

Motive Industries

Designs futuristic cars 50% faster with CATIA



Overview



■ Challenge

Motive Industries needed to streamline the process of turning a designer's idea into a manufacturable product.

■ Solution

Motive Industries saves time by leveraging CATIA to design contoured surfaces and solid models for vehicle engineering within a single, unified 3D environment.

■ Benefits

The company has reduced the overall time required to design and engineer new vehicles by as much as 50% compared to traditional methods.

The interface between body design and manufacturing

Motive Industries is a Canadian specialty design and engineering company that helps leading-edge vehicle companies translate great design ideas into manufacturable automobiles. Motive Industries has been involved in a wide range of innovative automotive projects, including the Aptera Typ1, BAIC 800, Toyota A-Bat, Dodge Rampage, T3 Motion, Chrysler Akino, and Suzuki Equator.

"We take a designer's idea and turn it into a manufacturable product," said Nathan Armstrong, president of Motive Industries. "Thanks to our decision to use CATIA for 3D virtual modeling, it is possible for just a few people to do what would take an automotive OEM hundreds of people to do using traditional methods."

A current high-profile project is the Motive Switch, a sporty two-door, two-wheel-drive, battery-exchange hybrid electric vehicle that is Motive's entry in the 2009 Automotive X Prize competition. The \$10 million X Prize, sponsored by the X Prize Foundation and Progressive Insurance, will go to

the builder of the best vehicle that can achieve 43 kilometers per liter (100 miles per gallon), comply with current safety standards, create a viable manufacturing plan, and prove its performance in a series of races. Popular Mechanics magazine recently featured Motive as one of its editors' Top 10 picks among leading competitors for the prize.

Motive's entry will be one of the first all-composite vehicles ever designed, with a body made by resin-infusion molding and a composite chassis made with a thermoformed vacuum-molding process. The vehicle will weigh only 591 kg (1,300 pounds), compared to 1095 kg (2,410 pounds) for the Mazda Miata, a sporty two-seater designed with traditional materials.

The traditional approach to designing a vehicle such as the Switch begins when a designer uses freeform surface modeling tools to define the visible interior and exterior surface contours. These surfaces are then exported to a parametric solid modeling environment, where the hidden, interior surfaces are designed to accommodate fasteners and the contours of interior components, along with the chassis, suspension and



"CATIA's knowledge-based design capabilities enable us to relocate a feature such as a ridge or flange with a few clicks of the mouse. The rest of the design adjusts itself automatically to accommodate the change."

Nathan Armstrong, President,
Motive Industries



other vehicle systems. The drawback to the traditional approach is that every time the body design changes, the industrial designers must export a new surface model and reconstruct the solid model, a cumbersome and time-consuming process.

One environment for surfaces and solids

"CATIA dramatically improves the automotive design and engineering process because it combines powerful generative shape design tools along with very capable knowledge-based solid modeling capabilities," Armstrong said. "We receive the surface data from our customer or create it ourselves. If the interior or exterior surfaces change, we make the change within the CATIA environment rather than having to import new surfaces and rebuild our solid model. We can easily move back and forth to conduct 'what if?' comparisons. This saves us 25% to 35% of the time involved in the vehicle design and engineering process."

Additional time savings derive from the knowledge-based design capabilities of CATIA, which make it possible to intelligently link design parameters in templates so that a change made to a dimension automatically updates other related dimensions, including vehicle surfaces.

"Knowledge-based design saves another 10% to 15% of the overall design and engineering time by simplifying the many changes that are required to integrate the various vehicle systems," Armstrong said. "That brings the total savings from using CATIA over separate surface and solid modeling solutions to as much as 50%."

Armstrong said Motive is now using these methods to complete the design and engineering work on the Motive Switch

and then will begin building two vehicles for the competition. The company will also use CATIA Composites Design to generate ply patterns, simulate lay up, evaluate producibility and optimize design and material usage of body and chassis panels. With this approach, he expects to save 80% of the time previously required to design structural composites parts.

"CATIA is revolutionizing the automobile industry by making it possible for a small team to design and engineer a leading-edge vehicle from scratch in a matter of a few months," Armstrong concluded. "It's the future of the automotive industry."

Focus on Aventec

As Motive grows its CATIA capabilities, it counts on Aventec, its Dassault Systemes Value-Added Reseller, for guidance and support. Aventec is in Markham, Ontario outside Toronto, while Motive is in Calgary, Alberta.

"Aventec has provided us with excellent support even though they are located at a considerable distance," Armstrong said. "Aventec helped us to define exactly which modules we need and gave us substantial assistance in setting up the software. Most important, they have provided very timely and knowledgeable technical support services that helped us quickly achieve very high levels of productivity with CATIA."

In fact, Aventec's sponsorship of Motive's X Prize car was critical to its development. "We especially appreciate the fact that Aventec provided the CATIA seats that we needed for the X Prize competition at cost as a sponsorship," Armstrong said. "Their assistance played a major role in helping us develop the Motive Switch and helped us win the funding that will allow us to actually build the car."

Focus on Aventec

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