

Altair HyperWorks Success Story



The Altair HyperWorks Suite Speeds Development of Lightweight Alpine Trains

Stadler Rail is a dynamic company in a dynamic industry. With 2,000 employees at six European locations, Stadler produces light rapid-transit trains and streetcars for regional and local railroads, and is the leading supplier of cars to the cog railway market. The company uses modular, scalable concepts to design customer-oriented solutions, targeting specific needs. The Static/Dynamic/Certification Department, which creates CAE simulations of Stadler's CAD railcar models, used Altair's HyperWorks Engineering Framework to develop the Glacier Express, a lightweight train that carries passengers over a breathtaking route through the majestic Alps. HyperWorks tools enabled the department to move quickly and efficiently through the development process.

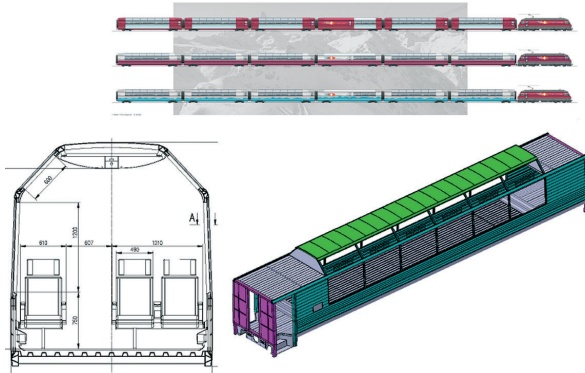


Altair Engineering

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Designing for the Heights

The Glacier Express of Switzerland's Rhätische Bahnen Rail Company rides the Swiss Luxury track between Zermatt and St. Moritz. It carries passengers across bridges, through tunnels and over mountain passes, including the 6,669-foot (2,033 meter) Oberalp pass. For this winding climb, the rail company needed six cars of lightweight aluminum construction with a total weight of no more than 135 tons. Stadler used HyperWorks tools, including HyperMesh and OptiStruct, to meet these requirements, while holding to a tight development schedule.



"The weight restriction for this project was very critical," said Dr. Alois Starlinger, head of Stadler's Static/Dynamic/Certification Department. "We went through many design iterations."

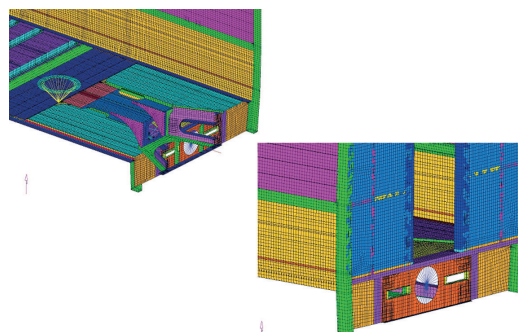
Construction engineers created the first models of Glacier Express railcars in CATIA V. Starlinger's group used HyperWorks to mesh the models and to analyze and optimize system behavior.

"HyperWorks fulfilled all our expectations," said Starlinger. "We were able to read input files directly into ABAQUS, our finite-element (FE) solver, without having to do any edits. HyperWorks enabled us to optimize the design quickly and reach the target weight."

Close Correlation Between Simulation and Reality

Because of increasingly tight development cycles, prototypes are uncommon in today's railway industry. Trains are built directly from optimized models and do not undergo trials before delivery.

"This makes the reliability of our simulations extremely important," said Starlinger. "We must be able to rely on simulation results 100 percent to avoid unnecessary modifications to the model."



HyperMesh is highly flexible and easy to handle for creating FE models from CAD geometry taken from CATIA V and other applications.

Compression tests for train accreditation demonstrated the reliability of the HyperWorks simulations. Railcars were subjected to specific clutch and side absorber pressures. The test series showed very close correlation between simulation results and real-world testing.

"We reviewed many comparative analyses and found the results of the simulations to be absolutely reliable," said Starlinger. "I expect compression tests for metal-only railcar construction to eventually become obsolete. They will be replaced by the kind of simulations we are using now."



