

Driving the Future of EVs: How DesignTech Systems Powers Electric Vehicle Innovation



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DesignTech Systems has been a trusted partner of Altair, a U.S.-based leader in simulation technology, for over two decades. With a strong presence in the automotive and manufacturing sectors, DesignTech offers cutting-edge design validation and simulation-driven solutions that enhance efficiency and performance in electric vehicles (EVs). Altair's advanced capabilities cover lightweight design, structural analysis for NVH, fatigue, crashworthiness, battery cell design, thermal management, motor pre-design, electromagnetic simulation, vehicle dynamics and durability, connectivity, AI-driven physics-based modeling, and power electronics. Additionally, Altair's suite includes tools for sheet metal forming, casting process simulation, and additive manufacturing, ensuring complete coverage of EV architecture, including systems and subsystems.

ENHANCING EV EFFICIENCY WITH SIMULATION-DRIVEN DESIGN

Altair's simulation-driven approach enables early-stage design validation, significantly reducing development cycles while enhancing product performance. By conducting design iterations, engineers can predict potential failures early and refine designs accordingly. Altair SimSolid, a meshless solver, allows structural analysis in minutes on unsimplified CAD geometry, accelerating decision-making. Tools like Inspire Form and Inspire Cast further optimize manufacturability, enabling seamless sheet metal forming and casting simulations.

OPTIMIZING EV COMPONENTS THROUGH GENERATIVE DESIGN

Altair is renowned for its structural optimization techniques, including topology optimization, which ensures the optimal distribution of materials to achieve lightweight yet durable designs. This approach is widely applied to components such as axles, suspension systems, battery packs, and brackets. Additionally, topography optimization enhances the stiffness of sheet metal components like the body-in-white (BIW) by optimizing bead patterns and shapes, improving structural integrity while reducing weight.

ADDITIVE MANUFACTURING: TRANSFORMING EV PROTOTYPING AND PRODUCTION

With India's EV sector growing rapidly due to government incentives and sustainability concerns, additive manufacturing (AM) is playing a crucial role in component development and prototyping. AM offers multiple advantages, including:

- **Rapid Prototyping:** Engineers can produce and test EV prototypes within days, significantly reducing development time.
- **Complex Geometries:** AM facilitates intricate designs, such as optimized topography structures, which improve component efficiency and reduce weight.
- **Material Innovation:** A broad range of high-performance materials enables customized solutions for battery housings, cooling systems, and more.
- **Mass Customization:** AM allows manufacturers to create unique, low-volume

components, eliminating the need for expensive tooling and long lead times.

LEVERAGING DIGITAL TWIN TECHNOLOGY FOR EV LIFECYCLE MANAGEMENT

Digital twin technology plays a vital role in EV development by gathering real-time data on battery health, motor performance, and overall vehicle efficiency. By integrating AI-driven predictive and prescriptive analytics, manufacturers can optimize performance and extend component lifespan.

DRIVING SUSTAINABILITY IN EV MANUFACTURING

DesignTech's virtual simulation tools significantly reduce the need for physical prototyping, minimizing material waste and promoting sustainable practices. By optimizing lightweighting strategies, manufacturers can reduce material consumption for every component, contributing to eco-friendly EV production.

REAL-WORLD IMPACT: CASE STUDIES IN EV DEVELOPMENT

DesignTech's solutions have been instrumental in the design and optimization of battery modules, a critical component of EVs. By utilizing Altair SimSolid, engineers can conduct finite element analysis (FEA) to compare cylindrical and prismatic battery cells, evaluating structural integrity through dynamic assessments like modal analysis, frequency response analysis, and steady-state thermal analysis. These insights enable manufacturers to enhance battery safety, reliability, and overall performance.

COLLABORATIVE APPROACH WITH EV MANUFACTURERS AND SUPPLIERS

To ensure seamless implementation of its solutions, DesignTech collaborates closely with manufacturers and suppliers, providing expert technical support and tailored Altair solutions. The company offers hands-on training, proactive assistance, and continuous guidance to help engineering teams maximize the benefits of simulation-driven design tools. By integrating cutting-edge technologies like simulation-driven design, topology optimization, additive manufacturing, and digital twins, DesignTech Systems is driving innovation in the EV sector, enabling manufacturers to develop efficient, high-performance electric vehicles for a sustainable future.