Altair | Partner Alliance

Two-Wheeler Designer-Manufacturer Cuts New Component "Time to Market" and Optimizes Component Design with the Altair Partner Alliance

Mahindra Rise.

Key Highlights

Industry
Automotive

Challenge
Increase Efficiency in Prototyping Components

Altair Solution
Access APA Products to Streamline Production Process

Benefits
- Development of more efficient "green" engi ne components
- Fewer prototypes resulting in cost savings
- Better understanding of material behavior resulting in fewer warranty claims

Customer Profile

Mahindra & Mahindra is an Indian multinational group with interests spanning several verticals. Its automotive business is one of its oldest and most reputed, and encompasses a wide range of personal and commercial utility vehicles.

In 2008, the Mahindra group forayed into the two-wheeler segment. Barely eight months after this entry, Mahindra Two Wheelers Limited launched a range of Power Scooters, which captured double digit market share in less than a year.

Since then, brand Mahindra has been growing from strength to strength on the back of strong internal product development capabilities guided by consumer insights, strategic partnerships, service orientation and building scale.

The Challenge: Expensive and Time-Consuming Prototyping of New Parts

As a relatively newcomer in the highly competitive Indian two-wheeler market, Mahindra Two Wheelers Limited is acutely aware of the need to shorten the "time to market" product development cycle. To that extent, company is open to technological enhancements that can positively impact the way it develops new vehicles.

In 2011, sales teams from Altair introduced Mahindra Two Wheelers' in-house product development team to the Altair Partner Alliance, an innovative offering from Altair Engineering and other third party vendors of virtual simulation tools.

Initially, the Mahindra Two Wheelers team was curious to just explore the different domains available through the partner programs.

Keywords: Altair Partner Alliance (APA), Mahindra & Mahindra, SC/Tetra, FEMFAT, HyperMesh, HyperGraph, HyperView, Hyper Crash, MotionView, MotionSolve, AcuSolve,OptiStruct, RADIOSS

Mahindra Two Wheelers Limited Success Story

Accessibility to wide range of Altair Partner Alliance tools has helped us to enhance our prediction capabilities without investing exclusively for these tools. This has also helped us to reduce the design lead time enabling us to bring our products faster to market.

Gyanendra Roy
CAE Team Lead, Mahindra Two Wheelers Limited

Since correlation research trials yielded good results, the team's interest in and utilization of the Hyperworks Suite and its partners' programs grew.

"We liked what we saw and believed that we would benefit from signing up. We especially liked the fact that we got access to many different sorts of programs without purchasing separate licenses. Our primary interests lay in the speed at which these programs allowed us to evaluate alternative component designs and the possibility of cutting prototyping costs," shares Gyanendra Roy, CAE Team Lead.

The Solution: End-to-End Capabilities with APA

Prior to signing up, the team at Mahindra Two Wheelers expressed concerns about software support. "The Altair Partner Alliance is a new concept involving different partnering providers. We wanted to be certain of getting adequate and timely support for each program," says Gyanendra Roy. Getting assurance of direct support from each partner laid these concerns to rest.

Gaining access to a wide range of virtual simulation tools tremendously increased Mahindra Two Wheeler's in-house design capabilities and part level analysis. Soon after signing up the team put the programs to the test.

The team used SC/Tetra to simulate the cooling capability and power consumed by several new designs of scooter engine cooling fans. Conventionally, the centrifugal cooling fan is driven by crankshaft and is enclosed in engine cowl. The engine cowl streamlines the flow towards engine surfaces. The centrifugal consumes as much as up to 5 % of the engine brake power. But the fan is an essential component of the Scooter — it is the only cooling

