HyperWorks

Forklift Manufacturer Cuts Pre-Processing Time in Half and Solves Stubborn Design Problems with Altair's HyperWorks Suite

NACCO MATERIALS HANDLING GROUP, INC.

Key Highlights

Industry
Heavy Industry

Challenge
Avoid costly prototype testing

Altair Solution
HyperWorks simulation and analysis to virtually design, test and evaluate products before production of physical prototypes

Benefits
- Cost savings
- Reduction in pre-processing time

Customer Profile

Businesses around the world that use forklift trucks, container handlers, and electric warehouse vehicles may not recognize the name NACCO Materials Handling Group (NMHG), but they all value the brand names under which its products are sold: Yale® and Hyster®. One of the world's largest producers of lift trucks, NMHG designs, engineers and manufactures materials handling equipment for virtually every type of market.

At its Counterbalanced Development Center in Fairview, Oregon, NMHG develops a wide range of counterbalanced sit-down forklift trucks. This center also serves as one of the global centers of excellence for computer simulations used by the company's network of development centers around the world.

The Challenge: Costly Iterations of Prototypes

NMHG in Fairview began using Altair Engineering's HyperWorks suite of simulation tools in February, 2009, after Chief Engineer Dr. Pedro Bastias joined the company. His ultimate goal was to virtually design, test and evaluate each product before any physical prototypes are made.

Previously, the company's engineers had been using finite-element analysis (FEA) for 25 years, but they needed to build several iterations of physical prototypes to test their designs.

Altair

Keywords: Heavy Industry, HyperWorks, OptiStruct, RADIOSS

NACCO Materials Handling Group Success Story

“It really caught my attention when colleagues in India told us they could reduce meshing time by half.”

Fred Forstner,
Engineering Manager,
NACCO Materials Handling Group

“We created a model; run through several iterations until a reasonable solution was found; then a prototype was built and tested, this process was repeated a couple of times,” Bastias recalls. “This iterative process takes time, and time to market is crucial for us. Those iterations were an added cost as well.”

Bastias felt that whatever tool could be used virtually to reduce time to market without compromising quality would result in important cost savings and a certain competitive advantage.

“My predecessor had done a good job of developing a framework to evaluate all our products,” Bastias says, “I tried to introduce new methods and new ways to look at the same challenges. That’s when the HyperWorks family of tools came to mind.”

The Solution: New Efficiencies and New Capabilities with HyperWorks

Before joining NMHG, Bastias was responsible for selecting the pre- and post-processor to build virtual models for a division of a large corporation manufacturing components for the auto industry. He compared HyperWorks to ten other products from vendors across the globe. “It took me quite a while to go over all of them,” Bastias says, “and I became confident that HyperWorks was the best.”

He adopted Altair’s HyperWorks suite at NMHG to try to reduce the amount of physical prototyping that needed to be done for products and thereby cut both costs and time to market.

“Our workflow hasn’t changed much — we create the CAD design and do the simulation, refining the design through iterations and then building physical prototypes that we test with strain gauges,” Bastias notes. “The whole analysis philosophy has to be modified and redefined to reduce the many, many cycles of numerical evaluations followed by physical tests we previously required. We are optimistic that HyperWorks will make us considerably more efficient in that objective.”

HyperWorks also is providing NMHG with new capabilities. For example, OptiStruct allows engineers to optimize a design based on fatigue — an approach that Bastias says holds great potential for his company. Altair’s RADIOSS opens the field to a broad range of simulations, previously run with an implicit code. The company will use MotionView and MotionSolve for multi-body dynamics analysis. Bastias also has found that pre-processing continues to be “extremely simple and very powerful with HyperMesh.”

The broad range of benefits offered by HyperWorks has made the suite very attractive to NMHG’s engineering team. “It’s a tool that’s good, not just in one area, but in many,” according to Bastias. “It’s good in optimization, in pre- and post-processing, and in our ability now to use Altair’s partner program to access other applications without additional cost.”

“We have a wide array of needs that lend themselves to the HyperWorks suite,” Bastias says. “We are just starting to

appreciate the advantages of using this program in the context of our products and are very happy with our collaboration with Altair. The tech support has been excellent."

NMHG Engineering Manager, Fred Forstner, echoes Bastias' praise for HyperWorks and especially appreciates Altair's token-based licensing model. "It's a good idea," Forstner says. "It allows us to run several versions of HyperMesh or OptiStruct."

The Results: Pre-processing in Half the Time

Using HyperWorks, NMHG is saving time, cutting costs and identifying new ways to resolve stubborn engineering problems. For example, with one small component — a counterweight support plate — engineers had gone through four design iterations. The part had been built with FEA and strain-gauged, but the plate still did not pass the company's minimum-hours-of-operation requirement. Around the time that the fourth unsuccessful iteration had been tried, the company acquired HyperWorks' tools. After running a single analysis with OptiStruct, the program suggested a solution that the company implemented; and the part passed the test.

The same process was applied to a gusset that was giving engineers problems. Using OptiStruct, within an hour the team had a solution that gave them a correct answer without having to go to the shop, cut the gusset, cut another plate with a different shape and test it.

"Forklift trucks are all about space constraints." Forstner points out. "We have dimensional limits and must be able to reduce the overall package size and still lift the same amount of load. Often very little space is allowed for structures, and to be able to optimize the product for the space in automated form with OptiStruct is very helpful.

The most evident impact of adopting HyperWorks, however, may be the time savings. Yogesh Kajale, NMHG's numerical analysis group leader in Pune, India, has reported that, after switching to HyperMesh for pre-processing, it reduced the time required to mesh a truck by 50 percent—from four weeks using the previous manual process to just two weeks with HyperMesh. Engineers there see the potential for even greater time reductions in the future.

"I'm an engineer but also deal in finance and business," Forstner states, "and it really caught my attention when colleagues in India told us they could reduce meshing time by half. That's a huge deal for us. It's something that's notable. To do that helps in so many ways, including speeding product time to market."

Forstner also finds benefits in having an entire suite of simulation packages available through HyperWorks. "The flexibility that Altair offers," he says, "and being able to use our license units in so many ways are advantages. One program offers pre-processing, post-processing, solver and multi-body dynamics, with all covered by one license."

Visit the HyperWorks library of

Success Stories

at www.altairhyperworks.com

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 1,300 employees, Altair has offices throughout North America, South America, Europe and Asia/Pacific. With a 20-year-plus track record for innovative product design and development, advanced engineering software and grid computing technologies, Altair has more than 3,500 corporate clients representing the automotive, aerospace, government and defense, and consumer products verticals. Altair also has a growing client presence in the life sciences, financial services and energy markets.

HyperWorks®

Performance Simulation Technology

HyperWorks is an enterprise simulation solution for rapid design exploration and decision-making. As one of the most comprehensive, open-architecture CAE solutions in the industry, HyperWorks includes best-in-class modeling, analysis, visualization and data management solutions for linear, nonlinear, structural optimization, fluid-structure interaction, and multi-body dynamics applications.

www.altairhyperworks.com

Altair

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