saft
international magazine

The magazine for Saft's customers and partners

NOVEMBER 2016
#35

Magalie Savany
works as an operator for Saft in Nersac, France

An incubator with a difference

Faroe Islands plan for 100% green energy

Towards a digital railway

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Ghislain Lescuyer,
CEO

Power 2020 – transforming to enhance performance

Since the last edition of Saft International Magazine, a lot has happened at our company. Our strategy, Power 2020, is on track and we are seeing the first operational benefits starting to bear fruit. Transformation plans are well underway in our four divisions, as well as in the functions. We have invested in a technology incubator, where we are innovating for the future; sharing technology prototypes early, collaborating closely with customers and co-creating with suppliers. You can read more about our Incubator on page 10.

Commercially, we have had some good successes this year. CEB (Companhia Energetica de Brasilia), the Brazilian power utility, is replacing the existing lead-acid batteries in 34 substations with Saft's Uptimax nickel-based batteries. Uptimax will provide CEB a significant increase in reliability and availability, while reducing battery maintenance and replacement costs. We also won a contract to deliver megawatt-scale lithium-ion battery system for Fortum in the largest electricity storage pilot project in the Nordic countries.

We launched our new LM cell for smart meters, which is especially resistant to hot climates. It will help us to win more business in the Middle East and Asia. In Space, we said farewell to the Philae lander – Rosetta mission – which was crashed into the comet on 30th September. All of us at Saft are very proud that our battery was the technology chosen to power such a critical mission.

This year, Saft has had a change of ownership. While we are now a fully-owned subsidiary of Total, Saft will continue to operate as a stand-alone company. Total is fully supportive of our Power 2020 strategy and we will continue down that path, with the backing of Total helping us to become a stronger company. We have begun to work with our counterparts in Total to identify potential opportunities, both in oil & gas, and in regions where they have a strong presence and can open doors for Saft. We are investigating whether there are joint opportunities with SunPower, Total's solar PV subsidiary, to develop the role of batteries in the intermittency of renewables. And we're discussing how we can leverage technology development in both companies, as well as in the portfolio of companies that make up Total's Energy Ventures. Total's ambition is to be present across the entire electricity value chain and Saft has a key role to play, thanks to the growing importance of batteries in energy storage and efficiency.

That's why - together with Total - Saft is in the right place, at the right time.

Saft, Groupe SA, 26 Quai Charles Pasqua, 92300 Levallois - France. **www.saftbatteries.com - Saft Magazine**, a magazine for Saft's customers and business partners. **Editor:** Elma Peters. **Managing Editor:** Karen Hollington. **Text:** Six Degrees. **Graphic design:** ML Lanceau. **Printed by:** Cap2tout. **Cover:** Photo ©Joel Peyrou- Saft. **Feedback:** karen.hollington@saftbatteries.com

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High flying performer

@airbus

Airbus named Saft as the winner of the 'Best Performer Award' in its Supply Chain and Quality Improvement Program awards, held in Toulouse in April. The award recognizes Saft's commitment and performance.
"The award highlights the close partnership developed with Airbus over many years. We aim to maintain the momentum for 2016 and beyond, taking into account the challenge of increasing production of the A350 XWB", said Patrick Sanchez, Quality Manager at Saft Bordeaux.

Saft receives the "Best Performer Award" from Airbus in Toulouse

©P. Pigeyre/Masterfilms

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New HQ in Levallois

@saft_batteries

Since moving to a new headquarters building in Levallois in late November, Saft is able to give customers a warmer welcome. The office is close to the center of Paris and has a contemporary design and layout to support customer meetings and enhance communication between teams.

New address: 26 Quai Charles Pasqua
92300 Levallois, France

New CFO

©Charlotte Lévêque

New Chief Financial Officer Eric Tersen joined Saft in September having held several top management roles at Total.

Your views on this magazine

We're reviewing our communications so that we focus on the news that is most interesting and relevant for you. Please take a few minutes to complete our survey – for every survey completed we will make a donation to our chosen charity, Fonds pour les Soins Palliatifs. As an organization that supports end-of-life care, it represents a cause that affects everyone.

FONDS POUR LES SOINS PALLIATIFS

Scan this QR code to access the survey

Riding the waves in world's toughest sailing race

@caliboissieres

The Vendée Globe is regarded as the toughest sailing event in the world. A round-the-world single-handed yacht race that involves battling your way through some of the most inhospitable stretches of ocean, against the prevailing winds. It's no wonder this 25,000 nautical-mile competition is commonly known as the Everest of sailing - and something Saft is proud to be on board with.

