

SAFT INTERNATIONAL

INNOVATION PAGE 4

Pioneering GEO Li-ion power



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Our aim: continuous improvement ...and remarkable performance



In recent months, Saft has focused on achieving still higher levels of performance. This focus has won us recognition from many customers.

The achievement isn't an accident. It's driven by a company-wide program that has been implemented for several years now. We call it our "World Class" program, and its scope reaches everyone in the company. Its focus is on continuous improvement.

Top military officials in Europe and North America have visited our plants, but not really for an inspection. Instead, they mainly wanted to thank our teams for our dedicated work in meeting exceptional levels of demand.

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Breakthrough photovoltaic performance

Sunica.plus brings solar panels — even in remote locations — greater reliability and efficiency



Quality-certification authorities have recently reviewed our operations at two European sites, ranking them at the top of the league. And, following the amazing success of the two Mars rovers, Spirit and Opportunity, NASA has bestowed kudos on us as one of 25 members of the Mars Exploration Missions who, in their words, “did it right”. Our batteries performed perfectly on both missions.

In a different area, an important opportunity opening up for Saft is the electric- and hybrid-vehicle markets. I have therefore just appointed a dedicated team to address our customers’ needs worldwide. This team will enhance our partnerships and underscore our commitment to new technologies in the automotive world.

This issue gives you a great overview of some of the many high-tech customers we serve with quality products and services.

John Searle
Chief Executive Officer



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INNOVATION

W3A opens multimedia services

In mid-May, satellite operator Eutelsat began offering revenue-generating services from W3A, its geostationary Earth orbit (or GEO) spacecraft that had been launched just a few weeks earlier. The multimedia services include broadband Internet access and videoconferencing in addition to TV broadcasting and traditional data traffic. In an industry premier, its batteries feature rechargeable lithium-ion (Li-ion) technology, supplied by Saft.

EADS Astrium, Saft's customer, is the supplier of this newest space infrastructure.



Built for Eutelsat by prime contractor EADS Astrium, W3A is one of the largest communications satellites ever. It was launched on March 16 by a Proton rocket and almost immediately ushered in a revolution in GEO satellite power. Within days, the W3A reached – on schedule – its orbital position 36,000 km (about 21,000 miles) above the Earth's equator just at the time of the spring equinox, on March 21.

That's important, because GEOs need to use their batteries only during a 45-day period around each of the two equinoxes. So the W3A had to begin using its Saft Li-ion batteries immediately – and Li-ion batteries had never before been used on a GEO bird. Saft is the pioneer supplier of this advanced battery technology to EADS Astrium.

The initial reports from those in the business: "All is going well on W3A. The battery is working very well and we have seen no problems during these final days" of the equinox.

Generous capacity, broad footprint

Weighing 4,250 kg at launch, W3A will provide a full range of services in the Ku and Ka bands, including enterprise links, Internet service and television broadcast. Users in W3A's footprint range across Europe, Africa and the Middle East. In all, 55 transponders fly on the spacecraft, 50 of which can be operated simultaneously. More transponders translate into more revenue for the operator. The powerful smaller-size, lower-weight Saft batteries enabled Eutelsat to pack greater capacity on W3A.

W3A's battery is made of Saft's Li-ion VES 140 cells, which are manufactured in Saft's plant in Bordeaux, France, and assembled into modules and tested at Saft's facility in Poitiers, France. The batteries, as the payload itself, are designed to perform throughout the 15-year service lifetime of the satellite, delivering 9,600 watts (DC). In fact, this performance requirement is regularly exceeded, even in the tough environment of space.

With this power and capacity, W3A can help Eutelsat serve new customers with advanced multimedia services. "W3A has been designed to optimize the business potential at one of our long-standing orbital

positions that already serves blue-chip clients such as the EBU, Reuters, Digiturk and Hughes Network Systems," said Giuliano Berretta, Eutelsat's CEO.

First of many

Beretta continued, "In addition to supporting delivery of a full range of services to Europe, the Middle East and North Africa, this new satellite almost doubles our capacity over sub-Saharan Africa, thereby increasing our ability to serve users for business networks and for broadband services such as voice-over-IP, Internet access and distance-learning."

As the current fleets of GEO satellites are renewed, Saft's Li-ion batteries remain ready to serve their mission-critical assignment of ensuring reliable performance even in this extremely harsh environment — at the same time as they lighten the weight and reduce the volume that batteries need on the payload's platform. W3A is the first of many GEOs that Saft's Li-ion batteries will fly on.

Saft currently has contracts for 17 satellites with Li-ion batteries.

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Galileo plans advance

The Galileo constellation of satellites for global localization and navigation services will launch two "test-bed" satellites next year. Their batteries will also be Saft's Li-ions.



Alcatel Space will build these first Galileo test satellites, which are a precursor to the constellation of Europe's own global positioning and navigation satellite system. The batteries feature the same Li-ion technology chosen for W3A, although sized to Galileo's power requirements.

