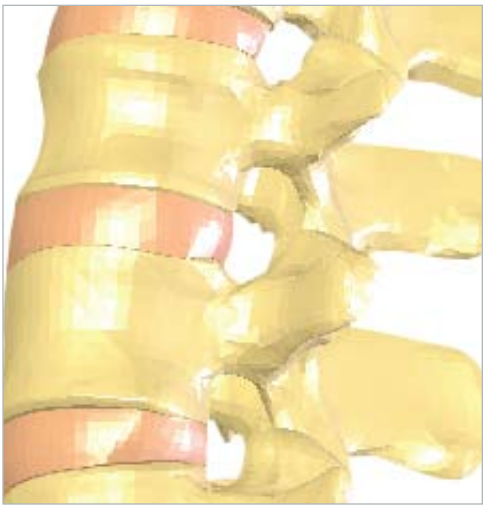
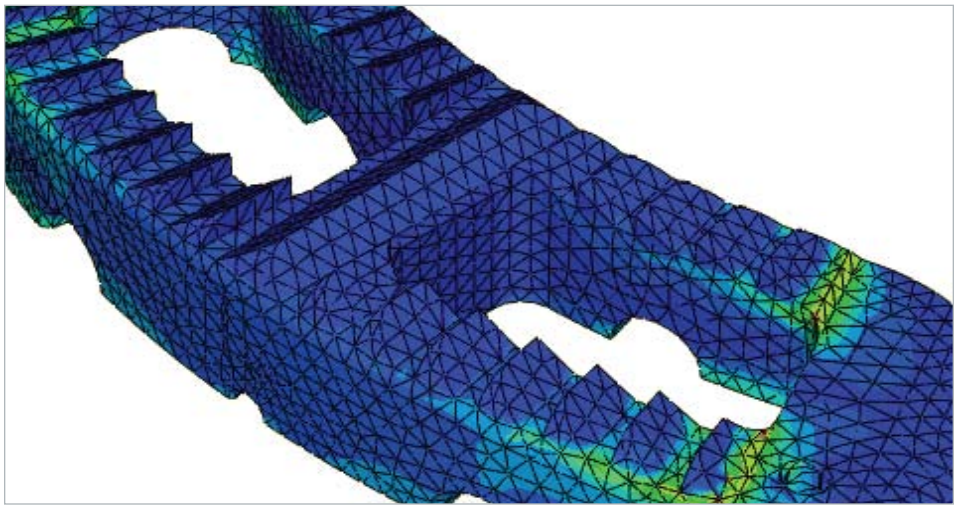
HyperWorks

WJH Engineering uses HyperMesh to cut physical testing costs of medical devices by 95%





WJH Engineering Consultants

Key Highlights

Industry
Medical

Challenge
Avoid costly physical testing

Altair Solution
Finite-element analysis with HyperMesh

Benefits
- Cost savings
- Accurate analysis

Customer Profile

WJH Engineering Consultants, of Chattanooga, Tenn., provides finite-element analysis and design for many of America's largest developers of medical devices. The company's expertise covers advanced materials used for devices implanted within the body; design and analysis of vascular stents, filters and heart valves; and design and analysis of orthopedic fusion devices, joint replacements and instruments. Company President Jim Harrison founded WJH Engineering in 2004 after serving as manager of R&D at Guidant Corporation, senior R&D engineer at Smith & Nephew Orthopaedics, and research engineer at United Technologies Research Center.

Harrison works with engineers at companies producing medical devices and directly with doctors to understand the clinical application of these products, including any anatomical loads or displacements that should be incorporated into their design. His goal for most clients is to help ensure their devices withstand the loading and movements that they will see in the body as well as to meet the testing requirements of the Food and Drug Administration.

In some cases, Harrison carries out just analysis; in others, he does the design work, as well. As a finite-element analysis consultant, he also advises companies on best practices and methods for analyzing their designs to prove safety and efficacy as well as gain FDA approval.

Keywords: Medical Industry, HyperWorks, HyperMesh

WJH Engineering Success Story

“Countless other software companies say they have some of the capabilities of HyperMesh; but when I try them, they’re not nearly as user friendly, and the claimed time savings are not there. HyperMesh allows me to create a really clean mesh really quickly.”

Jim Harrison,
President, WJH Engineering Consultants

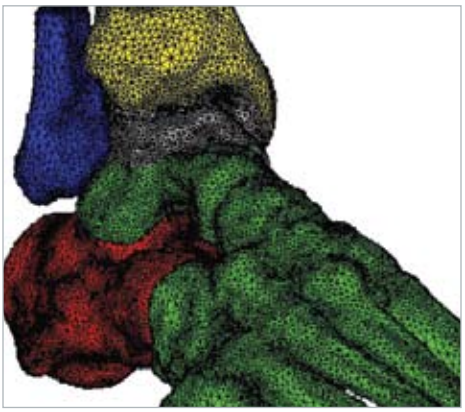
The Challenge: Avoiding costly physical testing

In some cases, companies designing medical devices are confronted with a dizzying range of product versions and sizes. For example, Harrison carried out a study of inter-body fusion cages for a spinal-devices company that required analysis of seven product lines. Altogether, those lines encompassed 20 different sizes, based on height and diameters. All the devices needed to be compared to currently approved implants to prove that the new ones were equivalent or better in three testing modalities required by the FDA: an axial test, a torsion test, and a combined axial and torsion test.

