THE INCLUSION OF NEW STRUCTURAL ADHESIVE WITH A LOWER CURING TEMPERATURE IN ELECTRIC VEHICLE HAS RESULTED IN IMPROVING THE MECHANICAL PERFORMANCE IN SHEAR AND T-PEEL STRENGTH ALONG WITH ENSURING THE 20% LONGER FATIGUE LIFE TO THE AUTOMOTIVE COMPONENTS

Overview

The automotive industry, particularly the electric vehicle (EV) segment, is witnessing a transformation fueled by advancements in materials and manufacturing technologies. Adhesive solutions play a pivotal role in ensuring the structural integrity, safety, and durability of EV components. A leading automotive manufacturer approached DBMR with the objective of improving the mechanical performance and fatigue life of their EV components by addressing challenges related to adhesive bonding in their production processes. By introducing a new structural adhesive with a lower curing temperature, DBMR helped the client achieve significant enhancements in shear and T-peel strength, along with a 20% increase in the fatigue life of automotive components.

Client Background

The client, a globally recognized electric vehicle manufacturer, is known for its innovative approach to sustainable transportation. With a commitment to producing lightweight and energy-efficient vehicles, the company has continuously invested in advanced materials and bonding technologies to enhance vehicle performance and safety. As part of their ongoing efforts to optimize production efficiency and product quality, the client sought to address issues related to adhesive curing and component fatigue, particularly in high-stress areas of the vehicle structure.

Challenges Faced by the Client

The client encountered several critical challenges that necessitated a reevaluation of their existing adhesive technologies:

High Curing Temperatures: The existing structural adhesives required high curing temperatures, which increased energy consumption and also caused thermal stress on sensitive components during assembly

Suboptimal Mechanical Performance: Despite using advanced bonding solutions, the client faced limitations in achieving desired shear and T-peel strength, especially in load-bearing areas of the EV structure

Fatigue Life Concerns: The adhesive joints exhibited reduced fatigue life under cyclic loading conditions, which impacted the long-term durability and reliability of the vehicles

Production Efficiency: The high curing temperature and extended curing time led to bottlenecks in the manufacturing process, increasing overall production costs and time-to-market

Sustainability Goals: The client's commitment to sustainability required a solution that reduced energy consumption and environmental impact without compromising performance

Solutions Provided by DBMR

DBMR company collaborated closely with the client to develop a tailored solution that addressed their specific challenges and aligned with their goals. The key steps in the solution process were as follows:

- DBMR conducted a comprehensive assessment of the client's requirements, analyzing the performance parameters of the existing adhesive solutions and identifying areas for improvement. Based on this analysis, a novel structural adhesive with a lower curing temperature was selected for evaluation
- The adhesive formulation was customized to meet the client's performance criteria, with a focus on enhancing shear and T-peel strength. Extensive laboratory testing was conducted to validate the mechanical properties, fatigue resistance, and thermal stability of the adhesive under simulated
- To ensure successful adoption, DBMR provided training to the client's production and quality assurance teams. Ongoing technical support was also offered to address any challenges during the implementation phase
- The adhesive was initially tested in a controlled production environment to assess its compatibility with the client's manufacturing processes. Adjustments were made to optimize curing parameters and ensure seamless integration into the assembly line
- DBMR employed advanced analytical tools to monitor the performance of the adhesive in real-world applications. The data collected from these trials confirmed a 20% increase in fatigue life, along with significant improvements in shear and T-peel strength

Business Impact

The inclusion of the new structural adhesive with a lower curing temperature yielded numerous benefits for the client:

- **Enhanced Mechanical Performance:** The optimized adhesive formulation significantly improved the shear and T-peel strength of bonded components, ensuring superior load-bearing capacity and resistance to mechanical stress
- **Extended Fatigue Life:** The adhesive's enhanced fatigue resistance resulted in a 20% increase in the durability of adhesive joints under cyclic loading, contributing to longer-lasting and more reliable EV components
- **Improved Production Efficiency:** By reducing the curing temperature and time, the adhesive streamlined the manufacturing process, enabling faster assembly and reducing production costs. This improvement also minimized thermal stress on sensitive components
- **Energy Savings and Sustainability:** The lower curing temperature reduced energy consumption during the production process, aligning with the client's sustainability objectives and lowering the environmental impact of their operations
- **Market Differentiation:** The enhanced performance and durability of the client's EV components positioned them as a leader in innovation and quality within the competitive automotive market, strengthening their brand reputation and customer trust

Conclusion

The case study demonstrates the critical role of advanced adhesive technologies in addressing the evolving challenges of the automotive industry, particularly in the electric vehicle segment. By partnering with DBMR Company, the client successfully overcame limitations related to adhesive curing, mechanical performance, and fatigue life, achieving measurable improvements in both product quality and production efficiency.

This collaborative effort highlights the importance of tailored solutions, rigorous testing, and seamless integration in driving innovation and sustainability in manufacturing processes. The inclusion of a new structural adhesive with a lower curing temperature not only enhanced the client's product performance but also contributed to their broader goals of energy efficiency and environmental stewardship. DBMR's expertise and commitment to excellence ensured the successful implementation of this transformative solution, setting a benchmark for future advancements in adhesive technologies for electric vehicles.