Set to be fully operational in 2008, Galileo will be Europe's own global navigation satellite system, providing highly accurate, guaranteed positioning services under civilian control. And it will be interoperable with the U.S.'s GPS and Russia's Glonass, the two currently operational global satellite navigation systems.

The Saft batteries are qualified for all Earth orbits: Low (LEO, for observation and science applications), middle (MEO, such as for Galileo) and geostationary (GEO, where telecoms and weather spacecraft fly).

INNOVATION

The Airbus A380: Flying 21st-century technology

The A380 Superjumbo has already flown off the Airbus designers' drawing boards. It is now being built in the aircraft-maker's main assembly plant, in Toulouse, France. Among the proud suppliers to this record-breaking commercial jet: Saft through its partner, Artus.



Next year, the Airbus Superjumbo will be flying — not just off the drawing boards, but off the runway. In test flights, to be sure, with commercial deliveries set for 2005. But this "over-the-horizon" dream in commercial aircraft is now about to fly in from the horizon, wherever you are on the planet. And it will fly in with Saft batteries onboard, powering the direct-current generation system supplied by Artus. The technology of this system, its batteries, and the entire aircraft is definitely cutting-edge.

Airbus has a long and successful record of pioneering new technology in an evolutionary — and environmentally responsible — manner. This approach ensures better aircraft performance, lower operating costs, easier handling and greater passenger comfort. Saft's high-tech battery participates fully in this equation of results delivery.

The A380 will pioneer new — yet proven — technologies in many ways, all to the advantage of its airline operators and their passengers. Saft's batteries are no exception.

New performance levels

The A380 will achieve new levels of aircraft performance in many ways: passenger comfort and operating efficiency, among them. In the latter area, the Saft battery plays a key role. Saft's ultra low maintenance (ULM®) technology for aviation applications has been still further enhanced. The A380's battery is based on its cousin at Saft, the nickel-cadmium (Ni-Cd) battery already in service in aircraft around the world, and most notably in the latest Airbus A340 jets.

The Saft ULM® technology is proven to reduce operating costs for battery maintenance significantly. The savings for A380 operators will rise still further.

Key to improved performance and airline's life-cycle cost is Saft's plastic-bonded (instead of sintered) negative electrode, a technology that dramatically reduces the battery's water requirements. Saft's patented negative electrode weighs less and delivers more power from a smaller battery. Airlines obviously appreciate the advantages, since the aircraft that they fly will weigh less, in terms of onboard equipment, while still carrying the same number of passengers — or even more.

Excellent Artus-Saft algorithm cooperation

A battery, no matter what its application, represents an electro-chemical force — and

technology challenge. It needs to deliver the right power and, as a storage battery, be recharged at the right power. To meet the unique A380 requirements for round-the-clock duty, onboard charge has been specifically optimized to minimize maintenance and maximize lifetime performance while assuring both the integrity of the no-break DC system and the starting capability of the auxiliary power unit (or APU).

As the A380 — ordered by airlines in countries as diverse as the hot-hot Gulf and the wet-icy British Isles — will need to operate, as its predecessors, in a variety of environments, the battery needs to do so as well. Saft's 20-cell 50-Ah batteries for the A380 come with temperature sensors, to ensure proper charging (photo).

But the charging technology comes from Artus, the supplier to Airbus of the DC generation system (of which Saft's batteries are a key part). Battery charging and monitoring criteria from Saft, derived by Saft engineers in their laboratories from extensive testing of the ULM® aviation batteries, enabled Artus to program their electronic charging systems for the A380.

This will ensure that the aircraft's 28-V network will have reliable power for avionics and other mission-critical assignments.



Civil aviation and Saft
Two out of three commercial
aviation aircraft fly with
Saft batteries. Technology
advances are the reason why.

Cost less in operation? Work longer? Require less maintenance? All are reasons for choosing Saft aviation batteries.

Operating expenses for an airline are as big a challenge as capital expenses. Saft helps reduce the bottom-line number, making airlines more profitable, as well as boosting the market opportunities of aircraft manufacturers. Saft, a player in both fields: helping aircraft manufacturers and airlines.

For the greater profitability of both.

Saft Battery University



How many times have you heard someone say, "It's just a battery"? Well, in this day and age, this is no longer the case. Consider the following: Your aircraft is sitting at the gate and the "battery fail" light illuminates. At the very least, this is going to result in a late takeoff; the worst-case scenario is a canceled flight. How much did this cost you? How did the customer or CEO feel having to wait for another flight?

Or, the aircraft is at 35,000 feet and the unthinkable happens: total electrical system failure. The battery is the last line of defense to get the aircraft back on the ground. All of a sudden, it is no longer "just a battery"!

