Poly Quarter Fender

Mechanical Engineering

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Abstract

The project presented consists of a redesign of the Betts original poly quarter fender with a goal of reducing manufacturing and assembly cost. Their current quarter fender consists of a poly fender panel mounted on a steel tube using various mounting components. The new design reduces the part count while maintaining an attractive appearance and meeting all performance specifications set forth by Betts. These specifications include a full poly design with a lifetime of 10 years/1 million miles. The final outcome of this project is to produce a functional 3D printed prototype that will help assess if the new design is ready for injection molding production and the market.

Quarter Fender

- **Location**: A quarter fender is mounted in front of the rear wheels of a semi tractor.
- **Functionality**: They help control the debris off the tires.

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Manufacturing Processing

Injection Molding - A tool is created that can be used to produce a maximum of 2.5 million molds before having to be replaced. To manufacture fenders, high pressure is used to inject plastic evenly into cavity.

3D Printing - SLA (Stereolithography) used to manufacture a prototype in order to run analyses before going into production.

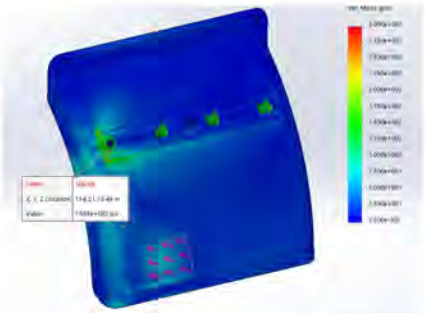
Material Choice

Polypropylene because of :

- High impact resistant
- Heat resistance
- Good appearance
- Recyclability
- Light weight
- High stiffness
- Low cost
- Good chemical resistance
- Tensile strength maximum at 5,400psi
- Flexural modulus (stiffness) maximum at 225,000 psi
- Can be injection molded

Simulations

- Maximum stress shown at farthest bolt location.
- Consistent with experimental test results.

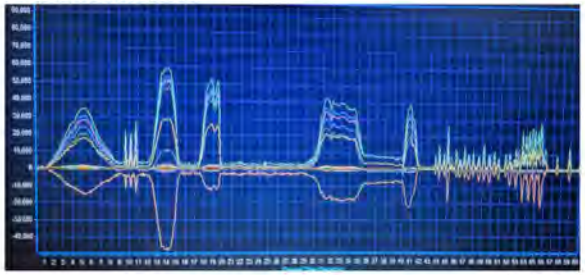


Testing

Water Spray Test – Developed a standard procedure to study the behavior of water spray. Compare water spray dispersion between new quarter fender model to competitors.

Vibration Test – Single axis vibration tester capable of frequency range between 2-13 Hz. Prototype underwent vibration testing to simulate on road conditions.

Static Load Test - Compared static test data to SolidWorks simulations to verify accuracy of the simulations



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