

Partnering to optimize battery enclosure design with high functional integration, reduce manufacturing costs, and achieve faster time-to-market

About Dukosi

Dukosi develops revolutionary technologies that dramatically improve the performance, safety, and efficiency of high-power battery systems, and enable a more sustainable value chain.

About Forward Engineering

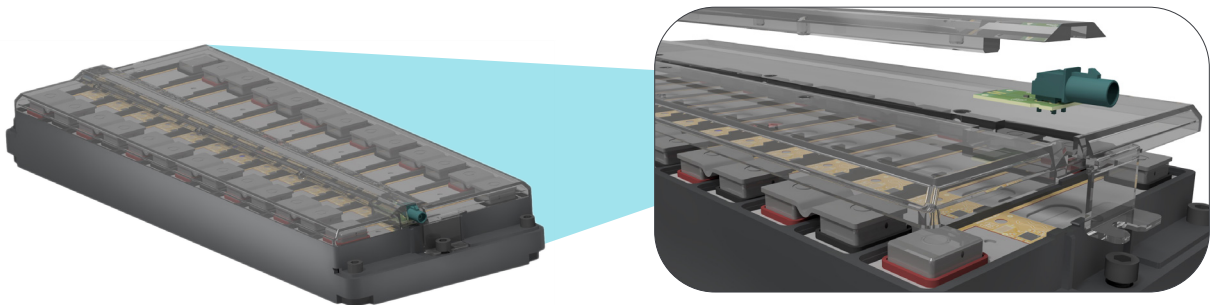
Designing functional structural components from individual module housings through to complete BESS enclosures, Forward Engineering leverages simulation-driven design, production-based engineering, and expertise in developing multi-material, large battery systems.



Prismatic cells with Dukosi's Cell Monitors installed on each cell



After the lid is closed on the enclosure the integrated antenna overlays the row of near field antennas from each Cell Monitor.



Background

Developing an enclosure for a high-voltage battery typically involves integrating layers of structural materials, cooling and heating hardware, sensors, high-voltage and low-voltage systems, as well as a large PCBA for each module. The enclosure must protect the battery from mechanical stress, ensure efficient thermal management, and shield it from environmental factors such as moisture and corrosion, all while minimizing component usage to reduce costs and potential failure points, and to scale manufacturing. Furthermore, isolating high-voltage power delivery from low-voltage sensing wiring adds to the complexity of the design process.

Challenge

Increasing the energy density of batteries (kWh/kg) remains an ongoing challenge for the industry. This can be addressed either by enhancing the energy density of individual cells or by reducing the weight of the battery pack. Additionally, battery assembly often involves labor-intensive processes, such as manually attaching wiring and connectors to cells and modules, which can hinder production throughput. By optimizing battery design and simplifying battery architecture, we can effectively tackle both of these challenges.

Solution

Dukosi and Forward Engineering have partnered to create a proof-of-concept smart battery enclosure that demonstrates the simplicity of integrating the near field communication antenna from the Dukosi Cell Monitoring System (DKCMS) directly into the lid of the enclosure. When closed, the integrated antenna is positioned over the Cell Monitors, enabling the contactless cell monitoring solution with patented C-SynQ® communications to automatically establish the cell network without further intervention.

Benefits

The smart enclosure solution unlocks one of the final steps in enabling a fully automated battery assembly line, reducing labor costs and reliably enhancing production efficiency. During operation, the integrated solution increases the robustness of the battery by reducing the potential for damage to the cell communication network.

By simplifying the design, eliminating the need for fixings and holders, and facilitating easier maintenance and repair, there is also potential for further cost savings. Additionally, the lighter, better-integrated smart enclosure improves power density without requiring new advancements in cell manufacturing, enabling greater mileage per EV and more kWh within a fixed volume for battery energy storage applications.

Achieve more

This proof-of-concept was created using only twelve prismatic cells, however, in principle, the integrated antenna can be scaled to support up to 216 cells in single-cell increments and a variety of orientations, creating a high-power battery suitable for electric vehicles, industrial mobility, or energy storage applications.

DKCMS combines unique chip-on-cell architecture, contactless near field connectivity, and patented C-SynQ® communication technology that reliably delivers synchronous cell data with deterministic latency to the BMS host, making it ideal for traditional battery designs as well as newer cell-to-pack and cell-to-chassis implementations. Facilitating an optimized enclosure is one way to achieve more production line efficiency and cost-effectiveness.



Forward Engineering's deep understanding of regulatory and technical requirements, multi-materials, and design expertise enables us to deliver a safe, cost-efficient, compact, scalable, and sustainable battery enclosure solution based on Dukosi's design for its integrated solution. Together we can alleviate challenges in battery design, providing clear advantages for electrified applications developers as well as end customers.

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