If your Ni-Cd battery isn't properly maintained, then you may end up with premature battery failure. You may be asking, if that is the case, then what can I do to maximize my investment? Saft, the industry's leading Ni-Cd battery manufacturer, offers a certified

battery maintenance class that will show you how to keep your batteries in peak operating condition and maximize your return on investment.

The two-day class encompasses everything from basic electrochemistry and battery maintenance practices to environmental considerations. After you complete the class, you will know the hows and whys of properly maintaining your battery so you can get maximum so you can get maximum life out of it.

In addition to class dates, you can access valuable information addressing various topics regarding Ni-Cd batteries as well as all of the current component maintenance manuals.

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Visit www.saftbatteries.com->aviation->aircraft->technical information->training.

For more news on Saft training courses on aviation battery maintenance, see p. 8.



Asia aviation maintenance: China leads the way

China is home to an ever-growing league of airlines, as it gives wings to its billion-plus people. China's airlines fly planes with mission-critical components, such as their batteries. They are mostly nickel-cadmium batteries (or Ni-Cds), supplied by Saft. **So Saft's Battery University has trained Chinese airline technical personnel in the best-ever battery maintenance.**



Last year's Beijing Air Show — China's largest — was the venue. Saft, along with its Asia-Pacific distributor Aviall, was the host. The subject? How to maintain your aircraft batteries. Saft's best engineers shared their knowledge (in both English and Chinese) with the maintenance people at China's leading airlines during a high-profile aircraft-battery maintenance training seminar held during the show.

The day-long seminar drew three dozen participants hailing from 17 different airlines with home bases all across China. Aviall's Yun Shan, who's been in Aviall's Beijing office for more than a decade, reported very positive feedback from the participants. "We expected only about 20 initially," he notes, "but the seminar's topic is obviously very attractive."

We explained in detail how the right type of battery maintenance contributes to the aircraft's safety, and therefore the passengers' and crews' safety, too."

Lower operating costs

"And," Yun continues, "we show how expert battery maintenance will help

decrease operating costs." According to Saft's Reinaldo Castro-Mercader, who came from Saft's aviation battery manufacturing plant in Bordeaux, France, to give the seminar, "It's relatively simple to maintain an aircraft's battery, but the airline's engineering teams must master the checklist of maintenance steps, and understand the electrochemistry behind it."

According to Saft, a top airline priority is to operate aircraft safely on a daily basis without incurring maintenance-related flight delays or cancellation — an extremely challenging task. "Operating costs are where a maintenance program can have the greatest impact," adds Castro-Mercader, a quality assurance engineer. He praised the participants' interest and knowledge — noting that there was no shortage of intelligent questions — as well as what he called Aviall's "super" organization of the event.

Plant seminars

Saft regularly hosts two-day seminars on aviation battery maintenance at its plants in Bordeaux as well as in Valdosta, Georgia,

which both make the batteries. The small groups of airline maintenance personnel thus get training that's half theoretical and half practical, plus a tour of the actual production lines. Seminar dates are spaced throughout the year and can be consulted on Saft's internet site. (Visit www.saftbatteries.com->aviation->aircraft->technical information->training.)

But the Beijing seminar was the first time that Saft and Aviall had hosted so large a group "off site". Castro-Mercader, however, has also done special training seminars on battery maintenance for a number of airlines and air forces in Europe and around the Mediterranean.

Concerning the Beijing participants, Yun says that he's still getting follow-up e-mails from them with requests for more specific information. And Saft in any case wants to keep up a long-term relationship with these key maintenance personnel, who are the front lines of a challenging job to ensure greater safety and on-time performance for both the traveling public and the airlines.

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PARTNERSHIP

Storing Sun power: Sunica.plus stars



Photovoltaic applications — where the Sun's rays are harnessed to generate electric power — are tough on storage batteries. The batteries must withstand a complex pattern of shallow and deep discharges, resist rough treatment and extreme temperatures, and be absolutely dependable for long periods. Saft's long-proven Sunica rechargeable nickel-cadmium (Ni-Cd) batteries are improving still further with the launch this year of Sunica.plus.

Virtually maintenance-free for more than four years during their 20-year service life, Saft's latest Ni-Cds for solar arrays feature a new, optimized electrode design. It is combined with Saft's proven internal partial gas-recombination electrolyte technology, derived from its Ultima battery range. The refinements deliver improved behavior in unstable charging conditions and significantly extend topping-up intervals.

And filled-and-charged Sunica.plus batteries can be stored for a year without maintenance, and extended storage is possible when the batteries are unfilled.

Robust pocket-plate construction and a shock-resistant polypropylene casing material enable Sunica.plus to withstand harsh treatment over difficult transportation terrain. Since its alkaline electrolyte doesn't react with steel, the Sunica.plus structure stays intact throughout its life. Most importantly, the performance of Sunica.plus is completely predictable throughout its entire service lifetime.

