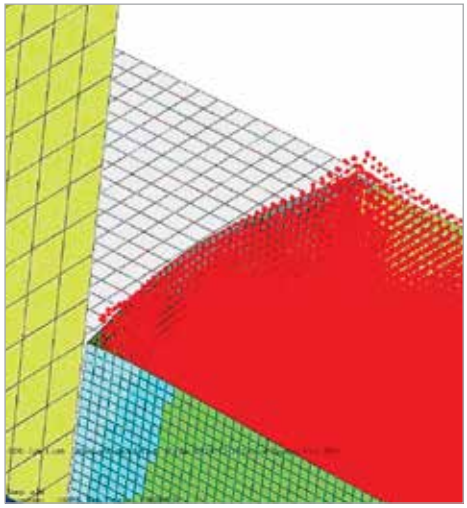
Railcar Manufacturer Speeds Design Modifications with HyperWorks



Key Highlights

Industry
Rail

Challenge
Find a faster way to modify railcar designs

Altair Solution
Use of HyperMesh for easy FE meshing

Benefits
- More options for the best design
- Allows real world testing
- huge time savings, which translates into dollar savings

Customer Profile

American Railcar Industries, headquartered in St. Charles, Mo., designs and manufactures commercial railroad cars, producing every part of the car above the wheels. Customers use the company's railcars to transport all sorts of liquid and solid raw materials, including oil, coal, cement, sand, grain and other substances. Their designs include boxcars, gondolas and hoppers, among other styles.

The Challenge: A Faster Way to Modify Railcar Designs

The company must design its state-of-the-art cars while keeping in mind the specific materials to be transported. For instance, chlorine is very corrosive and governed by federal and state regulations, so the design of the car carrying it must be very robust. At the same time, the railcar must be cost competitive, so the company seeks to develop the least costly design that provides high levels of efficiency.

"We have an efficient design if we can come up with minimum costs and the most efficient structure," explains Spencer Ashie-Winns, structural engineering manager for American Railcar. "The rails have a weight limit that the car cannot exceed—say 220,000 lbs. If my railcar structure weighs 100,000 lbs., the customer can haul only another 120,000 lbs. of commodity. If a competitor can develop a car weighing 75,000 lbs., the customer can haul 145,000 lbs. So the customer is looking at the bottom line, and that drives innovation to develop the best product at a very competitive cost."

Keywords: American Railcar, HyperWorks, HyperMesh, MotionSolve, HyperCrash

American Railcar Success Story

“HyperWorks has changed the way we design. Now we are not hesitant to try different options, because modifying the mesh is easy.”

Spencer Ashie-Winns
Structural Engineering Manager
American Railcar Industries

Ashie-Winns and his engineering team had been using finite element analysis software for many years, but the limitations of that software had begun to slow their innovation processes. For example, American Railcar maintains base models for various types of cars, but each customer requires modifications to tailor the cars for the specific cargos they will carry. As a result, engineers must re-run the model for different load cases.

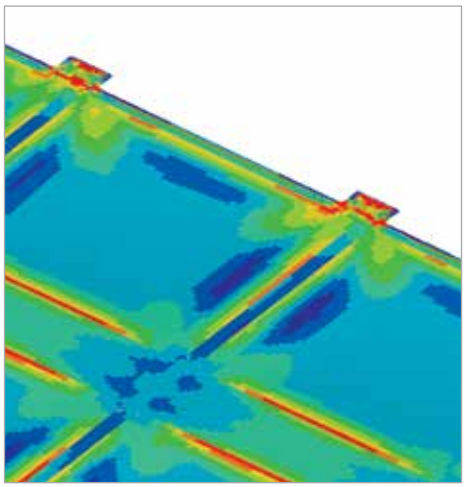
“With our previous software, anytime we had to do any modification, we go all the way back to the drawing board, delete a mesh and then re-mesh the model, paying attention to connecting the nodes,” Ashie-Winns says. “That could be very tedious if we had multiple changes to make. Another problem was that trying to rotate the model was a nightmare.”

Also, American Railcar is projecting that the company will be doing more and more projects involving structural dynamics. In the past, projects involving structural dynamics were contracted out. Using the previous software for the studies, he would have needed to buy an expensive package that included dynamic analysis. But with HyperWorks there was no need to buy extra software.

