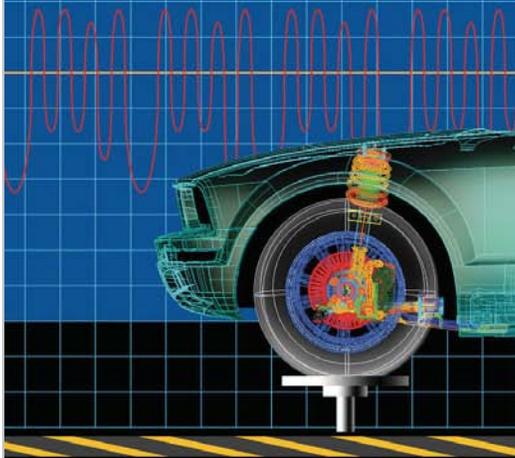


Product Development Success Hinges on the Pursuit of Innovation

Introducing **simulation tools** into the design and **manufacturing process** has enabled **Multimatic** to **transform innovative ideas** into patented products.



by Alex Duquette, Rudy Gruber and Hao Wang

From analysis to testing to production, Multimatic employs state-of-the-art technology, including simulation, to develop stampings, welded assemblies, mechanisms and suspension components.

Car manufacturers, driven by global competition, are constantly striving to shorten their development time, decrease costs and produce quality products. As such, they seek partners that can contribute to meeting these objectives.

Multimatic – a Toronto-based manufacturer of stampings, welded assemblies, mechanisms and suspension components – understands the dynamic automotive market and the business challenges facing original equipment manufacturers (OEMs). Since 1984, the company has collaborated closely with customers, applying advanced technologies to achieve outstanding product quality, delivery and functional performance.

In particular, simulation has enabled Multimatic to consistently bring innovation to the end product –

as well as the product development process. For customers, the innovation provides that extra “value” others cannot deliver, thus ensuring a competitive advantage.

On a Mission

Multimatic sees innovation as the foundation for success. Innovation, in part, is fostered through superior technology. Multimatic’s philosophy embraces the concept of “strength through technology,” which is also its company motto. Technology allows engineers to infuse quality into products, as well as the design and manufacturing processes. A strong culture that encourages teamwork, continuous improvement and the elimination of waste also promotes innovation.

When technology is introduced early in product development, the company can provide more value – and innovation – to customers. That’s because engineers have the ability to look at specific product features from the perspectives of performance and optimization.

Among the technological tools the company has at its disposal is Altair HyperWorks. The suite includes modeling, analysis, visualization and data management solutions for linear, nonlinear, structural optimization, multi-body dynamics (MBD) and fluid-structure interaction. The company has been using HyperWorks applications for 13 years.

Blue-Sky Thinking

Innovative products are born in multiple ways – sometimes out of necessity, sometimes from a simple idea.

As part of its culture, Multimatic promotes “blue-sky thinking.” On a weekly basis, staff is allocated time to work on whatever R&D projects they want. As ideas take shape, they are presented to peers and, if the ideas have merit, to management.

The outstanding concepts are eventually transformed into reality, such as the recently introduced Multimatic Stepgate System and the Tailgate Lift Assist System. Both of these products were honored by the 2007 *Automotive News* “100 Cool Things in Engineering” list.

The patented Stepgate System is an industry-first product that provides added functionality to today’s larger pickup trucks by improving entry and exit from the truck’s bed. What makes the system unique is that it deploys from an open tailgate to provide a step midway between the ground and the lowered tailgate.

In addition, an assist handle folds out from the inside face of the tailgate, which also incorporates a molded-in, dent-resistant tailgate liner that both protects the tailgate and secures the handle when stowed. This innovative product was launched on Ford Motor Company’s new Super Duty pickup truck.

The Multimatic patented Tailgate Lift Assist System also is a product of blue-sky thinking. This

feature allows users to open and close the tailgate with one hand. In addition, the system provides fall-open damping, which eliminates shock loads and creates a quality feel to the operation of the tailgate.

The 2007 Toyota Tundra and Nissan Titan feature the Tailgate Lift Assist System. The device uses a gas strut to provide weight-compensating assistance in both the opening and closing directions.

In the development of these products, the Altair HyperWorks suite played a key role in kinematics evaluation and structural weight optimization as well as formability studies and tooling development.