Sunica.plus has already won orders from customers in Scandinavia (box).

Meeting PV-specific demands

Compared to Ni-Cds used in standby applications and for emergency power, batteries for use with photovoltaic (PV) solar panels need to meet different requirements. Cycling varies on both daily and seasonal timeframes, with an impact on both the depth of discharge and the state of charge. Voltage and current tend to fluctuate during the charging cycle. Ambient temperatures may range significantly, and they are usually installed at sites that are difficult to reach, requiring still higher levels of reliability.

Once on site, a PV battery also needs to be easy to install by staff without any special battery training.

Technical characteristics

Sunica.plus rises to all these PV technical requirements — and still others. It operates a temperature extremes ranging from -50°C to +70°C. For example, at -40°C Sunica.plus still retains 80% of its capacity at a typical 120-hour discharge. Lead-acid

batteries will freeze at that temperature, often cracking the cell cases. At the other end of the thermometer, lead-acid loses 50% of its service life for every 8°C increase above 25°C. For Sunica.plus, the same temperature increase shortens its life by only 20%.

Sunica.plus achieves over 90% charging efficiency and cycles at an average 15% daily depth of discharge. Maintenance has been reduced with visits needed only every four years or more.

And Sunica.plus doesn't need a disconnecting switch, as lead-acid does, to prevent damaging effects from deep discharges. Ni-Cds can be 100% discharged while still retaining the battery's full capacity. Sunica.plus batteries range in capacity from 45 Ah to 1,110 Ah.

Additionally, Sunica.plus batteries — as all Saft Ni-Cds — are fully recyclable. A Saft service collects and disposes of batteries at the end of their service life.

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Swedish seaports...under night sky

Sweden's coast guard, long a Sunica user for its seashore beacons, realized that the once-yearly inspections of the beacons' batteries represented a significant operating cost. If these maintenance inspections could be spaced out by a year or more, then operating expenses would fall significantly. The Sunica.plus technology delivers on this expectation.

A Sunica.plus precursor from Saft, installed by the coast guard in 1999, was checked after four years of service. The inspection showed that the Saft Ni-Cd PV battery was as good as new. Now the Port of Gothenburg has decided to renovate all the fairway infrastructure leading craft into and out of the port. Advised by the Swedish coast guard, the port went directly to Sunica.plus: 34 new lighthouses will each have two Sunica.plus batteries.

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Bullet KTX transforms South Korean travel

KTX, which stands for Korea Train Express, has begun running on the key Seoul-Pusan line. The coaches on each trainset as well as the locomotive rely on Saft's nickel-cadmium batteries for critical backup power if overhead catenaries should fail. In addition to showcasing the latest in railway technology, the KTX is transforming the lives of South Koreans in many great and creative ways.



Supplied by Alstom Transport, a strategic Saft partner in the railway industry, the KTX bullet trains began revenue service in April 2004. At nearly 300 km/h (185 mph), the high-speed trains will cut in half travel times between Seoul, the nation's capital, and Pusan in the south, slashing what has been a four-hour journey over the 412-km route down to 1 hr 56 min.

With the inauguration of this service using Alstom Transport trains, South Korea joins the ranks of an elite handful of industrialized nations operating high-speed trains. The KTX's design is directly derived from the Alstom Transport technology deployed in both France and Spain. Since France's TGV (or high-speed train) started revenue service in 1981, Saft batteries have been a critical part of the Alstom Transport railway design.

Alstom prefers the Saft technology because it delivers higher reliability along with less weight and lower maintenance costs. These qualities in turn deliver more bottom-line income to railway operators by reducing their operating expenses.

Living differently...in the fast lane

On April 1, the first day of commercial operation, one of the KTX drivers reported, "As there was little noise, [the trip] was good and comfortable.... Safety and speed are our pride and joy." Although the first runs (at roughly 5:00 a.m.) were "only" at 80% capacity, those later in the day were packed full. Korail, the state railroad operator, charges about 25% less for tickets than airlines do for the same journey. So train passengers benefit from choosing rail over air.

So do those on the road. For the 300-km/180-mile drive to Seoul from Daegu (the country's third-largest city, also served by the KTX), gas and tolls run \$40/roughly €35 while the train ticket costs just \$35. In short, the KTX is already proving to be a significant magnet along this hugely important Korean corridor, which accounts for 66% of the country's passenger rail traffic, 71% of its population and 75% of its national wealth, or gross domestic product (GDP).

The Saft batteries on the KTX also help account for some of Korea's GDP.

Technology transfer to Korea

At the time Alstom won the contract, in 1994, it set up a Korean subsidiary named Eukorail to handle local contracting. While Alstom built in France the first 12 of the trainsets that were delivered, it was agreed that the following 34 would be built in Korea after transfer of the TGV technology. Saft's battery production kept the same technology transfer promise.

