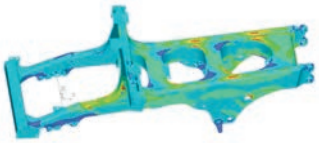
LIGHTWEIGHT MINING HAULERS OPTIMIZED

ALTAIR SIMULATION IS A FAST, COMPLETE SOLUTION FOR HITACHI TRUCKS

About the Customer

Hitachi Construction Truck Manufacturing Ltd is located in Guelph, Canada and is a subsidiary of Hitachi Construction Machinery Co. Ltd of Japan (HCM), a consortium of 13 manufacturing companies, with more than 20,000 employees worldwide. Yu Shen, senior manager of technical analysis at Hitachi Truck leads a team focused on rigid dump mining truck design and analysis. The Hitachi mining trucks are engineered for heavy duty applications such as construction, quarrying, and mining, with superior hauling capabilities and industry leading technology. The design criteria are high fuel efficiency, long fatigue life, and simple operation.

> “The benefit of using Altair software is that it provides an economical way to use different software without the need to purchase several licenses, helping further to cut costs. At Hitachi, we also use Altair Partner Alliance tools like FEMFAT, NCode DesignLife, and Maple. All these are conveniently available through the Altair license system.”
>
> Yu Shen, Senior Manager of Technical Analysis, Hitachi Truck Manufacturing



LEFT: New wave body.
TOP: Existing frame.
BOTTOM: FEA results – Frame weight reduction 10% after optimized design with FEA.

Their Challenge

A dump truck is constrained by the load capacity of the tires and the road it drives on, so a lighter, more robust truck would mean higher payload hauling efficiency. When designing a new truck, there are several design criteria to meet: **lightweight, low cost, long fatigue life,** multiple design iterations, and a **tight schedule.** Highly efficient design and analysis tools are needed.

Truck dynamics, control system, thermal, and fatigue analyses all need to be completed when designing a new truck design. Thanks to Altair's licensing model, Hitachi has access to many software applications to conduct these simulations.

Our Solution

For a new design, the first thing to be determined is the truck load conditions. It is time consuming, cost extensive, and it is difficult to measure the truck stress distribution due to varying road conditions, grades, surfaces, and turning radii. Using Altair simulation tools, Hitachi has achieved a 10% weight reduction in the main frame and rigid body, while maintaining product quality.

Hitachi uses Altair MotionView™ with Altair Activate® to obtain truck dynamic response under controlled traction and brake forces. In the model, solver variables collect the respective states of the truck model at each time-step and solver arrays continuously pass values of each solver variable between Altair MotionSolve™ and Activate. The simulation results from Altair MotionView allow them to calculate typical loads exerted to the main components like the rigid frame, front and rear axles.

For truck rigid frame, dump body, and front and rear axle analyses, linear and quasi static analysis are used. Altair Radioss™ is also used for the driver cabin roll over protection structure analysis. The use of Altair OptiStruct™ topology function enables Hitachi to optimize the shape and size of several components such as bumper frame extension and truck electric trolley.

Results

Hitachi considers Altair Simulation an important software package for their engineering work, as it helps to solve different engineering problems in an efficient way. The different tools included in the license allow Hitachi to run different simulations on one platform. Using Altair software along with Altair Partner Alliance tools for further fatigue and durability analyses, Hitachi has been able to achieve stronger, lighter dump trucks which can carry more payload by reducing truck weight and increasing its product fuel efficiency. These improvements were achieved with exceptionally fast product development times. The strong support from Altair is one of the main reasons why Hitachi continues using Altair products with confidence.

To learn more, please visit altair.com/agriculture-construction/