well as back-up power.

Railways, aviation…

As a leader on the Chinese aviation market, Saft supplies spare batteries for jetliners through its distributors Satair (Airbus) and Aviall (Boeing). Saft is also preparing the future on the world's largest market for new aircraft (4,500 new orders expected over 20 years). Since 2008, COMAC (Commercial Aircraft Corporation of China) has selected Saft's latest ULM (Ultra Low Maintenance) batteries for the emergency back-up, the APU and the DC system of the ARJ21, a twin-engine regional airliner. For years now, XAC (Xi'an Aircraft Industry Company Limited) Y-7 (twin-engine turboprop transport aircraft) and MA60 (60 seat regional turboprop), as well as the HAMC (Harbin Aircraft Manufacturing Corporation) Y-12 (a high wing twin-engine turboprop utility aircraft) have also been equipped with Saft batteries. Saft is reinforcing its presence in the Middle Kingdom through local maintenance trainings for Chinese operators and is working to become the battery supplier of the XAC MA700 (future high-end 70/80 seat regional turbo-prop, expected to make its maiden flight in 2015) and of the COMAC C919 (a 168-190 seat narrow-body jetliner due to fly in 2014), the future challenger of Boeing's 737 and Airbus's A320.

… and metering,

Saft is also a major player in the Asian, and particularly the Chinese, metering market. Saft has been supplying metering batteries for 20 years, and since 2006 some 50 million cells have been manufactured locally in Zhuhai. The factory supplies China (Saft has a 25% market share here, mainly for smart utility metering) and, to a small extent, Taiwan. Sales growth in 2010-2011 was 25% and is expected to remain strong. Saft is now targeting potential customers in Malaysia and Singapore.

…telecom and energy storage too

Saft is also targeting the Asian telecom market as well as battery storage for renewable energies (wind power and especially solar PV, where China is particularly strong). Saft participation in the Chinese association CNESA for the promotion of Green Energies and Smart Grid experiments is also a strong commitment to those new businesses.

angel.li@saftbatteries.com

LOCAL MANUFACTURING, A KEY ASSET

Key assets for Saft's continued growth in Asia, and particularly China, are the company's Hong Kong et Shanghai offices and above all its Zhuhai factory, which opened in 2006. Zhuhai enables Saft to provide the high levels of service and support expected by Asian OEMs as well as local nickel-based battery system engineering and assembly. For industrial and railway batteries, Saft can also integrate local added value to projects by incorporating locally-made engineering and manufacturing of complete systems. For primary lithium batteries and in anticipation of business growth, Saft Zhuhai has invested in a capacity increase, with a new filling machine, laser-welding machine and assembly machine raising the plant's capacity to 28 million cells per year.

Saft has a dedicaced web site in Chinese : www.saftbatteries.com.cn

Reliable nickel-based power for Hong Kong's West Island metro

CNR Changchun Railway Vehicles Co. (CNR CRC) has now taken delivery of battery systems for trainsets to serve the new West Island Line of the Hong Kong metro.

CNR CRC, a major manufacturer of rolling stock for both China and global markets, is constructing 15 eight-car trainsets for the line extension, which is scheduled for completion in 2014. The extension involves a 3-km route from Sheung Wan to Kennedy Town, serving three new stations. This will make the Island Line the longest urban line (16.1 km and 17 stations) of Hong Kong. Construction of the extension is quite a challenge, involving land reclamation on the coast of Hong Kong Island. The metro operator, MTR Corp., also plans to extend the network to the southern district.

Three locally-manufactured battery systems, based on Saft's SRM rechargeable nickel-based rail batteries, are being fitted to each ultra-modern trainset to provide up to 60 minutes of back-up power to support vital safety and control functions – such as braking, smoke detection, emergency lighting and door opening – in the event of an interruption to the main power supply.

Low-maintenance, long-life back-up for Malaysia's KTM EMU trainsets

Saft has now completed delivery to CSR Zhuzhou Electric Locomotive Co. of nickel-based MRX back-up batteries for new trainsets to serve Malaysia's KTM Komuter network.

China's leading rolling-stock manufacturer ordered onboard battery systems based on Saft's specialized MATRICS MRX cells to support critical safety and control circuits on 38 six-car EMU (electric multiple unit) trainsets currently under construction for Malaysia. The battery systems, worth $1.7 million, were delivered during 2011. The rapid transit EMUs, with a top speed of 140 km/h, will replace existing inter-urban vehicles on the busiest South-North intercity line in Kuala Lumpur.

