SIEMENS

Femap

GleisFrei

Railway equipment company significantly cuts production and material provisioning costs with Femap; costs savings expected to be up to 25 percent

Industry

Transportation

Business challenges

Execute multiple tests and evaluate several mesh types in the static analysis of railway car frames

Optimize designs to avoid costly oversizing

Keys to success

Femap for 3D model import and static analysis in the elastic field

Results

Fast learning curve to full productivity

Ease of compliance with strict new railway standards

Generation of detailed reports for approval institutes

Identification of design errors on existing cars and accurate sizing of new designs

Production and material provisioning costs expected to be cut by up to 25 percent

Use of Femap expedites compliance with strict new railway standards

Railway specialist

The GleisFrei technical department became fully operational and independent in the structural analysis of railway cars in just three months using Femap™ software. The finite element modeling (FEM) and finite element analysis (FEA) technology is from product lifecycle management (PLM) specialist, Siemens PLM Software.

GleisFrei Costruzioni Ferroviare Srl (GleisFrei) was created in March 2003 from former Gleismac Italiana SpA, which had been working in the railway equipment business since 1977. From the original company, GleisFrei acquired the right people, expertise, and technology, emerging from the very start as a leading player in the railway equipment maintenance business. GleisFrei repairs, maintains and builds all kinds of equipment and vehicles, including railway cars and special vehicles for the maintenance of aerial lines and rails, and engines for the logistic handling of cars and other equipment.

GleisFrei, which is based in Villimpenta near Mantua and guided by general manager Guido Fontanesi and production manager Roberto Zavatteri, consists of a technical department, a sales group and a fabrication workshop, plus administration and stock management organizations.

"Our cars are built in-house, starting from a frame construction built directly in our workshop," says Fontanesi. "Onto this structure, we assemble units and systems purchased from qualified external suppliers, including pneumatic parts, mechanical parts and engines. A significant portion of these materials is purchased abroad, approximately 30 to 40 percent. Sales, conversely, are concentrated in Italy. However, with the new range of products we are developing, we are also opening up new markets abroad."

Strict standards

GleisFrei's new product portfolio, currently in development, meets the rigorous requirements of the latest railway industry standards, which were implemented in 2011. "With the implementation of the new technical specifications by RFI, railway cars must meet much more stringent requirements for all parts, including frames, wheels, axles, components and braking systems," notes Francesco Lambiase, technical department manager.

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"Since we have adopted Femap, our external designer is learning to optimize his 3D models to achieve the best results during analysis. However, with Femap, I can also easily edit the 3D model, if necessary. When the model is ready, I prepare different types of mesh with hypothetic load conditions to check the response of each load case."

Francesco Lambiase
Technical Department Manager
GleisFrei

"As our company buys all components from externally approved suppliers, our attention is entirely focused on frames, which are manufactured internally."

Lambiase notes that according to the applicable standard, a frame can be designed and tested using traditional analysis methods, but preferably, analysis software should be used. For this reason, GleisFrei management decided to adopt FEM software for the static analysis of frames. "The first deployment phase involved the cars we produced before the new standards were introduced, therefore, the software is currently used for static verifications on existing designs," explains Lambiase.

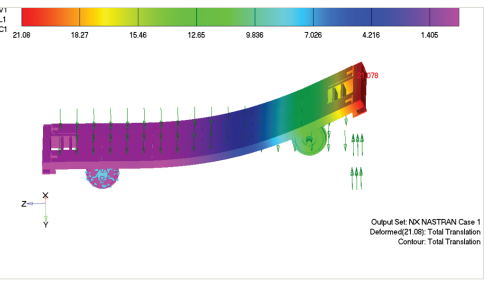
Solid references lead to Femap

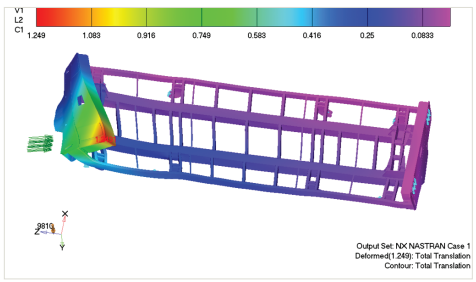
Based on previous direct experience at a university, Lambiase was familiar with Nastran® software, which provides a full spectrum of linear and nonlinear analysis capabilities. "We investigated further and narrowed down to two different FEM tools," says Lambiase. "We also asked several engineers for advice, many of them with aerospace experience, and they all recommended Siemens PLM Software's NX Nastran, which led us to Femap."