Our team has been working closely with other commercial partners to ensure 'Bateau des Métiers', one of 29 monohull yachts taking part in this year's race, is fitted out with the very latest in marine innovation. It includes groundbreaking structural designs, hydraulics and protective surfaces to overcome any challenge, come hell or high water. Winning an event like this comes down to experience and natural talent, both of which skipper Arnaud Boissières has in abundance. The other success factor is clever technology, something this 18-meter Imoca is crammed full of. There are satellite communications systems that provide voice, fax and high-speed data; radar that not only enables Arnaud to 'see' in poor visibility, but also provides a constant look-out for any potentially damaging floating objects, plus weather and navigation stations providing real-time information with pinpoint accuracy.

Powering that technology is a set of specifically designed Saft batteries, not only to withstand such extreme conditions, but also lightweight, without compromising on charge/discharge times. We wish Arnaud every success.

©Vendée Globe/Olivier Blanchet

Starring role for energy storage

@demain_lefilm

A film that shows how energy storage is combating climate change has won a César Award, the French equivalent of an Oscar. Called Demain (Tomorrow), the film was named as best documentary and was directed by Mélanie Laurent, who made a name for herself in Hollywood with a starring role in Quentin Tarantino's movie Inglourious Basterds.

The film features a Saft energy storage system on La Réunion that makes solar energy a reliable part of the energy mix throughout the day and night – and shows the potential for sustainable energy.

Director Mélanie Laurent (at the center) and her documentary team at Saft's installation in La Réunion.

"Electricity is the energy of the future"

INTERVIEW

Total has decided to develop a new business line dedicated to electricity. Why?

For many reasons, electricity is the energy of the future. Firstly because gas is the most promising hydrocarbon, and its primary market is electricity. And because I'm convinced electric vehicles are going to boom faster than anticipated, particularly in large Western cities and China due to the public health and pollution issues.

That's why Total decided to create a new branch dedicated to gas, renewables and electricity, which will encompass Saft, SunPower and the distributor Lampiris. Naturally we are and will remain oil and gas specialists, but we're positioning ourselves on the markets of the future.

Why choose to take over Saft?

In 2015, while drafting our long-term strategic plan, we took a serious look at the group's various business lines, especially renewable energies. We wondered about Tesla's announcements and the future of power storage, which seemed like a key link to the development of these renewables. Saft's name was mentioned by two different Total teams, and in very positive terms. So, as with SunPower in 2011, we decided to invest in a major industry expert with renowned technological expertise, rather than solely focusing on energy storage R&D.

©Pascal Sittler/REA

Patrick Pouyanné, Total's CEO

According to some observers, 95 percent of Saft's business is of no interest to Total...

If we're allocating almost 1 billion euros to buy Saft, it's certainly not just for the 5 percent of its business that's generated by energy storage! We're interested in all of Saft's technologies as we're convinced that its superior insights stem from its expertise in cutting-edge fields such as aerospace. Of course, we're also looking to help Saft expand its reach into new markets, which its size previously prohibited. But first, we're going to take the time to understand their business, which is new to us at this point.

The energy business is constantly changing, the mix is leaning towards a combination of renewable gas and storage, and we believe that Saft's know-how will be a key advantage for us to better grasp this trend.

This interview originally appeared in the magazine **L'Expansion**: *www.lexpansion.com*

Microgrids go "Back to the Future"

Back to the Future

From the opening of Thomas Edison's Pearl Street Station in Manhattan in 1882 to today's multiple generation solar, wind and diesel sources for greener microgrids.

Harnessing the Arctic's midnight sun

An excellent example of the difference a microgrid can make is Colville Lake, which lies 50 km north of the Arctic Circle in Canada. Since 2015 a microgrid has been deployed that combines PV panels with new diesel generators and a Saft Energy Storage System.

A fast growing market

Navigant, the market research company, estimates the overall value of the market for remote power systems to be around $11 billion today. And it has forecast a nearly 20-fold increase over the next decade to $200 billion.

Microgrids are becoming increasingly important for delivering electricity to remote or inaccessible areas, such as islands.

Back to the Future

In 1882, Thomas Edison opened the Pearl Street Station in Manhattan. As well as the first central power plant in the US, with local generation serving just 82 customers, it was effectively the first of many local microgrids. Over the next century these early microgrids expanded and grew into regional and national grids, becoming in the words of the US National Academy of Engineering, *"the greatest engineering achievement of the 20th century."*

Yet, while our current electrical grids continue to bring major benefits to billions of people across the globe, the demand for more power is pushing them to their limits in both size and complexity. As Phillip F. Schewe says in his book 'The Grid': *"Constructed of intricately interdependent components, the grid operates on a rapidly shrinking margin for error. Things can, and do, go wrong in this system, no matter how many preventive steps we take. Just look at the colossal 2003 blackout, when 50 million Americans lost power due to a simple error at a power plant in Ohio; or the one a month later, which blacked out 57 million Italians. And these two combined don't even compare to the 2001 outage in India, which affected 226 million people."*

Electrical grids: "the greatest engineering achievement of the 20th century"

Today, the desire for resilience and autonomy of supply, allied to the increasing need to deliver reliable and cost-efficient power to remote off-grid communities, is driving a reassessment of the way that grids are configured. The result is that microgrids are firmly back in favor.