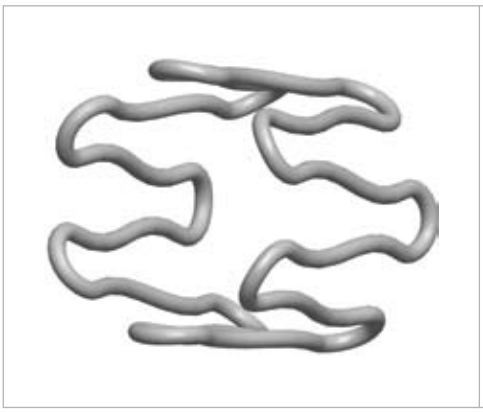
“The company had started developing this process by doing physical testing and trying to justify what tests they could eliminate,” Harrison says, “but they were still looking at well over $100,000 in physical testing.”

The Solution: Finite-element analysis with HyperMesh

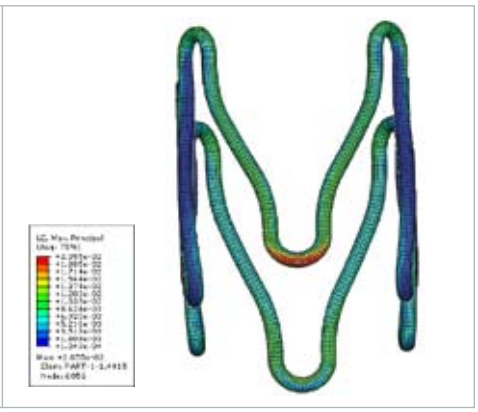
Harrison is respected in the community of medical-device manufacturers for his skill in using finite-element analysis to model products during the design and analysis phase, enabling a significant reduction in physical testing. Harrison has used HyperMesh, the pre-processing tool within the Altair HyperWorks suite, for more than 10 years, ever since bringing it on board at Guidant.



Study on the Interaction Between Joint Space and Ankle Instability

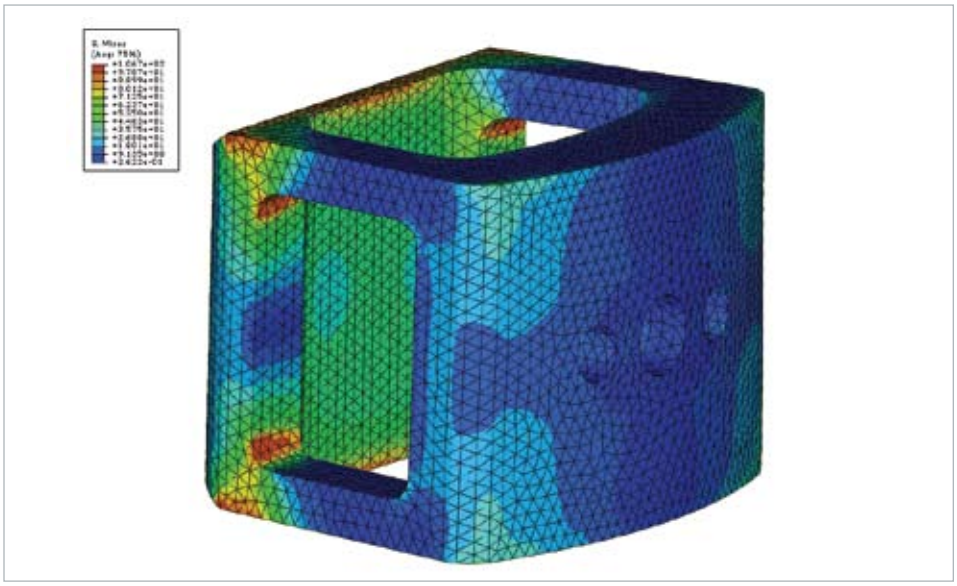


Single Ring of Heart Stent Used in Material Variation Study



Study Goal: Reduce Cross-section of Stent to Ease Delivery into the Artery

Analyzing Joint Performance and Spinal Instability



Analysis of a Spinal Fusion device Made From PEEK Versus Titanium (The Traditional Device Material)

HyperMesh is very easy to learn and use, interfaces with all major CAD formats, provides a wealth of both basic and advanced functionality and is extremely extendible. This combination of strengths enables engineers to rapidly tailor HyperMesh to fit their simulation environment and their specific engineering requirements.

"At that time, I looked at software options for pre-processing, and HyperMesh seemed to be the best fit for what we did," he recalls. "Other software applications were solver centric with little support for our modeling requirements. Functionality was limited and not as powerful as HyperMesh."

The Results: Accurate analysis for 1/20th the cost in 1/10th the time

For the spinal-devices study, Harrison reports, "the analyses I performed cost about 1/20th the price of the company's physical testing and required only about 1/10th the time to complete. After my analysis using HyperMesh as the solution to quickly and efficiently generate the model, the company looked at all the devices and found the three potential worst cases on which to conduct physical tests. Those physical tests were right on with my analysis results."

To perform the physical testing, the company would have needed to completely take their testing machines apart to test and evaluate the various devices for torsion and axial motion. With HyperMesh as a key element of his finite-element analysis, Harrison could change boundary conditions and use the same model, changing the displacements and loads to run the various analyses. "This method cost only a little additional computer time, instead of the expense of separate new physical tests," he says.

Harrison notes that HyperMesh is so efficient that his projects often go faster than he initially expected:

"There have been quite a few times that I've overestimated my costs to a customer based on what I thought it would take to mesh and run a job. HyperMesh's ease of meshing and modeling functions has surprised myself and the customer, saving us time and money because I'm able to create really clean meshes quickly — many times a lot more quickly than I've anticipated."

Looking forward, Harrison is preparing to evaluate RADIOSS, a next-generation finite element solver in HyperWorks, to replace a solver he has been using for many years. "I plan to look at RADIOSS because being able to stay in one product suite is always beneficial, as long as you get the functionality that you need," he says.

"HyperMesh provides very close integration with the solver I am currently using, but there is an integration and cost benefit (through Altair's software licensing model) of staying within one software family."

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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 25-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.

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