CASE STUDY

AI DRIVES MOTORCYCLE INNOVATION

ALTAIR® PHYSICSAI™ HELPS HERO MOTOCORP DESIGN 99% FASTER

About the Customer

Hero MotoCorp Ltd. (Hero), an Indian multinational motorcycle and scooter manufacturer headquartered in Delhi, India, serves millions of customers across more than 45 countries. As one of the world's largest motorbike manufacturers, Hero holds nearly 31% of the Indian two-wheeler market and has established partnerships with global brands like Zero Motorcycles and the iconic Harley-Davidson.

Hero strives to optimize development by utilizing best-in-class technology and the latest simulation methods – including artificial intelligence (AI) and machine learning.

Their Challenge

Simulation has been a central part of Hero's product development for years; traditional finite element analysis (FEA) has enabled Hero's development teams to perform component design evaluations and provide detailed design insights. However, Hero sought to overcome development bottlenecks and drive even quicker decision-making. This led them to move beyond traditional FEA and implement AI and machine learning. To support their CAE engineers in adopting AI and machine learning in their daily workflows, Hero needed efficient, powerful, user-friendly tools. Hero's first AI-driven project focused on designing a new motorcycle handlebar. The handlebar is a vital motorcycle component; it influences ergonomics, defines the rider's position, and impacts the motorcycle's steering, balance, comfort, and character. Because of its prominent role, teams typically invest a lot of time designing and refining the handlebar. To meet their goals and shorten the design process, Hero turned to Altair's AI-powered technology.

REDUCED DEVELOPMENT TIME FROM 1 HOUR TO 3 MINUTES

UPSKILLED DEVELOPMENT TEAM

EVALUATED MORE CONCEPTS WITH RAPID DESIGN EXPLORATION

Try Altair® HyperWorks®: **Download Now**

Try Altair® PhysicsAI™: **Download Now**

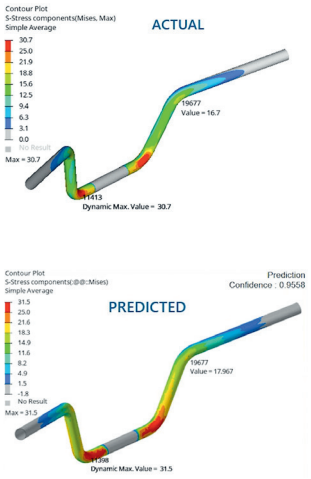
Our Solution

Hero chose Altair® PhysicsAI™, a powerful geometric deep learning technology that leverages historical data to train AI models and generate physics predictions in a fraction of the time that traditional FEA methods require. The PhysicsAI workflows, conveniently embedded into Altair® HyperWorks®, Altair's simulation and design platform, enabled Hero users of all skill levels to seamlessly weave this solution into their existing processes.

To leverage PhysicsAI, Hero first split their existing data into training and testing sets: training data to train their machine learning model on past simulations, and test data to evaluate and quantify the AI model's predictive accuracy. With a wide range of bikes – sport bikes, adventure bikes, commuter bikes, cruisers, etc. – Hero's team used a variety of handlebar datasets to ensure the AI model produced accurate results.

Data segregation and model training are critical steps in the AI-powered engineering process. Hero opted for a typical 80/20 data split, meaning 80% of the data was specified for model training and 20% was for evaluating predictions. The project team selected 30 handlebar variations for training from 24 datasets. After training, they tested the AI model with the remaining six handlebar datasets and evaluated the results' accuracy by comparing traditional FEA results to the AI-generated predictions. The comparison revealed only a 3% variation, proving that PhysicsAI delivered accurate predictions in a fraction of the time compared to traditional FEA.

In a separate simulation, the team imported a handlebar dataset that wasn't part of the training or testing sets to predict stresses on new handlebar designs. Using their newly trained PhysicsAI model, the team could predict stress results with a single click. They compared the PhysicsAI-predicted stress data to the values in a stress plot based on traditional FEA results, which once again revealed a less than 3% variation. The close match gave engineers confidence in the AI-generated results for a new design concept. The approach also saved time. Traditional FEA required an hour to produce analysis results – PhysicsAI took just three minutes.



TOP: Handlebar stress results from traditional FEA method. **BOTTOM:** Stress results from Altair physicsAI compared to traditional FEA show a 3% variation.

> **"PhysicsAI significantly reduced our development time. With it, we are able to generate conclusive results at lightning speed and accelerate our decision-making. While our traditional FEA simulation method took a full hour, PhysicsAI generated similar predictions – within a 3% result variation – in just three minutes."**
>
> **Jeevesh Prasoon, senior engineer, Hero MotoCorp Ltd.**

Results

The benefits of using PhysicsAI were enormous for Hero. Most notably, the time savings – from an hour to mere minutes – were substantial. Additionally, the PhysicsAI simulation was very accurate, with its results showing only a 3% variance compared to traditional FEA analysis results. Applying AI-powered engineering processes helped Hero reduce product development time, enrich its team's skill set, and accelerate design exploration. Based on this success, Hero plans to scale its use of AI technology, using it to design other complex components for even greater efficiency, accuracy, and decision-making.