Modern microgrids bring together a variety of distributed energy sources (including generation, demand management and energy storage) and loads, operating them in a controlled and coordinated way either independently or as part of a larger grid. Within microgrids, energy storage such as Saft's Intensium® Max containerized systems provide a number of functions including maintaining grid stability as well as smoothing the output of renewable energy resources.

The main difference between microgrids and traditional grids is that they maintain a closer proximity between the points at which electricity is generated and where it is consumed, eliminating the need for it to be transmitted over long distances. Microgrids also provide effective integration with a broad range of renewable energy sources such as solar, wind turbines, small hydro, geothermal and waste-to-energy plant as well as with combined heat and power (CHP) systems.

The main way of characterizing microgrids is not so much by their size as by their functionality. They are becoming increasingly important for delivering electricity to remote or inaccessible areas that are too costly, time-consuming or difficult to connect to the grid. Typical applications include islands, village electrification projects or remote mining communities.

There is also growing interest in using grid-connected microgrids, comprising a mix of conventional generation and renewable generation sources, to ensure continuity of supply

and to protect against potential grid faults and emergency situations. Here, the capability of a microgrid to separate and isolate itself from the main grid is attractive in the event of natural disaster or cyber disruption for mission-critical applications such as hospitals, university campuses, industrial facilities and military bases.

Diesel generators are the traditional mainstay of microgrids. However, with the cost of renewable plants continuing to fall, microgrids are now embracing multiple generation sources. Creating schemes in which diesel generation and renewables complement each offers considerable savings in terms of the costs of fuel purchase, transport and handling as well as maintenance, since the diesel gensets are required to operate for fewer hours. There are also environmental benefits from reduced greenhouse gas emissions.

©Fotolia

Saft Intensium® Max Energy Storage System in Colville Lake, Canada.

©NPTC

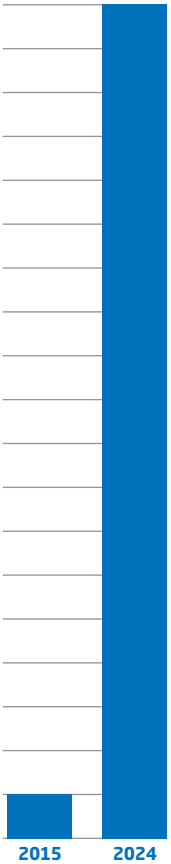
A fast growing market

Interest in microgrids has never been greater. Navigant, the market research company, estimates the global value of the market for remote power systems to be around $11 billion today. And it has forecast a nearly 20-fold increase over the next decade to $200 billion*. Saft energy storage systems are poised to play a major role in this growth as a key enabling technology for microgrids.

**Source: Navigant Research, Market Data: Remote Microgrids and Nanogrid Report, 4Q 2015*

From $11 billion in 2015 to $200 billion in 2024

the expected growth of the market for remote power systems



Harnessing the Arctic's midnight sun

An excellent example of the difference a microgrid can make is Colville Lake, which lies 50 km north of the Arctic Circle.

This small remote community of about 160 people is only accessible by air or by ice roads during a six-week window in February and March. For some years it had relied only on its diesel generators. But since 2015 a microgrid has been deployed that combines PV panels with new diesel generators and a Saft Intensium® Max Energy Storage System. The goal was to reduce the runtime of the diesel generators, especially in the summer when the sunlight is available for virtually 24 hours a day.

Saft's Energy Storage System helps stabilize the network. It has also reduced the generator runtime to around 50 percent. This provides significant savings in diesel consumption – something that is particularly important as delivering fuel via the ice road is both expensive and logistically challenging.

In addition to its new autonomy from dependence on diesel, the Colville Lake community now benefits from a greatly improved quality of life through noise reduction and elimination of emissions.

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©Jean-Paul Kieffer

By Philippe Biensan, Deputy Manager of Saft's technology incubator based in Bordeaux

An incubator with a difference

"My mantra is 'try quickly, fail early', something that is typically associated with the buzziest of technology start-ups. In a company with a near 100-year history, you'd be forgiven for thinking things might move a little more slowly. But in a nod to agile working, Saft has created a company-wide incubator with a difference. Sharing technology prototypes early. Collaborating closely with customers. Co-creating with suppliers. This is a part of Saft where failure is encouraged, because it helps us get one step closer to knowing exactly what our customers want.

