# Case Study

HyperWorks®

HyperWorks Improves Development Processes in Automotive Industry

Overview

In 2008 PWO Germany (Progress-Werk Oberkirch AG) had to develop and produce a new steel made automotive cross car beam (CCB) for the dash board of a new car. PWO received the CAD model, the design space definition and other pre-defined standards of the component from the customer and developed and produced the fitting cross beam based on this information. PWO used the HyperWorks Suite to develop the component. HyperMesh was used to transfer the CAD model into a FEA model, which was then used to run dedicated analysis and simulation tasks. To fulfill the requirements for crash and modal analysis, the company used OptiStruct to optimize the component, RADIOSS and other external solver to run the calculations and HyperView for the post processing. HyperForm was used to check the production feasibility of the individual components and for metal forming simulation tasks. It was important for PWO to have a software suite available that could cover all simulation tasks within one graphical user interface and licensing system.
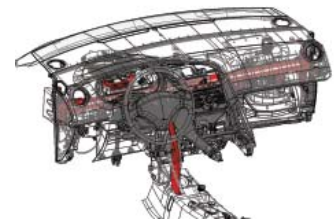
Business Profile

PWO is one of the world's leading suppliers of high-precision metal components for the automotive industry, specializing in vehicle safety and comfort. Its unmatched expertise in the fields of metal forming and joining technologies has been acquired over nearly ninety years, since the company's foundation in 1919. Today, PWO's German production site in Oberkirch employs around 1,100 people. With additional sites in the Czech Republic, China, Mexico and Canada, the Group has now achieved a global presence with a total workforce of around 1,900 employees.
PWO acts as a partner to the automotive industry in the development and production of innovative products. The Group manufactures millions of components on a just-in-time and zero-defect basis. In close collaboration with customers, PWO is expanding its international production sites in order to supply local markets in every region. PWO has already achieved significant success on its way of global expansion. The company has orders on hand which will lead to strong growth of revenue and EBIT once the industry will return to normalized sales figures.

Challenge

The customer defines different specifications such as the modal analyses and dynamic loads for the development of the component. Those specifications result from the expected use of the component. In case of the automotive crossbeam, developed by PWO, the eigenfrequency of the cross car beam, when connected to the steering wheel, cannot be above a certain preset value, since undesirable vibrations would occur within the vehicle when exceeding a certain speed. Other specifications that had to be considered in the development process are not related to comfort, but rather to crash and vehicle safety. The challenge is to combine these often conflicting specifications while at the same time developing the component in a timely and cost effective manner.

PWO

"We were looking for a reasonably priced product family with which we could cover all simulation tasks throughout our entire development cycle up to production. HyperWorks is such a tool and thanks to the support Altair Engineering in Germany gives us, we also receive any customizations that might be needed. Its open architecture and TCL base make it easy to customize the software by including macros and enables the use of other CAE tools in conjunction with HyperWorks, if requested by customers or needed for the development process. Without HyperWorks we could not develop and produce our products as efficient and quickly as with the CAE suite."

*Dipl. Ing. Michael Welle, Development Product/Process, Numerical Simulation, Progress-Werk Oberkirch AG*

Solution

PWO is using the HyperWorks Suite to develop automotive components such as the described cross car beam. By including simulation into the development process the entire system can be analyzed and specifications can be met before a prototype is built.
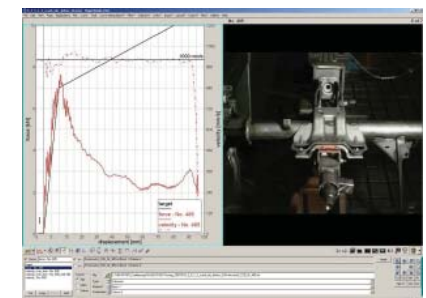
The PWO engineers received a CAD model, including all necessary specifications and then built the FE model within HyperMesh. The FE analysis was done with RADIOSS, the implicit and explicit solver of the product family, and other external solver tools. In a next step, the component was optimized with OptiStruct to look for potential material savings, while ensuring the products quality and meeting all preset specifications. The post-processing was handled with HyperView. Finally the feasibility of the crossbeam was checked and simulated with HyperForm. All results were validated with physical testing, which showed a very good correlation to the simulation results.
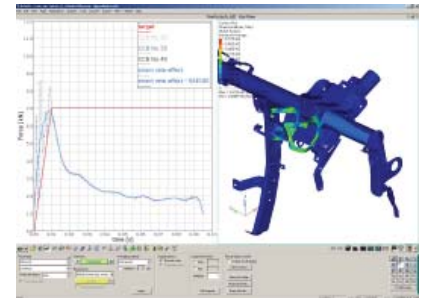
Picture 1: Virtual crash test results of cross car beam in HyperView
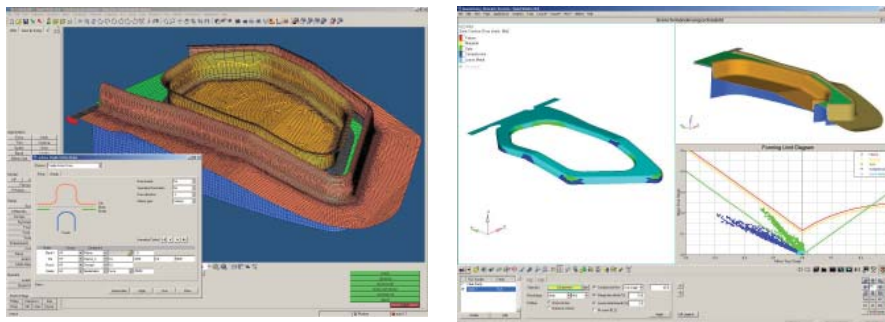
HyperMesh model of cross car beam fire wall braket and simulation results in HyperView.

Results/Benefits

The HyperWorks Suite offers a complete CAE product family for all simulation and analysis tasks that occur within a development process. Thanks to the patented licensing system all HyperWorks tools can be accessed within one system, in which users only pay for the tool they actually use.

With simulation many of the necessary development iterations can be handled virtually, therefore the companies save on physical prototypes and are able to study more variants in the same time. In addition HyperWorks shortens the development cycle by driving the design with simulation and gives the user the possibility to make important decisions earlier in the development process. Contradicting specifications can be analyzed and the best possible solution can be found. Thanks to its licensing system and its open architecture HyperWorks helps to:

*   Reduce Development Time
*   Accelerate Innovation
*   Maximize the Return on Software Investments
*   Improve Quality and Robustness

Picture 2: Result physical crash test of cross car beam.
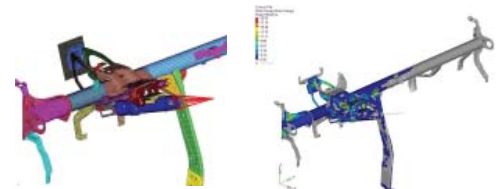
Picture 3+4: Basic FE-model in HyperMesh and simulation result of modal analysis.