Simulation Savvy in Manufacturing

Simulation in manufacturing is not new. However, the manufacturing community typically has been slow to adopt such technology, especially in metal stamping. This is not the case at



Multimatic. The company takes a scientific approach to understand the forming process by using simulation tools.

Successfully applying simulation technology in forming revolves around ensuring that the forming process that is evaluated and optimized on the computer is the same as that which will be used on the shop floor. This is achieved by having the toolmakers, who are trained in solid modeling, create 3D CAD models of the initial tooling concepts, which are then shared with the analysis department for evaluation. The forming process is simulated, and the results are reviewed with the toolmaker.

Being able to see “inside the die” and see how the material moves allows the toolmaker and analyst to quickly come up with changes to the tooling, resulting

This innovative stamping of a proprietary I-beam control arm is used on the latest-generation Mustang. Multimatic received the *Automotive News* PACE Award for this innovative design.

Ahead of the Curve

Incorporated in 1984, Multimatic is a Canadian corporation that specializes in the manufacture of stampings, welded assemblies, mechanisms and suspension components. While it primarily provides services to the automotive industry, it also caters to companies that make snowmobiles, all-terrain vehicles, skates and boats, among others.



Strength
Through
Technology®

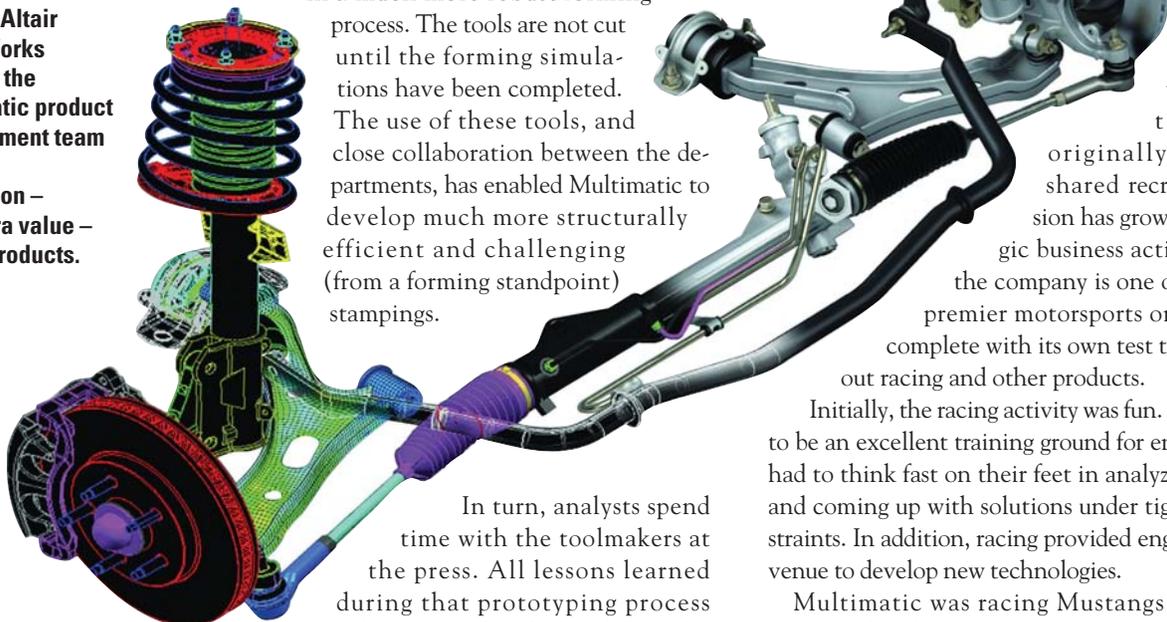
Multimatic

Engineering Services Group

The company's four operating groups include Hinge Systems, which manufactures closure products for original equipment manufacturers; Stamped/Welded Assemblies, which provides seating hardware, instrument panel structures and other integrated vehicle subassemblies; Suspension Systems, which focuses on suspension components and subassemblies; and Engineering Services, which offers design, engineering, analysis, prototyping and testing.

Worldwide, 2,000-plus employees are dedicated to designing and manufacturing innovative products for customers. To stay ahead of the curve, the company empowers product development team members to tap innovative technology, including the HyperWorks CAE software suite from Altair Engineering Inc.