Technology innovation is core to Saft's DNA, and in an effort to accelerate and improve how we do it we've created a new group that operates in a previously untouched area of the R&D process. After the research stage, but before development and then production, you'll find stages four, five and six of the Technology Readiness Level, or TRL. This is our sweet spot.

"Failure is simply the opportunity to begin again, this time more intelligently."

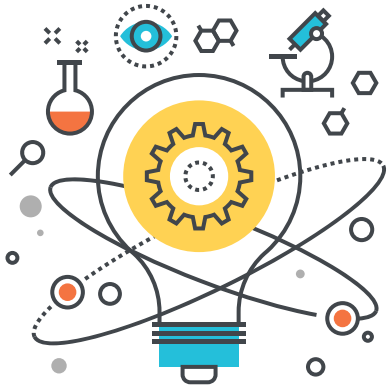
Henry Ford

Once a product or technology emerges from our own R&D team, or even a supplier's incubator, we now have a team of people that will use that technology to create new and challenging applications that are effectively working prototypes. These prototypes can be shared with customers to get their feedback much earlier on, even before the development process is started. It means you, as customers, can now touch and feel the technology long before it becomes a 'fait-accompli'. You can suggest tweaks (or major changes) that would better suit your own roadmaps – be it months or many years down the line. We're effectively asking our customers to challenge how we do things.

The goal of this incubator is to connect the scientific community

CREATIVITY AND INSPIRATION

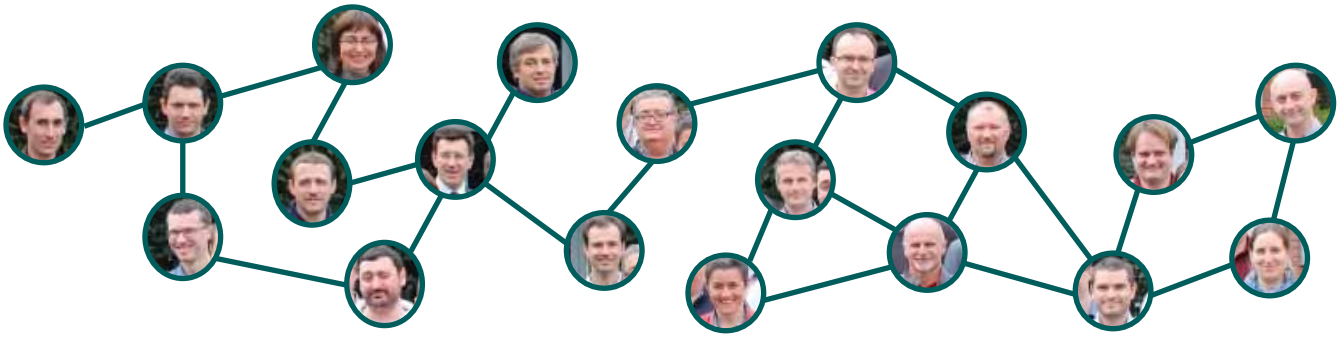
IDEAS AND IMAGINATION



INNOVATION AND DISCOVERY

THINK OUTSIDE THE BOX

Philippe Biensan is currently leading the incubator. Philippe was – quite literally – the first employee Saft hired in 1991 to work on lithium-ion (Li-ion) batteries. This was at a time when Sony was starting to commercialize the fledgling Li-ion technology in its mobile devices. With a PhD in materials from Bordeaux University, and after 25 years at Saft, there's clearly no one better to lead this hub of innovation today.



across Saft to ensure we will be developing products that address a real need, more effectively and often more quickly by bringing viable technological bricks.

Our team is made up of people with strong technical backgrounds, but they have diverse experience – whether it is in R&T, development, industrialization, or even production. Our team understands the technology, the customer needs or the practical constraints that may exist in terms of industrialization today. If there are hurdles, this team will identify them at the earliest possible opportunity. We are also commercially minded – we know what is compelling to engineers and business people alike.

Having officially launched the incubator in April this year, our activity is growing and we are actively looking for customers who are interested to know more. Our activity covers the three main areas of creating batteries: different chemistries, mechanical parts (from cells to batteries), and system components (e.g. electronics, software and integration). If you'd like to see what we're currently working on, or to share insight into the upcoming technology challenges you've identified within your own business, we'd love to hear from you.