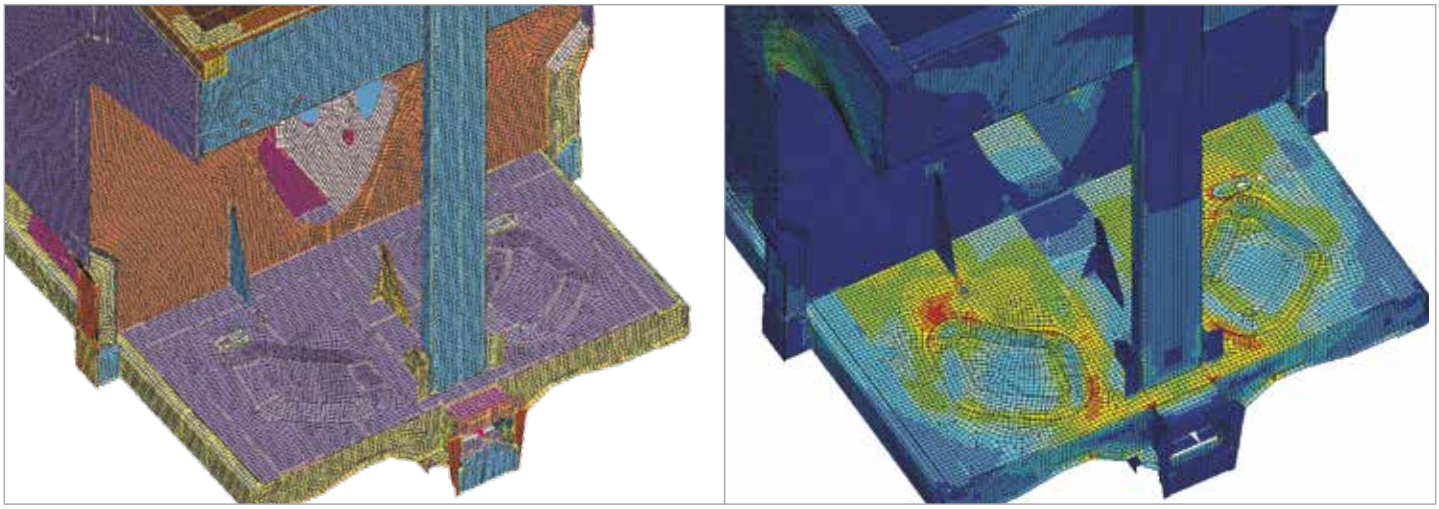
Finally, the difficulties inherent in his current software became too much. “It took us a lot of time to do modifications,” Ashie-Winns recalls, “and I felt like something had to be done.”

The Solution: HyperMesh for Easy Meshing

Prior to joining American Railcar, Ashie-Winns did work for a company that used HyperMesh, the pre-processing tool within Altair’s HyperWorks CAE suite. “At my previous company, I was given a choice of using IDEAS or HyperMesh for pre-processing, and I found myself sticking



With HyperWorks engineers evaluate more virtual design options before the final validation test.



HyperMesh FE model and stress results visualized in HyperView of a large railcar model.

to HyperMesh because of the ease of use," Ashie-Winns says. "At American Railcar, Altair gave us some demos, and I realized how advanced it had become—even better than I thought. It addressed our needs."

With HyperMesh, when American Railcar engineers needed to change the geometry of a car, the mesh updated quickly, with no need to delete and re-mesh. Moreover, Ashie-Winns could use the same set of HyperWorks units for any software tool in the suite or offered by the Altair Partner Alliance. "If I need to do a fluid dynamics analysis," he notes, "I don't have to buy anything—just draw whatever tokens I need from my HyperWorks tokens and I'm done."

Results: More Options for the Best Design

"HyperWorks has changed the way we design," Ashie-Winns says. "Now we are not hesitant to try different ideas. In the past we would eliminate a lot of good ideas because of the difficulty of redesigning and would select only two or three options, rejecting many other good ideas. The advantage of HyperWorks is that we are not limited by the number of initial design ideas. If we have 15 iterations we want to try, we won't hesitate, because modifying the mesh is easy with HyperMesh."

He has observed that graphics and displays are much more robust with HyperMesh, enabling his team to rotate very large models easily without the large resource drain they had been experiencing, resulting in a huge time savings, which translates into dollar savings.

American Railcar also occasionally uses MotionSolve to design mechanisms. Since the engineers can do this analysis on their own with HyperWorks, they no longer need to contract out the analysis to someone else who had the right software.

"We are an all-encompassing engineering team," Ashie-Winns asserts. "We don't limit ourselves to statics or fatigue, so knowing that we now have the tools for anything that comes our way makes us confident." Now, American Railcar is considering the use of HyperCrash to develop models that accurately indicate the behavior of various types of cargo when the railcar experiences an impact. "In the past most of the dynamic analysis were done by testing or contracted out. Now with the use of HyperCrash the dynamic analysis can be simulated to reflect real world testing, "Ashie-Winns observes, "The next step would be to validate the results of an actual testing with the results of HyperCrash.

"HyperWorks' capabilities across the board are an improvement over what other software companies provide," Ashie-Winns says. "The HyperWorks units licensing model allows us to choose what we want. It is exactly the kind of software package to meet our needs."

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