Saft's 110V battery systems will provide reliable, low-maintenance onboard back-up power to support emergency lighting, air conditioning, door operation and communication systems for the trains in the event of an interruption to the main power supply. Each battery system will be supplied as a complete unit, ready to install, in a stainless steel raft made in China.

edward.wong@saftbatteries.com

Li-ion batteries to power new hybrid diesel-electric river shuttle for Bordeaux

Saft has been chosen by Keolis to supply Li-ion battery systems to provide quiet, efficient, low-emission power for hybrid diesel-electric ferryboats operating a shuttle service across the Garonne river in Bordeaux.

Keolis, France's largest private sector transportation group, will launch the new ferry service in 2012 to help the port city move towards greener transportation and meet its ambitious environmental targets. The river shuttle is expected to carry around 200,000 passengers a year.

The two ferryboats will be equipped with a 140 kWh Li-ion battery system that will supply power for both its electric propulsion motor and auxiliary loads such as lighting and communications. The battery will work in conjunction with the boat's diesel engine, storing power produced by the generator as well as providing additional propulsion power when required.

The batteries will also be charged overnight from the local grid. Their excellent energy storage capability will provide the boats with six hours of autonomous, fully-electric operation during the two busiest periods of the day – three hours in the morning and three hours in the evening – helping to reduce fuel costs as well as CO_2 and NOx emissions.

THE ADVANTAGES OF LI-ION TECHNOLOGY

Li-ion battery technology offers a number of key advantages in applications such as the Garonne shuttle: zero maintenance, high power and/or energy storage in a compact space, weight savings, fast charging, high efficiency and a long calendar and cycle life (up to a million charge/discharge cycles).

E-transport catching on fast

Keolis is one of Europe's leading public transport operators and is also established in North America and Australia. The group offers local authorities a full range of transport solutions: trains, buses, coaches, trolley-buses, funiculars and airport services.

Saft, too, has a wealth of experience in the public transport industry as a supplier of battery systems for emergency back-up and traction for trains, metros, trams and electric ferryboats. Saft nickel-based batteries are already providing propulsion for electric shuttle ferries in La Rochelle, Marseille and Paris.

Saft, a reference in marine applications

More and more operators of ships and boats are turning to electric or hybrid diesel-electric propulsion for fuel economy and greener operation, and Saft is positioning itself as a reference in energy storage for marine applications.

"This project for the Garonne river shuttle is an important early success in Saft's new initiative focused on achieving substantial growth in the marine propulsion market thanks to our proven Li-ion technology" says Bertrand d'Hautefeuille, Saft's Sales Director for Marine Activities. "It is especially pleasing that one of the first applications for a hybrid boat battery system developed and manufactured at our Bordeaux site will benefit the local community."

yannick.chartier@saftbatteries.com

Light and powerful Li-ion batteries for **high-end military vehicles**

Saft has now delivered its new enhanced 6T (e6T) Li-ion battery system to the U.S. Marine Corps and Army and an extensive evaluation program is currently under way.

For some time the U.S. military has been seeking viable replacements for standard 6TL lead acid batteries, particularly for high-performance applications.

Saft's e6T batteries, about 40 in all, will demonstrate the performance of "smart" Li-ion batteries in providing engine starting, power for operational functions and enhanced communication between vehicle and battery. This is the first battery system to be delivered to both branches of the military. The trials program is proceeding satisfactorily and Saft's customers are very happy with battery performance. A successful demonstration program could lead to widespread replacement of lead acid on military vehicles.

Lower weight, higher performance

Compared to lead acid technology, Saft's custom-designed "drop-in" solution offers a significant reduction in weight as well as an improvement in cycle life, which results in a reduction in maintenance costs. Saft's 24V, 1.7 kWh Li-ion battery with CAN Bus communications weighs less than 50 pounds (22.7 kg), compared to 88 pounds (40 kg) for each of the usual two 6T 12V lead-acid batteries. Lighter vehicles mean greater fuel economy and range. The CAN Bus communications electronics relay critical battery information such as state-of-charge and battery temperature, as well as reporting on overall battery conditions.

Saft was chosen for its expertise in Li-ion technology and its extensive experience in developing batteries for hybrid military vehicles. Saft developed the e6T, which uses the proven VLP (Power) electrode, to meet the needs of several defense programs. These included the current Army and Marine Corps programs, but the next version of the Joint Light Tactical Vehicle (JLTV) will also require a battery in this form. Saft batteries will be trialled on existing and new vehicles, such as the JLTV platform.

jim.hess@saftbatteries.com

LI-ION, THE TECHNOLOGY OF THE FUTURE

The military's ultimate goal is to replace 6T lead-acid batteries in high-performance applications. The Li-ion e6T, which will benefit from current testing, will be able to be installed on any platform that presently uses the 6T. But given the higher costs and capabilities of advanced Li-ion technology it will probably be used mainly in high-end ground vehicles, such as scout vehicles and command and control units with heavy electrical power loads. Power loads in these vehicles are increasing very fast, with demands for computing, communications and other electronics.

