

Solid state batteries – the answer to safe energy storage?

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Danish company EPTechnologies dramatically illustrated the potential for safer boat battery banks by a live demonstration on its METSTRADE stand this year of what happens when you puncture a fully charged cell.

EPTechnologies started life by developing its own marine electric propulsion solutions just over a decade ago. As the company progressed its offering there were problems sourcing the kind of lightweight batteries it needed, particularly for power boat applications. That led it to adding battery production to its own capabilities.

Although EPTechnologies is focused on offering a one-stop shop solution for complete electric propulsion and hybrid packages, energy storage in a mix of several types comprises more than 40 per cent of revenues today. It currently produces around 10 megawatts of batteries annually and a new 1500m² manufacturing facility in Denmark is mostly earmarked to expand battery activities.

Key to its battery capability is a long-standing and proven partnership with an Asian battery cell manufacturer which has significant automotive players among its customer base. This partner provided EPTechnologies with its first solid state technology test cell around a year ago and it already reached its fourth iteration with a bigger cell for serial production in September. Now it is fully ready to ship.





To understand why solid state technologies represents a potential significant step forward, it's helpful to look at the evolving recent history of lithium battery storage, as EPTechnologies co-owner, Marco Ottiker explains: "Companies like Tesla are using NCA (lithium nickel cobalt aluminium oxide) batteries which have high energy density, but they experience thermal runaway at a relatively low temperature. Marine companies have favoured NMC (lithium nickel manganese cobalt oxide) based batteries with around 20 per cent less energy density but a higher ignition point of around 220°C which can be mitigated by fire prevention systems. We're at 5.2kg per kWh with our own NMC batteries now which we think is amongst the lightest in the market.

"The next step is LFP (lithium iron phosphate), which has a 280°C self-ignition temperature for a terminal runaway. However solid-state batteries get us to 350°C ignition point, and it is also much more tolerant of overcharging because this type of cell does not rely on a highly inflammable liquid electrolyte. There are several other safety advantages too. As we demonstrated on our METSTRADE stand, if you fully puncture a solid-state cell, it does not cause fire or an explosion, and minimal smoke compared to alternates. Although it will degrade over time due to internal shorting in the immediate vicinity of the puncture, the damaged cell will continue to perform in the short term."

Regarding performance Ottiker believes the company's first generation of solid-state based batteries will end up at around 7.3kg per kWh – heavier than NMC but same as to the commonly used LFP with a predictive lifespan of 9000-10,000 cycles at 100 per cent DoD (depth of discharge) or 12,000-14,000 at 70-80 per cent DoD. He believes there is potential for solid-state battery technology to improve energy density by up to 50 per cent in the next eight years and says EPTechnologies' supply partner is already indicating a very encouraging development path for the next two years. It has a track record of not deviating more than ± 10 per cent on previous forecasts.

Pricewise, Ottiker says that its solid-state batteries are slightly cheaper than its current NMC range.

Is this the future of batteries on board?

So, is solid state the future of onboard battery storage in coming years? Ottiker responds: "I'm maybe not the most objective now because I've just been running through two weeks of tests with these batteries and am totally astonished by them. The technology offers obvious safety benefits as well as

environmental gains as you'll be using these cells three to four times longer before replacement. They offer good C (charging) rates of 1-1.5C in discharge and 1.5 in charge. They only rise around 6°C in temperature with 1C.

“They are at an early stage of development, but we think solid-state batteries are already a game changer and better than anything else we know, which is why we are introducing them now, initially with a 280Ah battery. There hasn't been any step backwards in this industry since I joined so we are confident there is much more potential to come.”

For further information on EPTechnologies' battery ranges see <https://eptechologies.dk/battery-overview/>

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