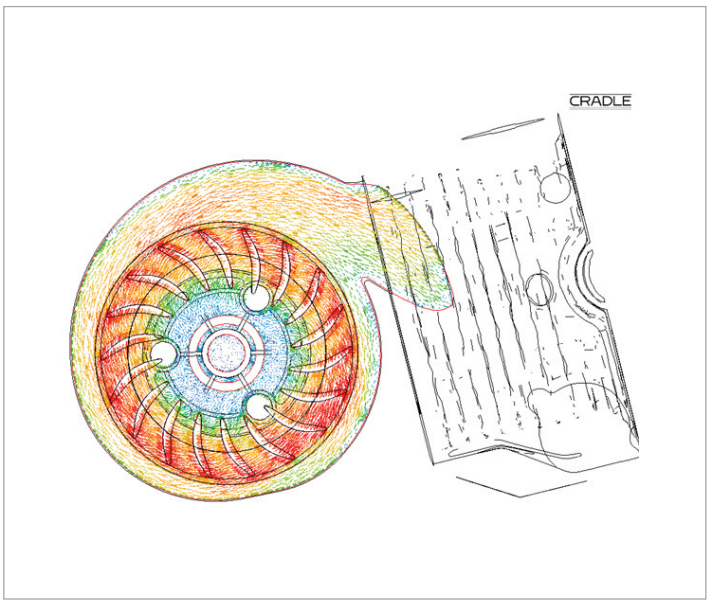

Figure 1: Engine Cowl Velocity Vector

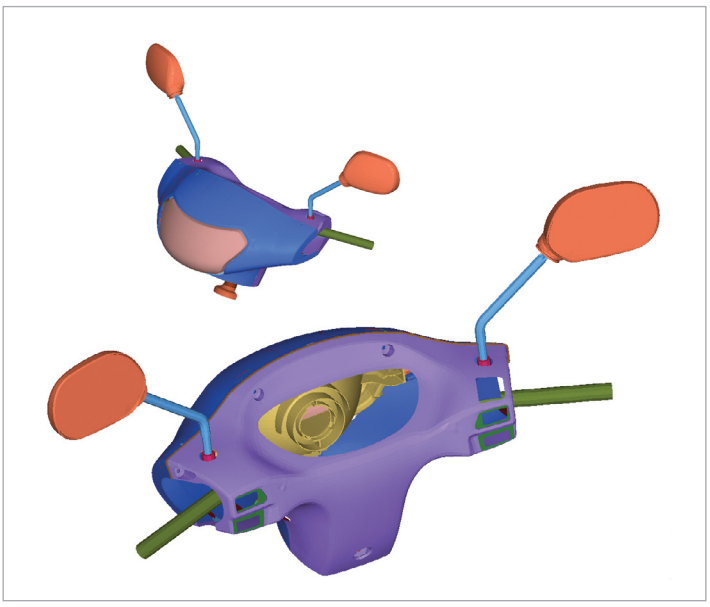

Figure 2: Headlamp Assembly on Handlebar

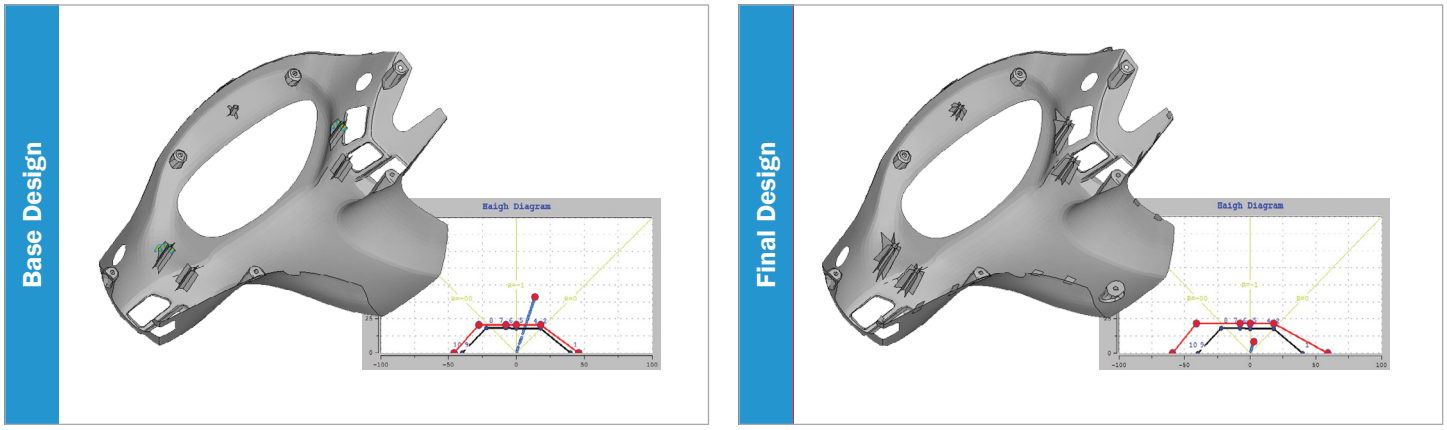

Figure 3: Damage plot comparison of headlamp casing mounting

mechanism for the engine mounted at the rear end of the scooter where it is not exposed to any natural cooling atmospheric air flow. Hence, it makes sense for initiatives to increase the fuel economy of the vehicle to also focus on reducing the power consumed by the cooling fan, taking precautions to leave its cooling ability and engine performance intact.

