Heavy-Duty Truck Ball End Retainer

Powertrain Component Solves Thermal Failure for Tier 1 Manufacturer

PROJECT DETAILS

Application: Commercial truck transmission

Material: Torlon®

Customer: Tier 2 Powertrain Component Manufacturer

Industry: Automotive

Timeline: 6 months

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THE OBJECTIVE

Design and manufacture a ball end retainer using a high-performance polymer that can withstand the friction and wear, as well as the load, between the connection of a rod and a clutch in a heavy-duty truck application.

THE CHALLENGE

A Fortune 500 powertrain component manufacturer for the heavy-duty truck industry needed an immediate, cost-effective solution for a product launch. The customer was attempting to use an engineering-grade nylon injection molded part that was failing in fatigue testing. The nylon part was deforming and experiencing fretting and delamination.

The part design was complex because it had to snap onto the ball end of a rod to function correctly, requiring it to snap off of the injection mold. Our tooling expertise was used as we designed and built the tool to support its product design. Getting the retainer to snap on required an exact tool design and the right material selection.

THE SOLUTION

From the start, it was apparent that the plastic currently being used for the part was the wrong material choice. During the durability testing it was experiencing thermal failure. APP focused immediately on selecting a material that performed under high temperature conditions: Torlon® 4301. Torlon offers exceptional performance across a variety of grades including: broad chemical resistance, compressive strength, high impact resistance and (especially relevant for this part) outstanding thermal and friction and wear properties.

Given the tight time frame, the APP team then brainstormed to isolate potential failure modes. This approach prevented multiple iterations in the development process for this time sensitive project. Working closely with the material supplier, the team completed CAE (Computer Aided Engineering) simulations. Based upon the results, the team then changed the design to account for potential failures. The initial tooling yielded a product that passed both the short and long term fatigue testing. With the new design, the part was ready for production. From the first phone call to production approval it took only 6 months.

At the conclusion of the project, APP President Greg Shoup said, *"This application development was revolutionary because it involved us identifying and solving potential failures modes by intensive collaboration with both the customer and the material supplier. Together, we overcame the challenges posed by this complex application by using the correct material, and design improvements."* Shoup continued, *"This customer's Project Manager told me this was the most successful plastics project he had ever experienced. The part we designed hit every deadline they had, and passed durability testing the very first time."*