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AWARD 2018
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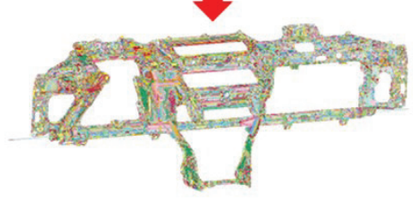
Future of Lightweighting Entry

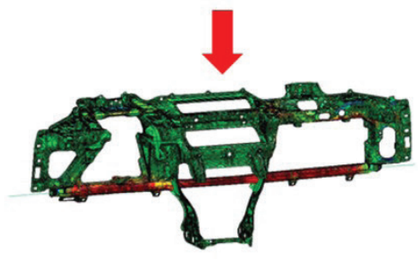
Casting process simulation

Meridian 美铝·镁瑞丁
Proprietary code

Process-property relationships



Mapped FEA mesh
Variable material properties



FEA part performance

Meridian Lightweight Technologies

Development of an ICME (Integrated Computational Materials Engineering) approach into Mg casting design

Magnesium alloy die-castings are being increasingly employed in automotive structural applications for decreasing nominal cast thicknesses in combination with more geometrically-complex and larger designs where castings are being designed at thicknesses less than 2.5mm. These castings takes advantage of the fluidity and excellent specific strength and stiffness offered by magnesium die-casting. A key factor in the design of these castings is the accurate representation of the material behavior in CAE simulations. The development of Meridian's innovative ICME approach began with a detailed investigation and knowledge development of the magnesium die-casting process, the microstructure of die-cast magnesium material, and the resulting mechanical properties. The microstructure of magnesium alloy die-castings that is formed as a result of the die-casting process plays a strong influence upon the local mechanical properties. Process-structure-property relationships were developed to predict the variability throughout different regions in large-complex die-cast components. Proprietary results from casting simulations of a component design are used as inputs into a Meridian-developed algorithm. The algorithm calculates and maps local mechanical properties onto a mesh as an input file for CAE simulations of product performance. This process is able to provide for a unique material response for each CAE element based upon the simulated local processing history.

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