The first batteries (two for each locomotive, and one on each of the coach "trailers") were manufactured at Saft's plant in Bordeaux, France. The 54-cell SRX batteries deliver 130 Ah from their sintered/plastic-bonded electrodes. This power can handle such basic tasks as raising and lowering the locomotive's pantograph (the device on the locomotive's roof that makes contact with the overhead catenary). If the catenary power fails, the batteries take over emergency lighting, air conditioning and communication — and provides the power to stop the train.



Key KTX NUMBERS AND DATES

A shortlist of the numbers and dates that make the KTX a world-class technology success in the rail industry.

- €15 billion: Total investment in the KTX line (mainly infrastructure)
- €1.5 billion: Value of the Alstom Transport KTX contract
- 46: Number of trainsets ordered (34 built in Korea)
- 72/204: Batteries delivered by Saft, respectively from France and Korea
- 25%: Savings for KTX passengers compared to an air ticket
- 300: Top speed (in km/h) of the KTX
- 387: Length (in meters) of a single KTX trainset (the KTX is the longest high-speed train in service, excluding Eurostar)
- 935: Number of passengers on a KTX
- 500,000: Daily passenger volume expected on the Seoul-Pusan line by 2010
- 6: Number of Saft nickel-cadmium batteries on a KTX trainset
- 1994: Contract signature
- 1998: Start of Saft technology transfer
- 2004: Start of revenue service

Transformation all along the line

After the first deliveries from Bordeaux, as early as 1998 Saft began transferring battery assembly operations to its base in Korea. In 2002, the first "made-in-Korea" trainset (including its assembled-in-Korea Saft batteries) was delivered to Korail.

So the KTX has helped grow the Korean economy even in its construction phase. In its service lifetime, it will make affordable weekends away from Seoul easier. It will help transform the entire country into a vibrant economic hub for North-East Asia. It will draw thousands of cars off the roads. It will increase the value of real estate out-

side South Korea's major cities.

And, thanks in large part to its Saft batteries and Alstom technology, it will ensure that Korail remains a profitable and vital player in South Korea's economy.

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"Paper tale" as French daily prints with Ni-Cds

Le Monde, a daily French newspaper with a global reputation, is handling its press runs with automatic guided vehicles (AGVs) supplied by BA Systèmes. The AGVs are powered by Saft Ni-Cds that feature superb charging capability. It's a tale of automatic newspaper printing that boosts the paper's efficiency.



"Opportunity charging" is the key phrase in the AGV story. Whenever an AGV is not bringing or changing a paper reel for the presses of Le Monde, it automatically homes in on a docking station where it receives a fast charge. BA Systèmes, which specializes in industrial logistics systems, chose Saft's STH rechargeable Ni-Cd batteries for its AGVs.

"The rapid charging capability of the STH batteries, combined with their [lighter] weight and space-saving design, along with Saft's service, meant that it was the best battery solution to ensure the success of the project for Le Monde," says BA Systèmes Technical Director Jean-Louis Thezé.

Five AGVs from BA Systèmes are on the job, round-the-clock and seven days a week, at the newspaper's printing site just outside Paris. Saft's STHs power both the vehicle's traction and its lifting gear (which picks up and positions the reels) as well as its on-board control systems.

Reducing on-board size and weight

Compared to valve-regulated lead-acid batteries, Saft's STH solution slashes the size and weight of on-board batteries by 75%. So the Ni-Cd technology significantly boosts the power-to-weight ratio of each AGV. Lead-acid batteries, which are often specified for AGV applications, can't be fast-charged. They would also require further significant costs in terms of spare batteries and labor.

With Saft's Ni-Cds, Le Monde's AGVs are always available when they're needed. The printing plant for Le Monde turns out around 600,000 newspapers each day. The AGVs can pick up and deliver 37 paper reels an hour, each weighing 1,500 kg. Each AGV has a 48-V battery system with STH cells that deliver a nominal capacity of 120 Ah.

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EXTREME POWER

Breakthrough electric propulsion — and Ni-MH

WaveCrest recently launched its first electric bike, featuring a breakthrough electric propulsion technology that transforms electrical energy into mechanical motion — and vice versa — with exceptional power and efficiency.

The electric bikes' power comes from Saft's nickel-metal hydride (Ni-MH) batteries.



Originally aimed at security forces, the TidalForce M-750 (as WaveCrest's first electric bike is called) is a rugged, durable and foldable electric mountain bike. In the back hub is its patented WaveCrest Adaptive Motor system, and in the front hub are the Saft Ni-MH batteries composed of Saft's VH D cells. "We've created superior, reliable and unique bicycles powered by the newest wave in transportation technology," says Roy Barbee, WaveCrest's president and CEO.