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Faroe Islands plan for 100% green energy

SEV, the Faroe Islands utility, recently inaugurated Europe's first fully commercial installation of a lithium-ion (Li-ion) energy storage system in combination with a wind farm. Saft International Magazine asked Terji Nielsen, SEV's R&D Manager, to outline the background to the project.

©SEV Faroe Islands

Terji Nielsen, SEV's R&D Manager

"The Faroe Islands are 18 islands located halfway between Iceland and Norway. The islands' harsh weather conditions make SEV's mission, as the main power producer and distributor, a key service to the islands' 50,000 inhabitants. All the islanders have a stake in our business so to speak, as we are owned by all the Faroese municipalities, and we receive no government subsidies. Any profits are reinvested into developing our grid.

SEV's green vision is for 100 percent renewable electricity production by 2030 by making full use of our abundant wind and hydro energy resources, together with other technologies like photovoltaics and tidal energy. Simultaneously, our energy mix is entering a period of profound change as we transition household heating from oil to heat pumps and incentivize the use of electric vehicles.

SEV's green vision is for 100% renewable electricity production by 2030

The aggregated effect is that by 2030 we will double our current 314 GWh annual demand for electricity.

A major step in our green energy program was the new 12 megawatts (MW) Húsahagi wind farm that came on line in 2014. From past experience we knew that the variable nature of wind would present grid stability issues. Therefore, to overcome short-term variations, lasting from seconds to minutes, we have deployed a 2.3 MW energy storage system installation at the site.

Saft and ENERCON were our partners for the Li-ion battery and energy conversion systems. They were a natural choice due to their combination of fully commercialized technology and the capability to support us from initial concept and solution modelling through to final delivery.

So far the energy storage system is functioning exactly as planned. And we were delighted to share our experience with the 350 delegates attending our recent conference in the Faroe Islands. I expect that energy storage will be an integral part of all new wind farms, either as local storage systems, or as more centralized systems. For SEV the benefits of energy storage are clear and this approach is readily transferrable to islands across the world."

Scan this QR code and watch SEV's Húsahagi wind farm video

©Bonnard/Venteea

Venteea, the largest battery system ever to be installed in mainland France.

Keeping the grid in balance

As more electricity is generated from both decentralized and intermittent solar and wind energy, there is a growing need for flexibilities and smart energy management in order to keep the mandatory permanent balance of energy supply and demand. When the sun shines or the wind blows plenty of electricity is produced, but this doesn't always coincide with consumer demand. As a consequence, reverse power flows may put low and medium voltage grids to their limits of hosting renewables. In addition, the high variability of generation places stresses on the grid, which needs to respond dynamically to changing levels of supply and demand to maintain high-quality power to consumers.

Smart grids integrate advanced IT solutions to monitor and control power flows. Yet, the additional flexibilities, needed for periods of minutes, hours and sometimes several days, have to be provided either by flexible generation or by flexible consumption. Both of them have their technical and economic limits. This is where energy storage comes into the picture as a fourth asset class in our energy system*, enabling effective, localized provision of balancing services to ensure the grid remains in balance.

Saft has developed commercialized solutions and is continuing to improve its solutions and innovate to meet these new demands, and is involved in some of the world's biggest trials of new storage technology.

> Energy storage, the 4th asset class in our energy system

One of these is a megawatt-scale lithium-ion (Li-ion) battery energy storage project for Fortum, the Finnish energy company. A Saft Intensium® Max containerized battery system, with a nominal output of 2 MW and 1 megawatt hour (MWh) of energy capacity, is being installed at Fortum's Suomenoja power plant as part of the largest-ever electricity storage pilot project in the Nordic region.

Saft also provided the containerized battery solutions for a large pilot project in France, known as Venteea, and being run for grid operator Enedis. The project includes dynamic voltage regulation tools, as well as a 2 MW capacity battery storage solution, located on a wind farm in eastern France (Aube). The latest results show that the system helps to bring network efficiency with a better renewable energy integration in the distribution network. The energy storage system is providing a bouquet of 12 different services to multiple stakeholders, including frequency regulation qualified by French TSO RTE. And the key to this is real-time monitoring and control backed by high-capacity storage.

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** Besides electricity generation, electricity transportation (grids) and electricity consumption*

SEPTA breaks into new trackside storage market

©Septa Elpic

In 2016 Saft provided 8.7 MW of battery capability for SEPTA subway line.

US transport authority SEPTA (South Eastern Pennsylvania Transportation Authority) is demonstrating how rail operators can plug into a new revenue stream and improve their environmental performance. In 2016, it made its third foray into capturing the braking energy from subway cars and storing it using Saft energy storage systems.

Under braking, a six-car metro train can generate up to 3 MW. By capturing this energy (which would otherwise be lost) in a storage device, it can be used either to power acceleration of trains or to help the operator of the electricity distribution grid balance supply and demand.

