CASE STUDY

Engineering Next-Generation Reliability with ReliaSoft: A DfR Approach for Electric Vehicles

Our customer is an American electric vehicle (EV) manufacturer that designs, develops, and manufactures category-defining electric adventure vehicles, commercial delivery vehicles, and its own charging infrastructure. By combining high performance and premium, they are dedicated to accelerating the global transition to sustainable transportation.

Challenge

As a new EV manufacturer, our customer needed to deliver exceptionally durable vehicles and charging products, proving their long-term reliability without historical data, and building brand trust in a competitive market.

Solution

Our customer's Design for Reliability (DfR) department implemented HBK's ReliaSoft suite for test design, lifetime predictions using test and customer fleet data, and comprehensive system reliability modeling across all vehicle and charging hardware.

Result

This proactive DfR program provided 9% improvement in product development efficiency by accelerating product maturation, provided early insights into lifetime performance, optimized designs for durability, and built deep-seated confidence in the reliability of their innovative electric vehicle ecosystem.

The Challenge

Launching a new car company is a monumental task; launching one dedicated to sustainability and adventure adds another layer of complexity. Our customer's brand promise is not just about electrification, but about creating vehicles that can be trusted in the most demanding environments, far from service centers.

This created a unique set of reliability challenges:

- **Establishing Trust from Scratch**: Unlike legacy automakers, our customer has no century-long reputation or decades of field data. Every product must prove its reliability from day one to build critical brand loyalty and justify its premium positioning.
- **Extreme Use Cases**: An adventure vehicle must withstand water-fording, rock-crawling, extreme temperatures, and high-payload towing – conditions that place immense stress on the chassis, battery, vsuspension, and propulsion systems.
- **Complexity of New Technology**: Integrating novel quad-motor propulsion, a large and complex battery pack, and a sophisticated software-defined architecture creates countless potential failure modes that don't exist in traditional vehicles.
- **Accelerated Development**: As a fast-moving company in a dynamic market, our customer must innovate and mature its products rapidly, requiring a reliability process that provides answers quickly and efficiently.

The Solution

To meet these challenges head-on, our customer established a dedicated Design for Reliability (DfR) department, embedding a data-driven reliability culture deep within its engineering organization. This department leverages the HBK ReliaSoft suite as its core toolset to institutionalize a proactive approach to building durable & reliable products.

This strategy is executed across several key activities:

- **Test Design and Planning (Weibull++)**: Before physical testing begins, ReliaSoft is used to design statistically robust test plans, including Accelerated Life Tests (ALT). This allows their engineers to determine the exact number of samples, stress levels, and test durations required to prove a component will meet its life target, condensing years of use into a manageable lab test.
- **Lifetime Predictions (Weibull++)**: As data comes in from lab testing and from the growing customer fleet, it is fed into our tool that analyzes the data to create precise models of a component's expected life. This allows our customer to understand the reliability of parts in the real world and predict when failures might occur.
- **System Reliability Modeling (BlockSim)**: A vehicle is a complex network of thousands of parts. Using BlockSim, their engineering team modeled the entire vehicle as an interconnected system. By inputting the lifetime predictions for individual components (from Weibull++), they simulated the overall vehicle reliability and identified which components had the biggest impact on system-level performance. This allowed for targeted improvements and intelligent design trade-offs.
- **Proactive Risk Reduction (XFMEA)**: Throughout the design process, XFMEA is used to systematically identify potential failure modes and their effects, allowing engineering teams to address risks on the digital drawing board before they become costly problems in hardware.

Results & Impact

The integration of a standardized DfR program powered by ReliaSoft provided our electric vehicle manufacturing customer with a powerful competitive advantage.

- **Data-Driven Confidence**: Instead of relying on guesswork, they made engineering and business decisions based on statistical proof. This provided quantifiable confidence that the vehicles will withstand the rigors of adventure.
- **Faster Product Maturation**: By using accelerated testing and predictive models, our customer identified and fixed potential weaknesses much earlier in the development cycle, dramatically speeding up the process of creating a robust and mature product.
- **Optimized Durability and Cost**: System modeling in BlockSim ensured that engineering effort is focused on the components that matter most. This prevented over-engineering of non-critical parts while ensuring the systems essential for safety and adventure are exceptionally robust.
- **Foundation for the Future**: By analyzing customer fleet data, our customer created a continuous feedback loop. This real-world data refined the reliability models, making future product designs and updates even more durable and customer-focused.

Conclusion

For electric vehicle manufacturing, reliability and sustainability isn't a feature—it is the bedrock of its promise to customers.

By establishing a dedicated Design for Reliability department and empowering it with the analytical horsepower of the HBK ReliaSoft suite, our customer is building more than just electric vehicles. It is systematically engineering trust, ensuring that every truck, SUV, and charger is ready for the journey ahead.