FORWARD ENGINEERING

CONSORTIUM DEVELOPS NEW COST-EFFECTIVE CELL TO PACK LIGHTWEIGHT HIGH VOLTAGE BATTERY ENCLOSURE

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Forward Engineering GmbH

- Modular mixed material design, leveraging new GFRP SMC compound, delivers scalable cost effective lightweight HVBE solutions.
- Comprehensive design, simulation and physical testing program provides visibility to series production capable solution for next generation BEVs.
- Collaboration provides critical resources to meet demands of rapidly evolving automotive industry.

Munich, Germany, January 30th, 2021 – Forward Engineering GmbH (FE), a global engineering and consulting firm specializing in enabling cost effective inclusion of fiber reinforced polymer composites in serial mass-produced automotive structures, as a part of a consortium of companies, has led the design of a cost and mass efficient high voltage battery enclosure for the next generation of battery electric vehicles.

As the automotive industry races to electrify their portfolio of products, development resources have become more limited than ever. Developing and validating an innovative new high voltage battery enclosure, one of the most complex and safety critical vehicle subsystems, is a resource intensive effort. Forward Engineering is proud to be the design partner working with Evonik, LION Smart, Lorenz, and Vestaro to realize the vision of a cost-effective high voltage battery enclosure (HVBE) for the next generation of Battery Electric Vehicles (BEV).

The product of this years long development program is a new high voltage battery enclosure design which can meet current and future anticipated technical and regulatory requirements at lower weight and cost as compared to incumbent designs. FE's holistic simulation driven design and production-based engineering approach, balancing design, materials and process, was a key enabler in successfully reaching the design goals.

For this project, Lorenz specially developed a new glass fiber reinforced SMC compound based on Evonik's VESTALITE S high performance epoxy curing agent. The new compound delivers outstanding mechanical properties (Flex Strength >350MPa, Flex Mod >18.5GPa, Impact Strength > 150kJ/M2) while achieving exceptional fire resistance and maintaining flowability to support complex geometries in series production applications. Production of complex hardware

demonstrators supported the validation of processability as well as mechanical and thermal performance.

Employing LionSmart's Super Cell module concept, the FE design team developed the structural composite modules which uniquely address three critical constraints in BEV energy storage systems: packaging space, safety, and simplicity of assembly. The structural modules mitigate the need for cross members while simplifying the automation of overall pack assembly. This design cost effectively delivers a cell to pack design virtually eliminating redundant components.

Forward Engineering's CAE team led the concept validation which included a comprehensive simulation program consisting of side impact tests up to 350kN, modal analysis, stiffness in bending and torsion, as well as impulse pressure in the event of thermal runaway. Together with hardware testing, the concept demonstrated the ability to meet all current and future anticipated performance requirements.

To highlight the relevance of the concept, the team developed three initial configurations at 65kWh, 85kWh and 120kWh capacity and total weights of 412kg, 527kg and 789kg, respectively. The modular design supports multiple variants, beyond these initial concepts, enabling designers to adapt relatively quickly and easily to rapidly changing market demands.

To learn more about this exciting collaboration and the innovative cost-effective light weight battery enclosure design, please contact Forward Engineering's Robert Maier at maier@forward-engineering.com.

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ABOUT FORWARD ENGINEERING
Forward Engineering is your trusted partner for holistic and sustainable product development. Our team supports you with comprehensive design, material and process know-how in the field of technical and fiber-reinforced polymers, functional lightweight construction, and CAE-supported multi-material design optimization. Bringing together our global network of material manufacturers, technology providers and tier suppliers, enables the resource efficient and cost-effective implementation of new and emerging technologies to meet and exceed your goals.

For more information about Forward Engineering, visit www.forward-engineering.com.