SAFT WINS RAYTHEON'S TOP SUPPLIER EXCELLENCE AWARD

Saft's Cockeysville plant in the U.S. has attained top recognition from Raytheon Network Centric Systems (NCS), winning its Five Star Supplier Excellence Award in 2011 for the second consecutive year.

This marks the sixth year in a row that Saft has been singled out by Raytheon as a Supplier of Excellence. "We are proud to gain this top distinction once again, and we are especially honored to have been recognized every year since Raytheon launched the program," says Cockeysville General Manager Frank Rosenthal. "This is a testament to Saft's unwavering dedication to delivering high-quality products, on time, at a fair price and providing overall excellent management of the program."

The award program recognizes suppliers that have exceeded expectations, with outstanding performance with regard to quality and on-time delivery. Saft was the first supplier to receive the Five Star award.

frank.rosenthal@saftbatteries.com

Left to right: Don Tice (Program Manager), Jim Hess (Director of Defense Sales), Vince Hrenak (VP, Supply Chain, Raytheon NCS) and Frank Rosenthal (GM of Saft Cockeysville).

General Atomics high-energy laser to use Li-ion technology

Saft has been selected by General Atomics Aeronautical Systems, Inc. (GA-ASI) to provide a megawatt-class Li-ion battery system to power a high-energy laser application.

GA-ASI was awarded a contract from the United States Defense Advanced Research Project Agency (DARPA) to develop a demonstration laser weapons system. DARPA seeks to create a 150-kW, solid-state laser weapon weighing less than one ton. The first and largest portable 150 kW laser of its kind, the system will be supported by Saft's advanced Li-ion battery technology delivering high power and energy.

This is an excellent opportunity for Saft to demonstrate its expertise in building complex, high-power battery systems for directed-energy applications. This program is the follow-on to the 500-kW system Saft delivered in 2010.

GA-ASI, an affiliate of General Atomics, provides Unmanned Aircraft Systems (UAS), including the Predator, and radar and surveillance systems for military and commercial applications worldwide.

The main role of this type of laser is to counter the threat from incoming missiles. Potential applications will be small military platforms such as patrol boats, fighter aircraft, combat vehicles, and UAS.

Laser weapons are the rising stars in the cutting-edge directed-energy segment, where Li-ion technology, with its kW/kg advantage, makes Saft a front runner. Saft's battery system consists of a number of very high-power VL22V cells. It is a high-powered, yet compact and light battery that also features a complete electronics management system. It will have an improved bussing architecture and a pre-charge circuit called modulated pre-charge (MPC). This is a new capability that allows Saft to limit the current while the MPC circuit is increasing the bus voltage up to the battery voltage in a very short period of time, just prior to turning on the battery power.

emilio.gomez@saftbatteries.com

Nickel-based ULM back-up power for Boeing's 747-8 Very Large Aircraft

Saft's specialised Ultra Low Maintenance (ULM®) aircraft batteries are providing back-up power aboard Boeing's new 747-8 Very Large Aircraft, the largest aircraft the company has ever built, which went into service in late 2011.

The nickel-based rechargeable ULM® batteries, provide emergency back-up power as well as starting power for the auxiliary power unit (APU) and electrical bus support.

Saft batteries are powering both versions of the aircraft, the 747-8 Intercontinental (passenger version) and 747-8 F (freighter version). The first 747-8F was delivered to Cargolux in October 2011 and the first 747-8 Intercontinental, a VIP version, was delivered to an undisclosed customer in February 2012.

Saft worked with systems integration specialist Crane Aerospace & Electronics to design and qualify the ULM® battery, which offers an ideal combination of high performance, low weight, top reliability (expected life of 12 years) and ultra-low maintenance that bring dramatic reductions in the cost of ownership and operation of aviation batteries.

The new 5319CH1 battery system developed for the 747-8 is an upgrade of Saft's 539CH-1 supplied for other Boeing models and is purpose-designed for the new aircraft. It comprises 20 CVH531KA cells providing a nominal 24 V and 53 Ah capacity with a total weight of 96 lbs./43.5 kg. Each aircraft is fitted with two of these batteries. Almost all new aircraft models require a new battery designed to suit the engines, their start-up sequence and also the routes to be served (short, medium or long-haul).

Saft provided integration test and flight test batteries and will deliver one aircraft set per month for volume production in 2012. In the longer term, Boeing has plans to ramp up production to 24 aircraft per year.

"We are proud to work with Saft to provide the battery system for the newly introduced Boeing 747-8 aircraft. This is just the latest collaboration in our long history of working together. The combination of Crane and Saft provides the best value solution for aircraft energy storage systems on the 747-8," says Ed Fuhr, Vice President Crane Aerospace & Electronics - Power Solutions.