SEPTA's energy storage journey started in 2011 when it used a government grant to fund a pilot project adjacent to the tracks on its Market-Frankford line. The trial indicated that SEPTA could reduce its energy bill by $135,000 per substation. A second pilot was then commissioned in 2014 to evaluate a mix of battery and supercapacitor energy storage, taking the total power capacity to 1.8 MW.

The latest project is the first to be operated on a commercial basis and required no upfront investment from SEPTA. Under a 20-year agreement, Constellation, a leading competitive energy company, will fund, own and operate lithium-ion (Li-ion) battery systems that add 8.7 MW power.

In turn, demand response and management specialist Viridity Energy will provide the commercial interface with the energy market through its software.

"SEPTA is undertaking a unique combination of regenerative braking capture and reuse, coupled with revenue-generating, market-based services. Indeed, the value is so compelling that the project has expanded from a single battery installation to a fleet of nine batteries that will be operational in the coming months," highlights Viridity President, Raj Chudgar.

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Towards a digital railway

In her keynote speech at InnoTrans 2016, Violeta Bulc, the European Commissioner for Transport and Mobility, emphasized the rise of the Internet of Things (IoT) in rail: *"Technology is changing our transport network before our eyes. Digitalization, intelligent transport systems and better use of Big Data are the heart of the future rail system."*

The IoT's integration of sensors and communication will help operators deliver more from their assets with less investment through increased automation and predictive maintenance – enabling them to service equipment only when it needs attention.

To help drive this integration Saft has launched a service that extends IoT capability to the backup batteries on board trains. C.O.M.M. Batt uses wireless monitoring to provide operators with a real-time picture of how their batteries are performing. The device carries Saft proprietary algorithms that calculate various battery parameters including State of Charge, thus supplementing routine inspections by predictive maintenance only when necessary. The result is reduced downtime, optimized fleet management and the associated cost efficiencies.

> Digitalization, intelligent transport systems and better use of Big Data are the heart of the future rail system.

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©Saft

Scan this QR code and watch Saft's C.O.M.M. Batt video

Going Dutch

Backup power is critical to rail operations, but the pressure is on designers to reduce the weight and size of these components while reducing maintenance requirements and increasing reliability.

CAF, Spain's largest rolling stock manufacturer, is achieving this by installing Saft batteries in 118 Civity EMU (Electric Multiple Unit) trains that will run on the Dutch railway network. The batteries will ensure continuity of power for critical control, safety and communications systems for more than three hours if the main power supply fails.

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©CAF

Saft on-board batteries will provide backup power on CAF's sprinter new generation trains for Dutch Railways.

©Benetti

Silent running for luxury mega yacht

The stakes have just got higher for owners of luxury mega yachts. It's no longer enough to have the biggest and fastest vessel on the seas. They now want hybrid electric drives that offer the possibility for smooth, silent, emission-free operation. And that's where Saft's specialized marine lithium-ion (Li-ion) batteries come in.

Saft has just won its first contract in this sector for the Zoza luxury mega yacht project. It will be one of the largest and most advanced private hybrid luxury yachts in the world; the vessel will feature an innovative propulsion system with six main engines and an electrical power plant featuring two Saft battery systems with a total capacity of 3 MWh.

"Our objective for Project Zoza is to create ultimate comfort and style by adopting the latest state-of-the-art marine technologies. Saft's battery systems will help to take yacht design to the next level by supporting silent propulsion and emission-free operations in harbor," said a representative from the yacht's future owner.

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"Our objective for Project Zoza is to create ultimate comfort and style by adopting the latest state-of-the-art marine technologies."

Award win for low emission ferry

The Scottish ferry, MV Catriona, was named as the best electric and hybrid propulsion system at the Electric & Hybrid Marine Awards 2016. This pioneering ferry features two Saft Seanergy® battery systems that provide a total of 800 kWh of energy storage. By integrating the batteries, the ferry's owner Caledonian Maritime Assets saves up to 30 percent in fuel consumption and CO_2 emissions.

Powering exploration, today and tomorrow

©CNES

Sarah Cruddas @sarahcruddas

It was called Europe's 'Apollo Moment'. Travelling billions of miles across our solar system, to chase a comet and then land on it. The technological feat was equivalent to landing a fly on a speeding bullet.

It was a mission that captured the hearts of the world in a way that no other European one has. With the spacecraft Rosetta and the lander Philae transformed into characters adored and followed by millions on social media and through their cartoons. And it is a mission which was made possible with the help of Saft technology.

When you think of space exploration, batteries are not necessarily the first thing that come to mind. But for more than 50 years Saft batteries have been enabling space exploration. Batteries for rovers, landers, space probes, tools to name but a few. Batteries that have enabled our science fiction vision of a Space Age to become reality.

