

CASE STUDY



OptiStruct Cuts Development Time to Design a Light weight and More Durable Window Regulator Lift Plate

Overview

Using Altair OptiStruct, ArvinMeritor was able to design a lighter weight window regulator lift plate which eased assembly. The new snap-fit design reduced the material compared to original design, without sacrificing performance and durability. Leveraging Altair's OptiStruct design optimization technology, ArvinMeritor was also able to evaluate multiple lift plate design proposals in a significantly less time than the traditional design process, while reducing their investment in prototype development and physical testing. Based on this their client DaimlerChrysler has requested ArvinMeritor to redesign the glass attachment method for the window regulators that are used in Jeep Liberty SUV, to a vertical snap-in style lift plate.

ArvinMeritor™

Business Profile

ArvinMeritor, Inc. (www.arvinmeritor.com) is a premier global supplier of a broad range of integrated systems, modules and components to the motor vehicle industry. The company serves light vehicle, commercial truck, trailer and specialty original equipment manufacturers and certain after markets.

“Topology optimization design tools like Altair OptiStruct prove to be much more flexible and cost-effective than traditional methods, and are being used increasingly in the automotive design process.”

*Nagaraja Gargeshwari
Manager-Engineering
ArvinMeritor India*

Challenge

This design change is a Value Engineering activity to reduce the overall system cost, including window regulator and glass. The snap-in lift plate design significantly reduces the content of the glass assembly. The original glass assembly requires a metal bracket and a pin bonded to the bottom of the glass for front and rear glass windows. The snap-in lift plate design also reduces the assembly time in the DaimlerChrysler's assembly plant.



Figure 1
Window Regulator Mechanism



Solution

Working within a pre-determined design space, OptiStruct topology optimization analysis were performed in two stages; first, to make the top end of the tabs strong enough to withstand the loads exerted on them during assembly; second, to ensure that the bottom of the tabs would remain strong over the life of the module. The design optimization focused on generating a rib pattern for the tabs to improve both strength and flexibility, without adding weight.

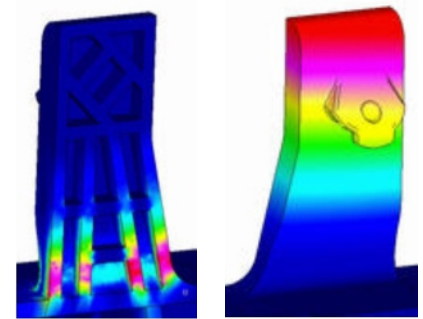


Figure 2

New rib pattern and displacement plot

Results

The new design of a lift plate met the desired criterion for strength and flexibility. Snap-fit tabs replaced the push-fit tabs of the base design. In addition, the total lift plate is narrower and has fewer components, which results in simplified assembly and reduced overall part weight. Design time for individual model set-up was reduced from two business days to 30 minutes.

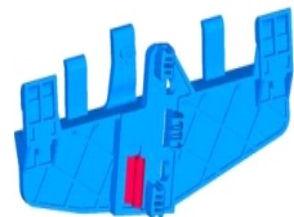


Figure 3

Base Line Design

Benefits

By reducing the window lift plate width, Altair's OptiStruct technology helped ArvinMeritor achieve 25% overall part weight reduction. In addition, the part is stronger and more flexible, and facilitates assembly by locking automatically. Above all, OptiStruct helped ArvinMeritor cut product development time and costs drastically by delivering a feasible design concept that satisfied the design assembly requirements, thus minimizing their engineering investment, expensive prototypes and associated testing.

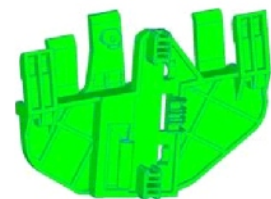


Figure 4

Optimized Design

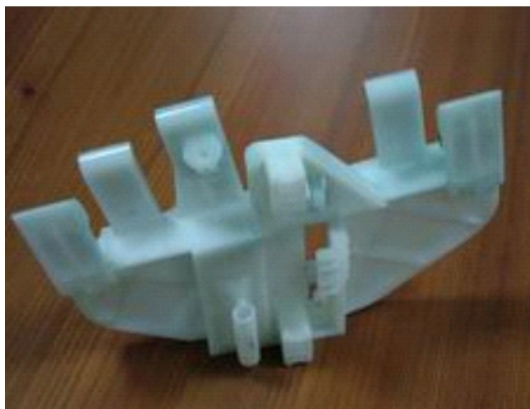


Figure 5

Prototype of the optimized window regulator lift plate

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