Saft batteries aboard all Boeing 737 and 747 models

The 747-8 Intercontinental (passenger version) twin-aisle aircraft is the largest passenger aircraft ever built by Boeing. It is the improved, larger and more efficient 747 model that succeeds the 747-400, which is recognized and well respected among large aircraft operators. The new aircraft, which features an upgraded state-of-the-art flight deck and raked wingtips, offers reduced emissions with GEnx-2B engines (also used by the 787) and lower trip costs. Boeing estimates demand for between 300 and 500 aircraft in this class over the next 20 years.

Saft batteries are aboard all Boeing's 737 and 747 models as well as a number of Boeing military planes and helicopters. Saft is the world leader in design and manufacturing of high technology battery systems and products dedicated to aeronautics with batteries on board two-thirds of the worldwide fleet of civil and military aircraft.

gary.mcmillan@saftbatteries.com

Metering market: **growth driven by smart technology**

The metering market is in growth mode, expected to double within 5 years, due to the rapid introduction of smart metering.

There is large-scale deployment of new residential meters as utilities prepare for the switch to smart infrastructure for electricity, gas and water. While a majority of the conventional meters based on a mechanical architecture do not include batteries, this new generation of smart meters requires high-tech batteries to power functions such as communications, alarms, or the metrology itself.

The Saft Group has more than 30 years' experience of the metering market and it is one of our most important business segments. We supply specialised batteries for all segments: electricity, water, gas and heat metering devices and ours is the only lithium technology proven by more than 25 years in the field. The brands of the Saft Group are references for the world's leading meter manufacturers.

New technologies

The Saft Group is developing new technologies to meet the needs of smart-metering infrastructure:

- Tadiran's PulsePlus technology, recognized as the most advanced solution for smart meters requiring high power, high energy and high voltage.
- Unique designs with Li-MnO_2 technology specifically tailored for high-power smart meters relying on low-consumption chipsets
- Innovative Hybrid Mixed Oxide technology, offering breakthrough performance compared to conventional Li-MnO_2.
- A smart rechargeable battery module specifically optimised for small PV installations, enabling off-grid set-up for fixed RF networks in dense urban areas or remote zones.

…and increased industrial capacity

To support customer demand, we are also investing in significant production capacity increases:

- in major plants involved in metering (Europe, Israel, China, US)
- in all technologies offered for metering applications
- up to double capacity for high-volume product ranges.

nicolas.paquin@saftbatteries.com

Saft's technology to help **India manage increasingly scarce water resources**

Chetas Control Systems has chosen Saft Li-$SOCl_2$ batteries to power the smart water meters that it supplies to India's municipal and regional utilities. A winning partnership in an emerging economy.

Chetas Control Systems, founded in 1989, is a leading flow instrumentation company that focuses on providing turnkey solutions in liquids management. Based in Pune, India, Chetas specialises in ultrasonic transit time flow-metering technology with the emphasis on meeting the challenging needs of the water industry. It supplies water utilities all over India and is a proud winner of the prestigious UNESCO Water Award. The firm also serves industries requiring flow measurement of oil, chemicals, petroleum products, acids and numerous other liquids.

Two functions, two batteries

Chetas needed two different batteries for its new smart water meters, one to power the measurement function and another for transmission of the data. The batteries chosen were Saft D cells, LS33600 and LSH20. Saft's Li-$SOCl_2$ solutions are specifically tailored for high-power smart meters relying on low-consumption chipsets.

Chetas evaluated a number of battery suppliers and chose Saft for its technical expertise and its reputation as a leading supplier of batteries for smart meters. "Saft advised us on the best batteries for both metering functions. We had numerous meetings during the development stage to fine-tune the technical specifications, and the Chief Engineer of Saft's Poitiers facility even came to our Pune plant to help us with integration," says Chetas Managing Director Mahesh Deshmukh.

Fostering sustainable development

India's fast-growing population is driving demand for water. Resources are already scarce. "And the problem is compounded by inefficient water management in some regions and cities," adds Mahesh Deshmukh. "The first step in saving water is to know how much your are using. Our slogan at Chetas is Measure water… Save water".

Completing its first order, Saft has now delivered 2,500 of each cell and the strong growth of India's water-metering market makes further orders highly likely. "Our customers are very happy with their Chetas meters, and we are very happy with the Saft batteries that power them," smiles Chetas' Managing Director. "Together we are helping to ensure that adequate supplies of the most precious of all natural resources are available for generations to come."

sanjay.hegde@saftbatteries.com

Intensium Max, Li-ion energy storage for grid support




Intensium Max is Saft's ready to install containerised energy storage system designed for today's electricity grids, and for the smart grids of tomorrow.

It provides a megawatt-level energy storage solution featuring Saft's highly efficient and long life Li-ion technology. The system is readily scalable to suit a wide variety of applications, including grid support functions that enable optimized utilization of grid infrastructures.

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