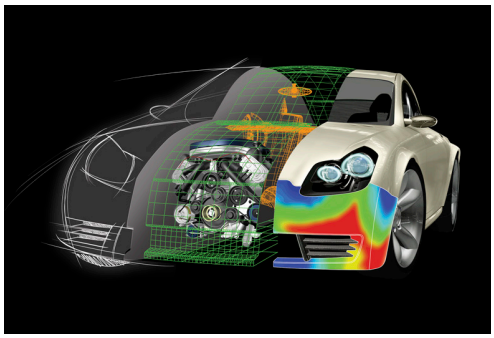
Efficient vehicles require lighter, more aerodynamic designs

Rapid digital prototyping and simulation solutions support robust design and accelerate time-to-market



Access state-of-the-art automotive digital prototyping with integrated simulation tools for plastics, composites, CFD and manufacturability.

Highlights

Execute energy analysis directly within the design model
Simulate viability of plastic part design and molding process
Put a virtual wind tunnel on your desktop
Access best-in-class materials database and testing facility

Benefits

Optimize early for damage tolerance and progressive failure
Avoid cost overruns in plastic unit piece price and tooling costs
Optimize aerodynamics at the conceptual stage
Calculate embodied impacts, validate HVAC design

Design engineers in the hot seat

Market pressures and technology trends like hybrid and EV drives are forcing automotive OEMs and their supply chain partners to explore new ways to design and manufacture more efficient vehicles. An overwhelming majority of automotive executives (92%) cite fuel efficiency as their customers' top priority[1] and, worldwide, regulatory standards for fuel efficiency will continue to climb upwards.

No matter the type of vehicle, there are two primary strategies for addressing these demands – making vehicles lighter-weight and more aerodynamic. Together, these measures can achieve 50% or better fuel economy.[2] As more vehicles incorporate heavier and more complex systems, like hybrid drive trains, light-weighting and aerodynamics become ever more critical levers for product performance.

Simulation solutions are key to success

With tight development cycles that often don't allow for late changes, early-stage exploration of performance and manufacturability is increasingly critical. Early design optimization reduces the risk of defects and suboptimal system performance. And when a new design passes late-stage testing faster and with less re-work, time-to-market speeds up. Consequently, simulation-led digital prototyping has emerged as a strong competitive advantage over a traditional development process. Autodesk's engineering teams are committed to ongoing development and integration of the following cutting-edge simulation tools which support light-weighting and aerodynamic design.

Autodesk Simulation Composite Design

This new addition to the Autodesk portfolio supports experimentation with composite materials such as carbon-fiber. It gives the automotive engineering team access to a robust materials database, the most common composite failure analysis methods, and a host of simulation solutions for ideal composite structures. See the sidebar on the next page for more details about Composite Design.

Autodesk Simulation Composite Analysis

This complementary tool predicts progressive, nonlinear composite failure with unsurpassed accuracy and faster convergence times. A state-of-the-art composite analysis tool, it easily integrates with an existing finite element solver. See the sidebar on next page for more details.

Autodesk Moldflow

The market leader in plastic part design and manufacturing simulation, Moldflow offers advanced algorithms for predicting production flaws, such as warpage, resulting from part design issues and/or

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Contact your Autodesk Sustainability Solutions team today.

