MISSION CRITICAL
POWER

missioncriticalpower.uk

ISSUE 25: December 2019

Sustainable backup

Olivier Amiel, marketing director for Saft's Industrial Standby Division, explains how backup batteries for the sector do not have to cost the earth

Traditionally, data centre operators have made investment decisions based on total cost of ownership (TCO). This is the sum of all the costs associated with a battery system throughout its life, including purchase, transport, installation, maintenance and end-of-life handling and recycling.

However, TCO also has a sustainability perspective. A battery system that is designed for a long and trouble-free life will also minimise the use of natural resources, energy and materials. There will be fewer replacements and fewer call-outs for maintenance visits from specialists, and most materials can be recycled once the asset reaches the end of its life.

Advanced lithium-ion (Li-ion) battery solutions such as Saft's Flex'ion are a case in point. They are designed for a long life of 20 years, whereas best-in-class valve regulated lead acid (VRLA) batteries need to be replaced every seven years or sooner. That would call for at least three sets of batteries, as well as transport and logistics, to match a single Li-ion.

Another benefit is that Li-ion operates at elevated temperatures. That means operators can turn up the temperature, reducing the need for cooling and saving energy. This improves energy performance, as measured by power usage effectiveness (PUE).

Sustainability is also an important consideration at the end of a battery's life. Saft established a global network of bring back points for spent nickel batteries about 20 years ago. We then ship the end-of-life nickel batteries to our facility in Sweden or to other fully certified recycling centres for efficient recycling. We are now planning to replicate that approach for Li-ion batteries as they mature.

Beyond the battery

However, sustainability extends beyond the battery installation itself. This is particularly true for data centre facilities in city centres, where space is at a premium, floors often have defined load bearing limits and rents are high.

Opting for a lightweight and compact battery system will minimise the space and weight in a building. In turn, it requires less civil and structural engineering support, all of which has a carbon footprint as well as a financial cost. In situations like these, the lifetime savings of a Li-ion battery system in an uninterruptible power supply system (UPS) can far outweigh its initial purchase price.

Short duration, high power

At the same time, it is important for suppliers like us to respond to the trend of data centre operators specifying higher power over shorter duration. While we have been supplying batteries to provide 5-10 minutes backup, many of today's customers want cover for as little as two or even one minute.

> We are planning to upgrade the power rating further when we introduce the next generation, in mid-2020, to offer 200kW per cabinet from the same footprint

They want that power to ride through interruptions or voltage drops. For example, our first-generation state-of-the-art Li-ion system provides up to 140kW of power per cabinet.

However, we are planning to upgrade the power rating further when we introduce the next generation, in mid-2020, to offer 200kW per cabinet from the same footprint.

Saft's Flex'ion batteries are designed for a long life of 20 years compared with seven or less for best-in-class valve regulated lead acid (VRLA) batteries

Fast pace of development

This is possible thanks to our approach to research and development. Battery technology is changing fast. I have personally seen an average increase in performance of about 10% every year since the start of my career. This is the result of research focused on four key areas: energy density, battery life, cost savings and speed of charging.

At Saft, we divide our R&D between a corporate centre in Bordeaux that oversees long-term research programmes, and several incubators that take a fast-paced approach inspired by agile development methodologies of the software world. All of this development is overseen by a technology roadmap.

For Li-ion technologies, the underlying principle is safety. Li-ion is an umbrella term that covers different battery electro-chemistries. Some of these are more reactive, offering higher performances but requiring more careful management and containment.

When creating systems for safety critical applications such as data centres, aircraft or ships, safety has to come first so we have developed our own Li-ion blend, called Super Lithium Iron Phosphate (SLFPTM), that boasts high levels of stability and safety.

Solid state for a step change in performance

Looking further ahead on our technology roadmap, we recognise the demand for a step change in battery performance that will take us beyond Li-ion. To achieve this, we are now developing the first generation of industrial solid-state batteries, which will provide high energy density that will take backup power and energy to the next level.

Whereas Li-ion uses a liquid electrolyte, solid-state batteries are named for their solid electrolyte, which is straightforward to contain and therefore promises high levels of safety. We have more than 100 engineers working on our solid-state programme and expect to start customer trials within the next few years.

Integrated UPS packages

Another essential aspect of backup for data centre operators is electronic monitoring and control. To achieve this, we have worked closely with main UPS manufacturers including AEG, Socomec, Eaton, Mitsubishi and Piller to develop packages that integrate Li-ion batteries into UPS systems.

The result is that data centre operators can plug their backup batteries into their control and SCADA systems, monitor the health and state of charge of batteries remotely and identify when a battery is approaching the end of its life – and take proactive action to arrange a planned replacement.

Role for nickel technology

Another battery electrochemistry used in the data centre backup power chain is nickel technology. Batteries such as Saft's SPH are designed to provide cranking power for starting diesel generators during longer outages.

Nickel technology batteries offer long-term value over VRLA batteries thanks to their reliability and long lifespan. Our technology roadmaps include two areas for development of nickel batteries.

The first is a remote monitoring system for these nickel batteries. This digital solution will provide the insight to keep track of the condition, performance and remaining life of the battery fleets. As a result, operators will be able to carry out condition-based maintenance and plan replacement only when it's needed, rather than a time-based schedule. This offers the clear benefits of savings in opex and better capex planning.

Second, we are making adaptions of our nickel electrochemistry to make the batteries a near plug-and-play replacement for VRLA. Nickel technology batteries previously needed a slightly higher charging voltage than VRLA (1.42V per cell rather than 1.39V). The result was that customers needed additional hardware in the form of a DC-DC converter to bridge the gap.

We are overcoming this with an adaption to the electrochemistry of nickel batteries so that they can charge at 1.39V per cell. As a result, customers can upgrade to nickel and achieve long-term cost and sustainability benefits from a product that provides a low TCO. ●