When Philae landed on the surface of the comet 67P Churyumov-Gerasimenko, not everything went to plan. Philae bounced across the surface. It landed in an area which meant its solar panels would not get the sunlight needed. But the Saft primary battery on the Philae lander worked. It did not need sunlight. After more than a decade travelling across our solar system it worked. It provided 60 hours of power for all the scientific experiments performed by the Philae lander. This information has helped to tell scientists more about comets, how they are formed, how they evolve. What they are made of. This is science that found ingredients that are crucial for the origins of life. The data collected is so vast that discoveries will still be made from it in 30 years' time.

> It was called Europe's 'Apollo Moment'

Saft's primary battery enabled this. With all the glitz and glamour of space exploration, it is the things which we do not shout about, which quietly make the impossible possible. And will continue to do so as we push forward with our endeavors in space.

About the author: Sarah Cruddas is an established space journalist, broadcaster and author. She has an academic background in astrophysics and is the face of space on many British and US TV channels.

60 hours
battery-powered operation of Philae lander

31 months
time spent in deep space hibernation

Scan this QR code and watch the France 3 Saft Poitiers Philae video

Sebastian Muench, Marketing Team Leader at Berlin Heart

©Berlin Heart

60 second brief – Berlin Heart

Your heart is the ultimate pump. In the time it takes to read this page it will have pumped around five liters of blood around your body. But sometimes medical conditions mean that it will require some assistance, and that is where the ventricular assist devices (VADs) manufactured by Berlin Heart come in. Sebastian Muench, their Marketing Team Leader, answers our questions:

Q - What do your devices do?

A – Our VADs provide mechanical support for the hearts of patients with end-stage heart failure, many of them waiting for a transplant. VADs are designed to pump blood through the patient's body and thus relieve their sick heart. There are two devices, the implantable INCOR® for adult patients and the paracorporeal EXCOR® (pump outside of the body). Most importantly, the EXCOR® is the only VAD available and approved for pediatric patients.

Q - How long has the company been operating?

A – We were founded in Berlin in 1996. Since then we have grown to 250 employees. And this year we celebrated our anniversary '20 Heartbeating Years'. In that time, we have supported around 4,600 patients in more than 40 countries.

Q - How long have you been a Saft customer?

A – We have been using Saft's rechargeable lithium-ion (Li-ion) MP* batteries since 2002. They meet our very high expectations for both reliability and long-term availability.

Q - What role do the batteries play?

A – The batteries are mission-critical. They provide totally reliable mobile power for the VADs. Mobility is also an essential feature for our patients as it enables them to enjoy an improved quality of life since they can walk around freely and leave the hospital ward.

Q - How long will the batteries last for?

A – Normally a patient can enjoy total freedom from external power for up to four hours between charges. This is a very demanding application and the battery packs are replaced at intervals from six months to two years.

Q - How will Berlin Heart's technology evolve?

A – As the technology continues to evolve, we hope to deliver VADs that will further minimize the constraints for our patients. This will require smaller and more powerful batteries that enhance the mobility of our patients.

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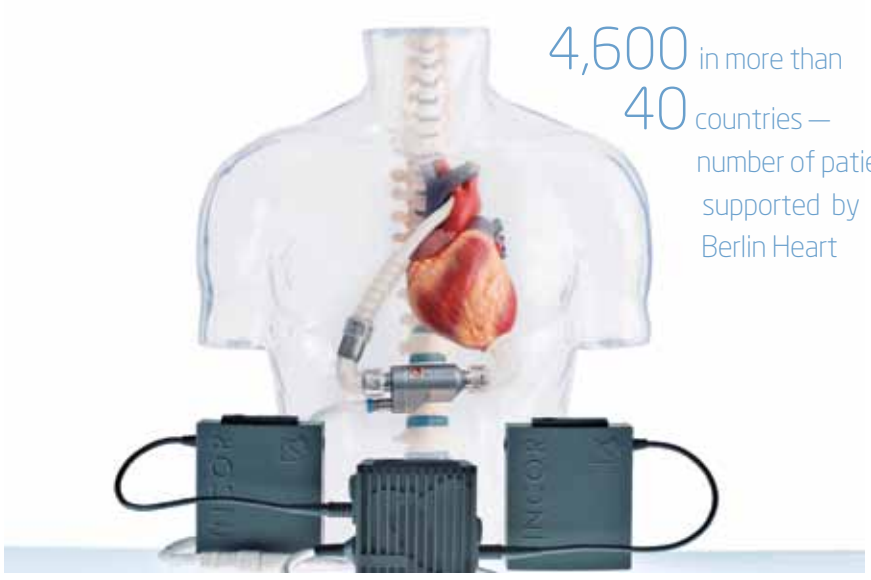
**MP (Medium Prismatic)*



©Berlin Heart

The INCOR® implantable ventricular assist device from Berlin Heart.