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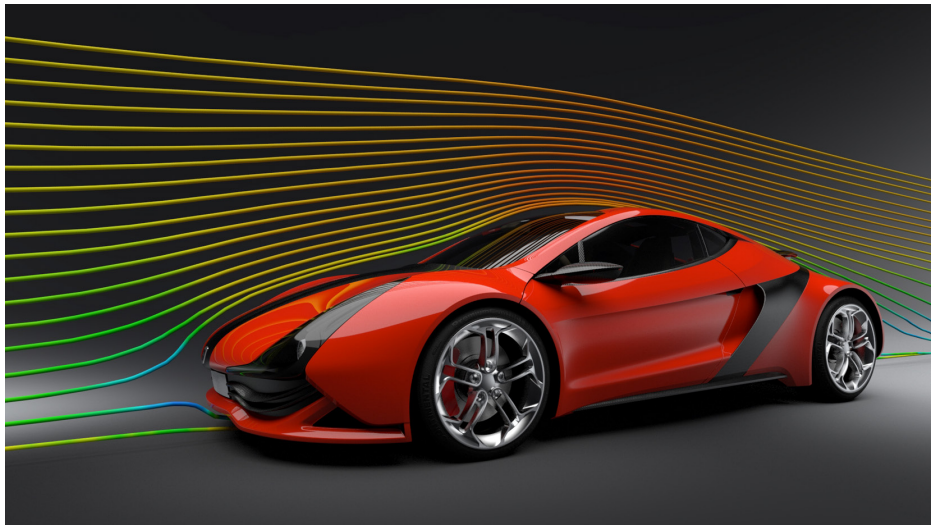
Technicon Design's Evo MK3 super sports car, with a carbon fiber space frame, shown with stream lines from a Simulation CFD aerodynamics study.



Helius: MCT is now –

Autodesk Simulation Composite Design 2015

With more support for laminates:

- Simulates the effect of the manufacturing process for laminates
- Helps predict how much angle change will occur for a given laminate and temperature/ moisture change
- Supports singly and doubly-cured, symmetric and non-symmetric laminates
- Features enhanced reporting and export capabilities

Helius: CompositePro is now –

Autodesk Simulation Composite Analysis 2015

With enhanced support for MSC Nastran SOL400:

- Unidirectional materials – Energy-based degradation; Multiple failure theories; Instantaneous degradation
- Woven materials – 1,4,5,8 harness satin; Multiple failure theories; Instantaneous degradation
- Cohesive elements
- Support for Windows and Linux 64 bit

the molding process. Users have the added benefits of access to Autodesk's state-of-the-art testing facilities for comprehensive thermoplastic material characterizations and the direct support of Autodesk's global support teams with their decades of relevant expertise.

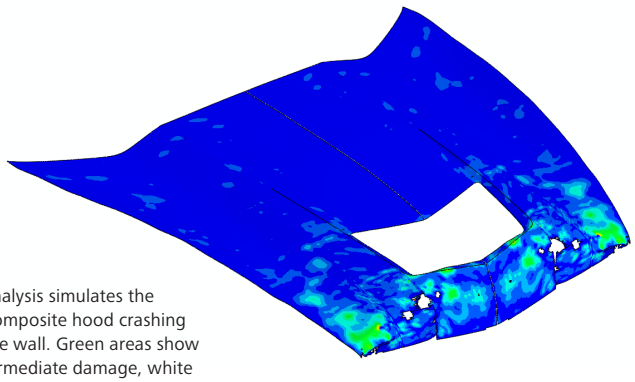
Autodesk Simulation CFD[2]

Employing a flexible, intuitive environment, this tool excels at both concept- and detail-stage aerodynamics studies by putting a real-time virtual wind tunnel on the desktop. Cabin ventilation for maximum air conditioning efficiency and passenger comfort can also be characterized by simulating airflow and heat transfer through interior systems.

Autodesk Simulation DFM[3]

Users can simulate and expose flaws in plastic part design even without prior experience in engineering simulations. Intuitive indicators provide feedback on manufacturability, cost, carbon footprint and recyclability, and results are returned in seconds or minutes instead of hours.

For more information about Autodesk Sustainability Solutions, contact: sustainability.solutions@autodesk.com.



Composite Analysis simulates the effects of a composite hood crashing into a concrete wall. Green areas show matrix or intermediate damage, white holes show material loss (i.e., element deletion) due to fiber damage.

[1]"KPMG's Global Automotive Executive Survey 2014, *Strategies for a fast-evolving market*; [2]*Reinventing Fire: Bold Business Solutions for the New Energy Era*, Amory Lovins and The Rocky Mountain Institute, Chelsea Green Publishing, 2011

[2]Computational Fluid Dynamics

[3]Design for Manufacturability

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