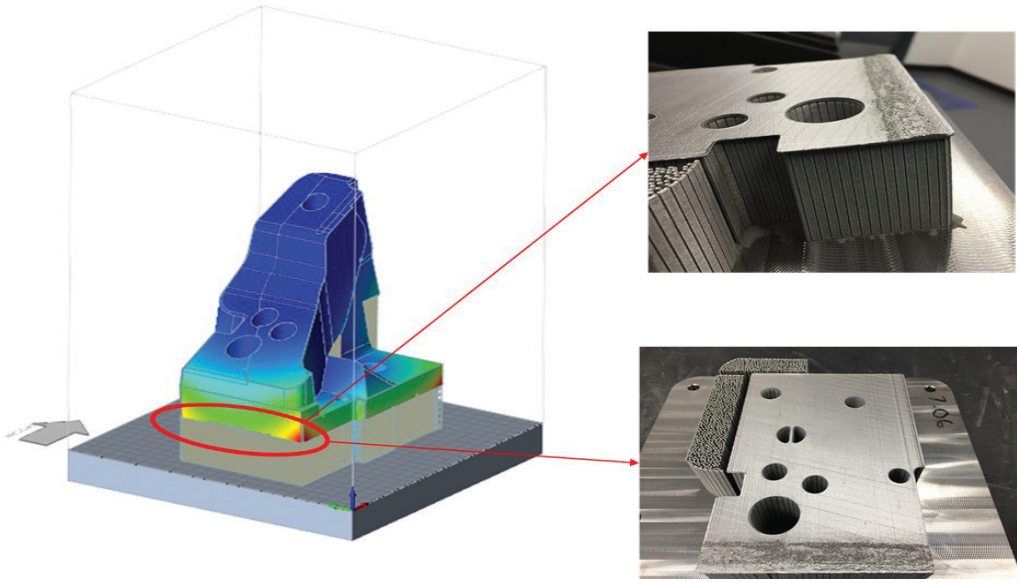
BOOSTING 3D PRINTING DESIGN WITH SIMULATION

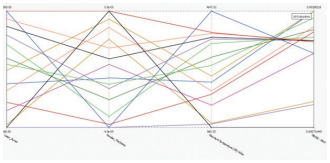
FORD USES ALTAIR® INSPIRE™ TO CREATE LIGHTWEIGHT COMPONENTS FOR VEHICLES

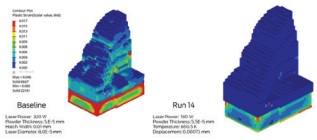
About the Customer

Ford Motor Company, a Fortune 50 automotive company, operates plants all over the world and produces millions of vehicles every year. Committed to being the world's most reliable mobility and intelligent vehicle design company, Ford maintains engineering centers in locations like USA, India, Mexico, Germany and Brazil. More than 30 years ago, Ford began working with Altair to support the company's product development activities. Today, the company employs Altair software globally to support the development of Ford cars, trucks, and heavy equipment.

> "With Altair´s Additive Manufacturing tools, we are able to successfully predict failures on physical models reducing cost production.
>
> José Cazares
> PT Cooling CAE Engineer







LEFT: Plastic Strain (CAE model vs Physical Testing)
TOP: DoE runs and results.
BOTTOM: Baseline and Run 14 CAE results

Their Challenge

Additive Manufacturing (AM) is the process of adding material layer by layer to manufacture components, which provides great benefits in the automotive industry including component cost reduction, systems and tooling improvements, and the freedom to create more complex geometries and designs. As this technology is relatively new, however, AM expertise in the industry is not on par with that of traditional manufacturing.

It is easy to overlook critical considerations in pursuit of mechanical design efficiency, and difficult to set printer parameters that, if chosen incorrectly, could produce structural failures, performance deficiencies, and aesthetic issues in the printed components.

Our Solution

Implementing AM along with the Altair® Inspire™ 3D printing simulation within the product development process has helped Ford Motor Company identify possible error states throughout the manufacturing lifecycle, providing relevant information to optimize and ensure first-time quality through design.

Specifically, brackets design is meant to provide better heat management via internal cooling channel design. Simulation allows the creation of complex, optimal geometries for brackets, which promotes a more effective heat dissipation and ultimately produces better mechanical behavior and dimension control for these components.

Altair Inspire's 3D printing simulation, together with a design of experiment process created with Altair® HyperStudy®, has helped solve issues that typically happen at printing stage such as detachment of the supports and aesthetic finish problems, and enables printer parameter optimization for peak performance. The Renishaw AM500Q printer datasheet was used to determine the operational range of the parameters that define the process, such as the Laser Power and Powder Layer Thickness, whereas Maximum Displacement and Maximum Temperature were selected as output variables. This process provides designers and engineers a better understanding of process parameters and their impact on results.

Utilizing Inspire and HyperStudy has helped Ford develop new tools and methods for implementing beneficial AM technologies.

Results

With software solutions from Altair, Ford better understands the 3D printing manufacturing processes covered. The simulation showed good A to B comparison results and correlations between the FEA model and physical testing, since the simulation method was able to provide qualitative correlation against the result on the physical manufacturing method. As a result, Ford can identify and propose the best process parameters to avoid future failures before going out to production.

Using HyperStudy technology for design of experiments also provides value on the analysis' decision making, such that Ford is able to identify the impact of the process parameters on the output variables.

To learn more, please visit altair.com/additive-manufacturing