By close consultation with WaveCrest, Saft engineers have helped ensure the best electronic interfaces for what is a unique circular battery. Thirty Ni-MH cells are linked via 15 cables and four connector systems to the bike's motor and controls. Saft's role also involves receiving components from other suppliers chosen by WaveCrest for the manufacture of the bike's battery subassembly. The TidalForce M-750 has a range of 20 miles (about 32 km) on a single battery charge. It reaches top speeds of 20 mph, which is consistent with U.S. government regulation of light transport vehicles.



Greater mobility and security

On the heels of this electric bike, WaveCrest also launched another model, called iO, for consumers. Both electric bikes deliver similar performance levels which include, as WaveCrest points out, efficiency, acceleration, quietness and torque — all unparalleled in the electric bicycle market. Riders of the iO (named after Jupiter's third-

largest moon) can augment its range by pedaling. So, for exercise, consumers can pedal the iO without assistance, and then add as much power as they need to climb hills and cover long distances.

Security officers who use the TidalForce M-750 can quickly apprehend suspects in pursuit situations. They also can patrol larger areas for longer periods of time, and carry more equipment and supplies without fatigue.

What's unique about the technology?

Conventional motors waste energy at nearly every phase of their operation, WaveCrest points out. But WaveCrest's electric propulsion system dynamically reconfigures itself to be always at peak performance.

In addition to the electric adaptive motor system, the technology features customizable controls that manage the system's total performance — and an advanced Saft battery system that delivers excellent power, range and efficiency. Thousands of times a second, optical sensors in the motor inform a digital signal processor how fast the motor is rotating and how much torque it is generating. The chip then uses algorithms to optimize motor efficiency at that speed and at that torque, automatically recharging the battery when feasible.

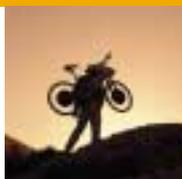
To ensure the technology's success, Saft has not just delivered unique battery systems but has also built a close long-term partnership — a great combination in making these electric bikes a success.

VH D 9500: power for many applications

In addition to mobility, Saft's VH D cells have found a number of other applications.

They include:

- Professional electronic devices
- Lighting equipment
- Lawn and gardening tools
- Home appliances



The 58 mm x 32 mm super-high-energy cell packs 9500 mAh and operates at 1.2 volts. Along with super high capacity, the VH 9500 also features fast charging (in as little as two to three hours) and good energy storage.

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Wet, electric & safe: a plumber's dream



Plumbers need electric power for their portable drain-cleaning machine, but water — as everyone knows — conducts electricity. So how can manufacturers devise a safe plumbing tool that's also powerful and efficient? **By replacing the AC cord power with a DC battery, from Saft. Trojan Tool tells the tale.**

The breakthrough concept of replacing AC power with DC batteries came to Trojan Tool Vice President David Manning, who patented his concept in 2003. In January 2004, the U.S. maker of a family of sewer and drain-cleaning machines for the high-end professional plumbing services met Saft to discuss an urgent request.

The single most important industry event — the Pumper Show — would take place in Nashville, Tennessee, in February, just a month later. Trojan Tool wanted to unveil its new "Go Cordless" concept and first products at the show. Could Saft come up with a rechargeable battery in time? The short answer is, "Yes".

Outperforming the AC competition

Saft designed and shipped fifty 24-volt VRE D batteries that Trojan Tool was able to showcase as part of its strategy to transform its line of sewer- and drain-cleaning machines — Colt, Pony and Stallion, for respectively small, medium and large drain jobs — from AC-powered machines, with a risk of electric shock, to a Saft-powered solution, with DC power and no danger of electric shock to the user.

The VRE D is a 5.5-Ah Ni-Cd cell which, for Trojan Tool, was delivered in a 20-cell battery that fits directly onto the newly-designed DC-powered Colt. It was on display at the February show. Additionally, the machine's DC motor that Saft's batteries drive has out-performed all competing AC-powered machines in actual operation by providing more usable torque.

And the battery-powered Colt is only the beginning of the transformation of Trojan Tool into a supplier of DC-powered plumber tools.

Safety first

Workplace statistics in the U.S. alone show that every year there are many thousands of cases of non-lethal electric shocks and hundreds of lethal electric shocks, all due to AC-powered tools and the wet environment in which they are used. These



injury/mortality facts can lead to lower insurance premiums for users of Trojan Tool DC-powered machines — users who are typically plumbers that clean sewers, drains and septic tanks.

With a shock-free machine such as the Colt with its Saft battery, insurance costs are expected to fall by 20% — good news for Trojan Tools' customers.

Multi-technology battery solutions

While the first Colt battery solution is Ni-Cd, Trojan Tools is planning to power its Pony and Stallion machines, which have higher energy demands, with nickel-metal hydride (Ni-MH) batteries from Saft. Supplying power to the company's mid- and high-end tool range, the batteries will deliver current at 36 V using Saft's VH D 9.5-Ah cells.