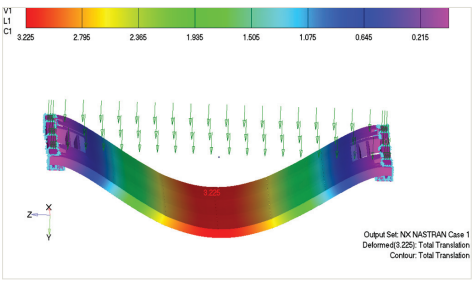
In the autumn of 2011, GleisFrei contacted Cosmos Italia, a Siemens PLM Software partner. Cosmos Italia has specific experience in the sales, service and operation of computer-aided engineering (CAE) solutions since 1994. The company can support customers in the deployment of complete solutions for all product development needs, spanning comprehensive simulation disciplines, including FEM, FEA, computational fluid dynamics (CFD)/multiphysics, and kineto-dynamic analysis, plus PLM solutions for computer-aided design/computer-aided manufacturing (CAD/CAM) and product data management (PDM).

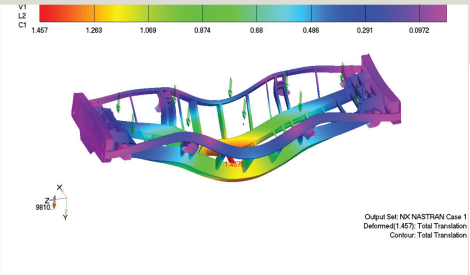
"The Cosmos Italia representative illustrated the features of Femap and, from the very first meeting, focused on understanding and defining our specific requirements," recalls Lambiase. "Basically, GleisFrei needs static analysis in the elastic field, so in the end we selected the basic version of Femap as the most suitable solution for our company, in agreement with Cosmos Italia."

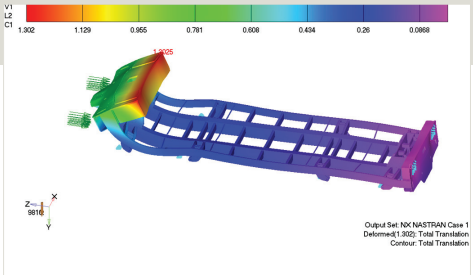
Leveraging the expertise of Cosmos Italia and the advanced, convenient and intuitive interface of Femap, it took just three days of training for Lambiase and Zavatteri to acquire the requisite skills to start using Femap on real designs. Lambiase notes, "After that, we identified the specific aspects of Femap we wanted to focus on and completed the related training in a day."











Solutions/Services

Femap
www.siemens.com/plm/femap

NX Nastran
www.siemens.com/nx

Customer's primary business

GleisFrei Costruzioni Ferroviarie Srl specializes in the design, construction and maintenance of railway cars and engines, and the maintenance of vehicles and equipment for rails, aerial lines, tunnels and all railway infrastructures.
www.gleisfrei.com

Customer location

Villimpenta, Mantua
Italy

"Based on our estimates on model H1100, Femap will help cut costs by up to 25 percent."

Francesco Lambiase
Technical Department Manager
GleisFrei

Up and running in three months

GleisFrei representatives first met Cosmos Italia representatives in December 2011 and, just three months later, Francesco Lambiase was fully operational and independent in the use of Femap. The analysis process starts from the rail CAD model, provided by an external designer, who delivers it in a neutral format, normally the Standard for the Exchange of Product Model Data (STEP). Lambiase imports the model into Femap, which allows him to make edits and modifications in view of the subsequent analysis. "Since we have adopted Femap, our external designer is learning to optimize his 3D models to achieve the best results during analysis," Lambiase points out, "However, with Femap, I can also easily edit the 3D model, if necessary. When the model is ready, I prepare different types of mesh with hypothetic load conditions to check the response of each load case."

The 12663 standard introduced in 2000 prescribes about a dozen tests to be carried out on each railway car, including compression and diagonal compression on bumpers, traction on the hook, maximum useful load, combined compression and traction loads, and car lifting. "Each test generates stress on different parts of the car, for instance, spars or crossbeams," says Lambiase. "For each type of analysis, I carry out 4 to 5 tests on different meshes, until I achieve stable values indicating that we are approaching the right solution."

Cutting costs by up to 25 percent

By applying Siemens PLM Software FEM technology to existing designs, GleisFrei was able to identify railway cars that did not really match their nominal load capacity, and so they were downgraded to a lower category. "Most of all, Femap highlighted specific problems in the construction of model H1100," says Lambiase. "The frame had been oversized during design, and this translated into higher material provisioning and production costs. For the next family of cars, we will use Femap in the design stage, so we can develop and size the frame more accurately, optimizing costs. Based on our estimates on model H1100, Femap will help cut costs by up to 25 percent."

The analysis process at GleisFrei concludes with the generation of detailed reports for the preparation of technical specifications to be submitted to approval institutes. Lambiase explains, "The Italian railway company's engineers who release certificates of approval do not always have specific analysis skills and knowledge, so we have to prepare a tailored report for their use. The reports generated by Femap are attached to the applicable technical documentation; most of all, they are always easily traceable and readily accessible in case of failure or possible inspections."

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