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Failure prediction in Laser-welded Interconnects in Battery Electric Vehicles: CAE Methodology

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At the forefront of the electrification movement, Volvo Cars is steering towards the exclusive production of fully electric vehicles (EVs) by 2030.With strategic intent, the company has strengthened its expertise in simulation to tackle challenges posed by electrified vehicles. The rising demand for electric vehicles requires faster, efficient electrical connection processes within battery packs. Material selection for tabs and busbars depends on factors like weldability, weight, and cost. Laser welding, due to its rapid capability to weld diverse materials, is emerging as the predominant technology to meet the need for efficient joining with low cycle times.

This presentation focuses on multifaceted challenges in interconnects, emphasizing failures induced by mechanical and thermal loads during operational cycles. In Battery Electric Vehicles (BEVs), optimal functionality relies on reliable electrical joints, highlighting the importance of factors like thermal dissipation, electrical conductivity, and load-bearing capacity.

To address these challenges, advanced Computer-Aided Engineering (CAE) methodologies are explored. The presentation includes a thermo-mechanical model demonstrating lap-welded interconnection with copper and aluminum for Lithium-ion batteries. The study delves into potential advancements in CAE modeling for failure prediction, aiming to optimize weld patterns and enhance the robustness and reliability of electrical interconnects in complex battery pack contexts.