Simulation software such as Altair HyperWorks enables the Multimatic product development team to bring innovation – and extra value – to end products.



in a much more robust forming process. The tools are not cut until the forming simulations have been completed. The use of these tools, and close collaboration between the departments, has enabled Multimatic to develop much more structurally efficient and challenging (from a forming standpoint) stampings.

In turn, analysts spend time with the toolmakers at the press. All lessons learned during that prototyping process are documented and used during the production tooling build.

The cross-training and collaboration foster trust in the technology. Toolmakers believe what the analysts tell them; they know that when they build the part, time will be saved in the process.

Multimatic toolmakers are proactive users of

Altair HyperForm, a sheet metal forming software, for their blank development. For relatively simple components, such as a typical hinge, a detailed forming simulation is not performed; however, the blank shapes are predicted using HyperForm software.

Multimatic has customized the HyperForm interface to automate the process of developing blanks, and it is used by the toolmakers on the shop floor. Menus guide users in setting up the HyperForm simulation, thereby minimizing the amount of training required to use the software.

Streamlining this process helps to reduce overall tooling and development costs.

In the Fast Lane

In the early 1990s, a group of Multimatic engineers became involved in motor-sports racing in their spare time. What

originally began as a shared recreational passion has grown into strategic business activity. Today, the company is one of the world's premier motorsports organizations, complete with its own test track to prove out racing and other products.

Initially, the racing activity was fun. It also proved to be an excellent training ground for engineers, who had to think fast on their feet in analyzing problems and coming up with solutions under tight time constraints. In addition, racing provided engineers with a venue to develop new technologies.

Multimatic was racing Mustangs in the mid-1990s and early 2000s and won a number of manufacturers' and drivers' championships. The in-depth knowledge of the Mustang, and its suspension components, proved to be extremely beneficial when competing for the suspension manufacturing business for the next-generation vehicle (2005 Mustang). Multimatic was awarded the contracts

Instruments of Success

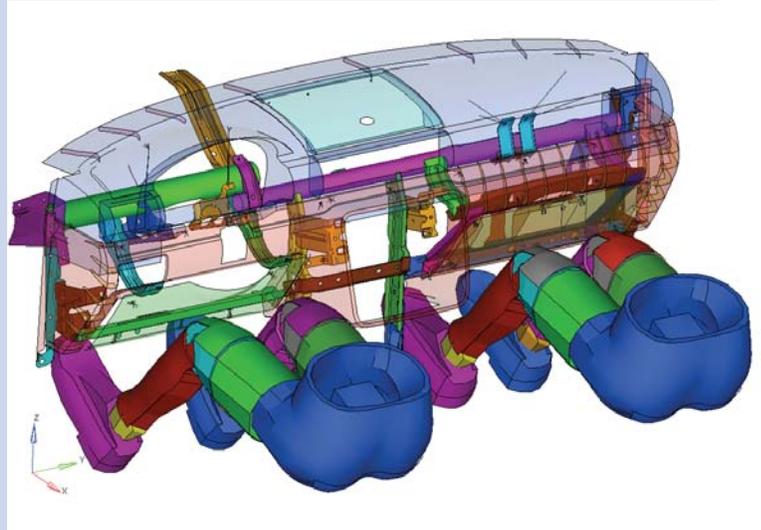
Instrument panel structures, or IPs, are among the products that Multimatic designs and manufactures for global original equipment manufacturers (OEMs). These metal structures fit underneath the dash panel and represent one of the most complex assemblies in a car.

The IPs are complex for various reasons. From a functional standpoint, they hold ventilation ducts and wiring as well as interface with a range of components – the steering column, air bags, gauge cluster, stereo, cup holders and glove box, among others.

In addition, they must meet a myriad of global safety regulations. That's because the IPs are designed to absorb energy during a crash event and to slow down an occupant's lower body in a controlled manner, helping to prevent serious injury. What's more, Multimatic must develop the IPs to support the "style" designers strive for while meeting various structural and crash requirements. Furthermore, there is a huge drive to generate IPs that are as light as possible.