In the near future, Trojan Tool expects that its entire range will be cordless, leveraging all the advantages of non-AC-connected tools.

In helping Trojan Tool meet its tight deadlines for product innovation, Saft has relied on its sales managers, technical engineers and battery designers who can deliver customized solutions for rechargeable battery systems fast. This includes, in the case of Trojan Tool, a charge controller to manage the charge from a standard power supply and a "gas gauge" (or state-of-charge indicator) that is particularly important to optimize the job of the end-user. Transitioning from "corded" to "cordless", as Trojan Tool is doing, is a process that Saft knows well.

Making plumbers' tools safer and more productive

Trojan Tool's Vice President David Manning tells Saft International how his company came to the battery-powered cordless solution for its machines.

"Early last year," recalls Manning, "I was watching two plumbers unload a large sewer-cleaning machine from a van. Once the machine was on the ground, one man loaded the other with over 400 feet of electrical cord to run their machine, as the electrical outlet must have been a long way from their actual job site. As I watched them, I reflected on a comment from Jack Kline [CEO of Trojan Tool Manufacturing Co.] that over 500 plumbers were electrocuted every year in North America.

"I then realized that, if the machine were battery-powered, there would be no extension cords and the plumber wouldn't have to worry about being electrocuted. Another plus is that the job would only require one additional person instead of two, thereby increasing profits and manpower availability.

"Coming from the oil-field equipment business, I also knew that using a DC traction motor would provide the machine with substantially more torque than an AC machine, and therefore would have better performance than the current AC machines.

"We are very proud that Saft is on our team in developing our battery-powered sewer and drain-cleaning machine line of equipment. Their expertise has been invaluable to us in our development efforts, and the product has exceeded our expectations."

PARTNERSHIP

Warming blood in emergencies: Biegler relies on Li-ion

With mains power — or without: The ESH 04 emergency blood and infusion warmer from Biegler Medical Electronics operates whether there is mains power (when it can be plugged in) or if there isn't. Here it's shown with Saft's slim, light Li-ion MP batteries (upper left).



Biegler Medical Electronics has selected Saft's lithium-ion (Li-ion) batteries for use in infusion devices that it makes to warm blood — and other so-called “transfusable” liquids — in emergency situations. **Those involved in these sometimes life-threatening emergencies benefit, whether they're first-aid workers or those needing an infusion.**

Blood and other transfusable liquids are stored at low temperatures, even sub-zero. And health-care emergencies outside of hospitals often require portable, reliable equipment for first-aid workers. So, before liquids can be used for an intravenous transfusion, a first-aider needs to be able to raise their temperature to 37°C (98.6°F).

In these sometimes life-critical missions, the ability to ensure the liquids' temperature reliably is essential.

This is where Saft's Li-ion batteries play an essential role. Saft's MP lithium-ion batteries are now standard on the newest infusion warmers that Biegler Medical Electronics has begun making for use in emergencies, where access to mains power is difficult or impossible. Based in Vienna, Austria, Biegler supplies innovative, high-quality solutions for the medical profession worldwide.

For its warmers, Biegler selected Saft's Li-ion batteries because of their excellent reliability, light weight and high power.

New-concept medical technology

The Biegler solution to this medical challenge includes not just Saft's latest lithium-ion batteries. It heats liquids, such as blood, without any risk of contamination. The ESH 04 portable emergency warmer is designed to bring one or two flasks of blood or infusion liquids up to body temperature and hold them there (without a mains connection) for as long as 90 minutes, depending on the ambient temperature.

Biegler's ESH 04 features simple, fast and user-friendly operation. Three heat zones are independently measured by the device. Patients requiring emergency treatment will be able to benefit from transfusions that treat them sooner and better because the treatment is given closer to the place where the emergency has happened, all thanks to higher-tech medical electronics because the solution is portable.

Life-saving Li-ion

Saft's Li-ion MP technology features high operating voltage — of over 3 volts — as well as 20% higher capacity (assembled in parallel) than cylindrical cells, better battery and system integration, and high recharge capability: Even after the 800th recharge, 80% of the battery's capacity is still restored. The Saft lithium-ion technology delivers still more benefits. It retains 95% of its charge even after one month of storage at room temperature. It's recognized by the U.S.-based UL standards organization. It charges at temperatures as low as 0°C and up to 50°C. And it supplies power in environments from down to -20° and up to 60°C. So Biegler's new warming solution, with Saft's Li-ion MPs, will help save lives — reliably, and powerfully.

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North-Africa energy distribution with Ni-Cd backup

Oil flowing out of the Wafa fields in western Libya is delivered to a processing plant on the Mediterranean coast at Mellitah via a system that relies on Saft's Ni-Cd batteries for backup power.

Italy's ENI and Libya's National Oil Corp. have begun pumping oil from new fields in a desert area known as Wafa along the border with Algeria. Early estimates called for daily production to reach the equivalent of 39,000 barrels from some three dozen wells. A network comprising hundreds of kilometers of pipelines transports the oil to Mellitah for processing.