The Results: One "Green" Product, One "Warranty Saving" Product

With SC/Tetra, the team was able to closely observe the flow path, this study prompted them to design a streamlined flow across the engine cowl , which facilitated/aided in achieving them the desired solution.

The newly designed cowling and fan resulted in 30% reduction in power consumption without affecting the cooling performance. Also, SC/Tetra cut short a typically lengthy product development cycle and helped Mahindra Two Wheelers save on the cost of prototyping more than one design.

Buoyed by the results, the team applied another Altair Partner Alliance solution to assess the durability of plastic parts of the scooter headlamp assembly. When such parts fail, this involves huge warranty costs. So it is critical to develop the best possible design.

Based on the plastic material test data, the proposed new design with the material models were generated in FEMFAT, which includes the material S-N curve, true stress-strain curve considering failure at rupture, Haigh diagram and other material descriptives. Together with information about the production process and possible influences, it was a straight forward analysis and simulation of fatigue behavior. Studying the damage to several proposals helped the team identify the most feasible design — the one with the best survival factor.

Through FEMFAT, the experimental design validation cycle was sped up, the prototyping and tooling cost were reduced, and the team gained a better understanding of the material behavior and performance. The life of the part was improved by a factor of 3 as compared to base design in simulation environment, and a factor of 4.16 in experimental tests in the laboratory and real world.

The Learning: Percolating Design Best Practices across Mahindra Two Wheelers

With the Altair Partner Alliance, Mahindra Two Wheelers is coming up with "first time right designs" within the least possible time. Mahindra Two Wheelers is using HyperMesh, HyperGraph, HyperView, Hyper Crash, MotionView, MotionSolve, AcuSolve, OptiStruct, RADIOSS from the HyperWorks Suite. Within the Altair Partner Alliance, the team is using SC/Tetra from Cradle Software and FEMFAT from Engineering Center Steyr. In future, it would like to try Coustyx from Ansol.

The Altair Partner Alliance has considerably improved Mahindra Two Wheelers understanding and use of analytical software tools. "Joining the Altair Partner Alliance has helped us to expand in new areas such as CFD, acoustics, fatigue etc. which has greatly improved prediction capabilities for the new domains with faster results," reflects simulation team, who would recommend the Altair Partner Alliance to the design team, electronics team, testing team and styling team to perform respective system-level analysis. In fact, learning from the headlamp assembly study has already been deployed in other vehicle platforms, thereby reducing the design cycle time by 80%.

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About Altair

Altair empowers client innovation and decision-making through technology that optimizes the analysis, management and visualization of business and engineering information. Privately held with more than 2,000 employees, Altair has offices throughout North America, South America, Europe and Asia/Pacific. With a 28-year-plus track record for high-end software and consulting services for engineering, computing and enterprise analytics, Altair consistently delivers a competitive advantage to customers in a broad range of industries. Altair has more than 3,000 corporate clients representing the automotive, aerospace, government and defense, and consumer products verticals. Altair also has a growing client presence in the electronics, architecture engineering and construction, and energy markets.

About Altair Partner Alliance

One Platform. One License. One Source. **All Access**.

Altair's HyperWorks platform applies a revolutionary subscription-based licensing model in which customers use floating licenses to access a broad suite of Altair-developed, as well as third-party, software applications on demand. The Altair Partner Alliance effectively extends the HyperWorks Platform from 28 internally developed solutions to more than 65+ applications with the addition of new partner applications. Customers can invoke these third-party applications at no incremental cost using their existing HyperWorks licenses. Customers benefit from unmatched flexibility and access, resulting in maximum software utilization, productivity and ROI.

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Altair Engineering, Inc., World Headquarters: 1820 E. Big Beaver Rd., Troy, MI 48083-2031 USA
Phone: +1.248.614.2400 • Fax: +1.248.614.2411 • www.altair.com • info@altair.com