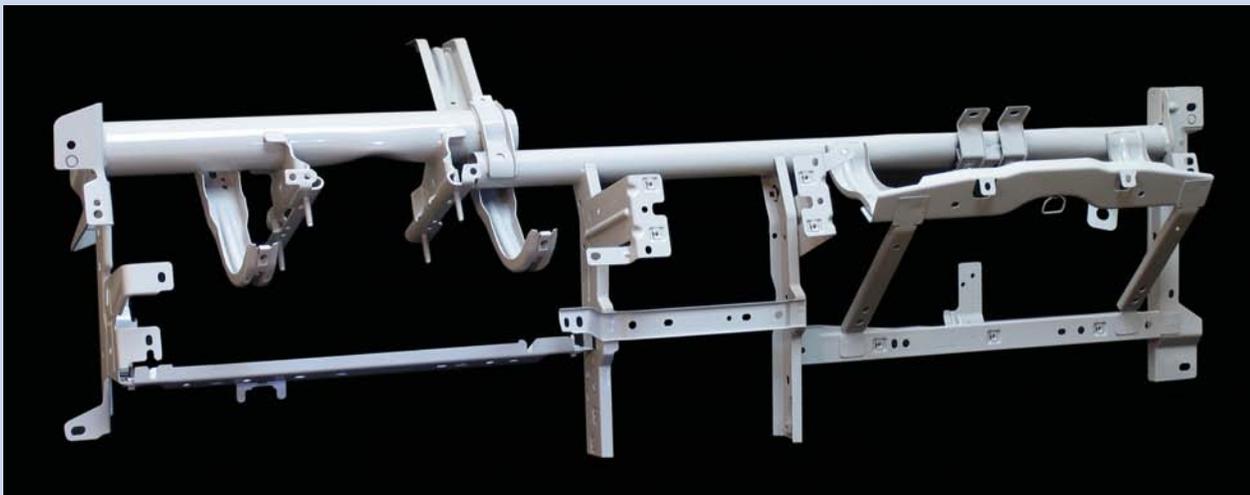
Optimization technologies available in Altair HyperWorks help Multimatic product development teams minimize the mass of IP steel structures. Altair OptiStruct, for example, enables engineers to understand where structure is needed and where it can be removed to optimize mass and cost.

Altair HyperForm is used to predict blank size and the formability of sheet metal parts up front in the product



The above finite-element model of the instrument panel shown below was created with Altair HyperMesh software.

development process. This technology has allowed Multimatic to streamline the development of complex designs and forming processes to quickly mass produce products with confidence.



This production stamped instrument panel steel structure represents the type of products Multimatic manufactures.

for the front lower control arm and the links for the rear suspension. The Mustang became the first car to use Multimatic's proprietary stamped and welded I-beam front lower control arm.

During the development process, Multimatic performed structural analyses on the suspension control arm, evaluating various load cases. They ran

simulations to determine what design would provide better performance and then optimized components to keep the weight – and cost – as low as possible. One of Multimatic's early Mustang race cars was modified by the motorsports department to the new vehicle configuration and used as a development mule for this new suspension system, which



The race track proved to be an excellent training ground for Multimatic engineers, who had to think fast on their feet in analyzing problems and coming up with solutions under tight time constraints.

resulted in Multimatic and Ford Motor Company obtaining performance data as early as possible.

The unique front lower control arm is configured to utilize two complex press-formed stampings, welded together to form a highly efficient I-beam cross-section. The innovative aspect is that each stamping is configured with the correct plan view shape and is formed into a U-shaped section with the upstanding flanges fully returned 180 degrees back unto themselves to effectively double their thickness.

This requires highly sophisticated metal-forming techniques to fold the edges back into a double-material-thickness upstanding flange. The two stampings are then placed together in a back-to-back arrangement and welded along the free, peripheral edge using a novel gas metal arc welding process. The resulting suspension member offers a superior strength-to-weight ratio in comparison to conventional configurations.

For its efforts, Multimatic was named a 2005 *Automotive News* PACE Award winner for the proprietary I-beam control arm. The Premier Automotive Suppliers' Contribution to Excellence award is accepted around the world as the industry symbol of innovation.

Innovation, fostered through strength in technology, has enabled Multimatic to win a range of awards as well as patents for products. Most importantly, it enables the company to bring value to customers. Simulation technology – such as the HyperWorks CAE software suite from Altair Engineering, Inc. – paves the way for innovative ideas to be transformed into reality. 

Alex Duquette is Manager of CAE, **Rudy Gruber** is General Manager and **Hao Wang** is Assistant General Manager, Multimatic, Toronto.

To receive more information about HyperWorks, visit www.altair.com/c2r or check 01 on the reply card.