The electrical substations and energy distribution systems for this network were supplied by CEG Elettronica Industriale. To back up its critical 110-V DC and 110/220-V AC uninterruptible power supply (UPS) systems, it chose Saft's nickel-cadmium batteries. CEG based its decision on its previous experience with Saft Ni-Cds in Middle East oil and gas projects.

The Wafa project infrastructure, like its cousins in the Middle East, must perform in tough desert conditions.

The electrical power systems supplied by CEG are responsible for mission-critical operations in the Wafa infrastructure, so reliable backup power is essential. Saft's Ni-Cd technology delivers advantages in several respects.

In addition to ensuring a 20-year service life, Saft's Ni-Cds are virtually risk-free in terms of the “sudden death” that lead-acid batteries can suffer. Ni-Cd maintenance is also lower, helping reduce the infrastructure's operating costs.

Saft supplied the batteries on custom-designed racks: its SBMs for the DC application, with up to three hours of backup power; and its SBMs, SLMs and SBLs (depending on the specific requirement) for the AC UPS application, with up to two hours of power.

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MARKETS



Vrrrooomm!

Dorna Sports captures live video of motorbike races

Experiencing the ride on a Grand Prix motorbike — live — as it races in high-speed competition is a huge edge in the broadcast world. Dorna Sports' onboard video system enables viewers at home to get this experience. **And Saft's lithium-ion (Li-ion) batteries are a key part of that system.**



Mud and gears: Grand Prix races invariably involve getting wheels sunk in mud, plus gears that don't get shifted right. The onboard battery, from Saft, still helps transmit the race images.

Grand Prix motorbikes need to be light and fast, in order to win. Broadcast priorities require live video images from the bikes racing around the track. Dorna Sports has combined these two requirements with light-weight, compact video systems (including Saft batteries) that ride onboard the bike, shooting images simultaneously ahead and behind — as well as sometimes from a third camera with yet a different angle.

The result? A viewership that sticks to the screen longer and more often (with the consequent impact on ad revenues for broadcasters) during Grand Prix motorbike races that Dorna's stable participates in. So the Dorna on-bike video system, with its Saft MP Li-ion batteries, delivers bottom-line benefits to broadcasters and their advertisers.

The Dorna-specific battery pack designed by Saft includes three MP 144350 cells and comes with a specially designed state-of-charge indicator, which Dorna particularly appreciates. Before a race starts, the broadcasters need to be sure that the video feed will continue throughout the event, which can last two hours.



Light and powerful: The Dorna-specific battery pack includes three Saft MP 144350 cells ("MP" stands for "medium prismatic", a small flat rechargeable-cell type of battery that

is particularly powerful and that fits easily into engineers' designs). In this application, it comes with a specially designed state-of-charge indicator, which Dorna particularly appreciates. The Saft battery pack in all represents just 350 grams, roughly a third of the entire video system's weight.

Live image-switching... at high speed

Saft's MPs with Dorna's advanced video system will help broadcasters entertain Grand Prix motorbike racing fans still better, and keep viewers watching longer. With up to three TV-quality images from each of a dozen or more bikes, the broadcast director has a wealth of valuable video feeds among

which he can choose freely — all the feeds being reliably available, thanks in large part to Saft's reliable MP batteries.

The Saft MP Li-ion technology delivers a host of benefits. It retains 95% of its charge even after one month of storage at room temperature. It's recognized by the U.S.-based UL standards organization. It charges at temperatures as low as -20°C and up to 50°C. It supplies power in environments also from down to -20° and up to +60°C.

Reliable performance in a tough environment

Because of the vibration and other aspects of the racing environment, the entire video system — including the Saft battery pack and the transmitter — must be especially tough. But it is precisely this fast, tough environment that makes the images so valuable to the race organizers and broadcasters.

And it makes the robustness of Saft's MP batteries all the more valuable. Not just to Dorna Sports, but also to broadcasters who need to keep viewers glued to a race's live video images.

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Saft. New face, same vision.



As a newly-independent company, we at Saft are just as committed as ever to pursuing the win-win partnership with industry we have developed over the past 100 years. Saft is world leader in the design and manufacture of high-tech battery systems for industrial applications ranging from space, aeronautics and defence to telecommunications and road/rail transport.

In today's demanding context, we are determined to strengthen even further our position as a key added-

value partner, continuing to develop innovative, cost-effective solutions that provide energy when, where and how our customers need it.

Saft is 4,000 dedicated men and women in 23 countries united by a unique Saft spirit emphasizing technical excellence, teamwork and customer satisfaction. With Saft's sound financial backing and proven technological expertise, we look forward to continued teamwork with industry in rising to the challenges of an exciting future.

www.saftbatteries.com