"We like HyperWorks' open platform structure because we don't have to confine ourselves to a single FE solver to use with this tool suite."

Dr. Alois Starlinger
Stadler Rail, Switzerland

Transforming Construction Methods

Simulation is also changing component development at Stadler, enabling the company to create entirely new evaluation methods. In the case of the Glacier



Express, glass windows and the composite-sandwich roof over the entrance are literally glued to the train body.

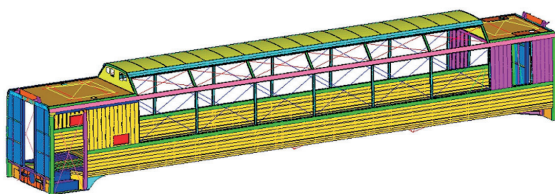
"Using simulation, we were able to define the ideal glue joint and optimize production," said Starlinger. "Tests required for the glued joints were completed on time prior to accreditation. Working with the glue supplier, we were able to optimize application guidelines for structurally glued joints and have them accredited for production."

Simulation also enables construction methods that would be impossible to achieve or would present too much risk, if conventional development methods were used. Some construction steps can now be replaced by simulation, reducing project development risks.

Fast, Reliable Results

Before Stadler added Altair computer-aided engineering (CAE) software to its development process, the company outsourced simulations to engineering companies that used a variety of software tools. Stadler based development on reports and plots from these contractors. In 2003, Stadler's enormous growth and a desire to minimize development risks moved the company to establish an in-house simulation department. From its inception, the department used Altair software. Starlinger is particularly pleased with the pre- and post-processing capabilities of HyperMesh, HyperWorks' FE modeler.

"HyperMesh makes us very flexible," said Starlinger. "We can convert CATIA V computer-aided design (CAD) models into FE models very efficiently. Moreover, HyperWorks enables us to calculate and analyze large models very quickly."

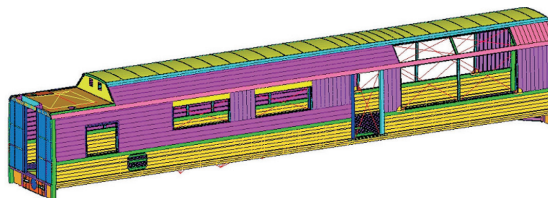


"The reliability of the software is very important to us. We run the HyperWorks suite on PC workstations using Windows XP and Windows 2000, building models with up to 3.5 millions degrees of freedom and 700,000 elements with no problems. We use HyperWorks for pre- and post-processing on a PC with 2GB of memory and a 3.4GHz processor, and calculation of the models is amazingly fast."

Altair Support: A Key Advantage

Altair's focus on customer satisfaction was an important factor in Stadler's choice of the HyperWorks suite.

"From our first contact with Altair people, I realized that they had a great deal to offer in terms of knowledge and experience," said Starlinger. "We found them very responsive to our requests. Altair also invested a month's work to develop the special features we requested. That's how I have always imagined a good relationship between software customer and provider would be."



"I picked up a lot of simulation know-how during my career, and I've worked with a number of CAE tools. We evaluated many products before deciding to use HyperWorks. We chose it as our engineering framework not only because it's a perfect match for our needs but also because it includes optimization software."

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The Future: Expanding the Use of HyperWorks

The use of CAE is expanding rapidly at Stadler. During the past three years, Starlinger's department has grown to eight employees and six licenses.

"Our order situation is good, and I expect further growth in the future," said Starlinger. "We already have development orders for the next two years that will require additional manpower and more HyperWorks licenses. We're planning to increase our use of HyperWorks modules, such as OptiStruct, which we will be using for numerical optimization."

As Stadler continues on a strong growth curve, HyperWorks tools will continue to contribute to reduced costs, shorter development cycles, and the high quality for which the company is known.

Using HyperWorks, Stadler was able to reduce the time spent on individual iterations, cutting calculation time by 20 percent and significantly shortening total development time.



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