When the heat is on – LM smart meter cells deliver

The new LM cells based on Li-MnO_2 technology

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-40°C to +85°C
new LM cells operating temperatures

Scan this QR code and watch a video about how our cells are produced in South Shields, UK

Smart meters are rolling out to warmer regions of the world such as the Middle East and Asia.

Not only do smart meters provide consumers with more accurate energy bills but they are also a key component of our transition to renewable energy as they provide utilities with a clear picture of exactly where, when and how much energy is consumed. They need their own source of power for monitoring and data transmission and typically rely on primary batteries based on Li-$SOCl_2$ chemistry that perform well in temperate regions.

However, their adoption in hot climates is a challenge for these cells. Because at higher temperatures they struggle to deliver the high current pulse needed to activate essential data collection and transmission functions.

A popular option is a hybrid design that pairs a Li-$SOCl_2$ cell with a capacitor - the cell provides the high capacity needed and the capacitor delivers the pulse. It works well, but has cost, complexity and space implications.

Saft is now offering metering OEMs an elegant alternative with its new LM cells based on Li-MnO_2 technology. They deliver both high capacity and high power capability at operating temperatures from -40°C to +85°C.

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No need for a flying service visit

It can be costly, dangerous and take precious time to send a technician out at short notice to hard-to-reach industrial and utility sites.

That's why these sites place major emphasis on redundant backup systems with high reliability and maintenance-free requirements. And that includes their backup batteries, where Saft nickel batteries are increasingly the technology of choice.

One example is E.ON's Amrumbank West offshore wind farm, which lies 40 km from the nearest land in the North Sea and generates up to 302 MW. The investment case for this expensive infrastructure calls for turbines to be online as much as possible to generate maximum power, while minimizing the number of costly maintenance visits by helicopter.

By fitting E.ON's 80 turbines with maintenance-free backup batteries, power systems supplier Benning has played a role in improving the viability of renewable energy. The Saft Uptimax batteries will power emergency lighting and communication for up to four days.

Value for money in Brazil

The same battery technology has also been chosen by Brazilian power utility CEB (Companhia Energetica de Brasilia) to provide backup power across the entire network of distribution substations serving Brasilia, the country's capital city.

Like many utilities, CEB's objective is to deliver reliable power – and demonstrate value for money for Brasilia's 2.9 million residents. In support of this, the Saft Uptimax batteries will provide a significant increase in availability and reliability while reducing overall costs when compared with the existing lead-acid batteries.

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©E.ON-Amrumbank

Saft Uptimax is the only battery system that meets E.ON's stringent technical requirements.

Renewable power for remote telecom stations

Saft Evolion® modules deliver energy storage for PowiDian's renewable energy stations that power off-grid telecom sites.

Delivering a reliable electricity supply for remote telecom installations where the grid is unreliable or non-existent is a challenge in itself. Putting it in the form of a turnkey package system that makes effective use of renewable energy is even harder. But that is what PowiDian, a spin-off company from Airbus Group, has achieved with the help of Saft's Evolion® lithium-ion (Li-ion) battery modules.

> "Our goal is to deliver a reliable, non-polluting, year-round power source anywhere on the planet and with only one maintenance site visit per year over a 15-year lifetime."

The result is SAGES (Smart Autonomous Green Energy Station), a turnkey solution that uses one or more forms of renewable energy (including solar, wind turbines, marine turbines, geothermal and hydro power). This energy is stored using a combination of Li-ion batteries for the short term and hydrogen batteries for the longer term, ready for use when required.

While the main application is expected to be mobile telecoms, SAGES offers great potential for many other off-grid operations and resorts, weather stations and defense installations.

"Our goal is to deliver a reliable, non-polluting, year-round power source anywhere on the planet and with only one maintenance site visit per year over a 15-year lifetime. The proven reliability and long life of Evolion® Li-ion technology is key to helping us achieve that goal," explains Pierre Langer, PowiDian CEO.

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100% green
renewable energy solution

1 site visit/year
required for maintenance

We've got it covered

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GSMA
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Satellite 2017
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Energy Storage Europe
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Hannover Messe
April 24-28
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MRO America
April 25-27
Orlando, FL, USA

Fly **safely** with OEM **approved** batteries

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2/3 of the world's fleet flies with Saft batteries, including the Airbus A320.

Scan this QR code and watch a video on Saft's aviation batteries

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