

Herman Miller



Consumer Products

USA

ANSYS® Structural™ and DesignSpace®

ANSYS

Overview

With sales in more than 40 countries around the world, Herman Miller, Inc. is a leading provider of office furniture, accessories and related services. Founded in 1923, the company is one of the oldest and most respected names in American manufacturing. Herman Miller transformed the office furniture industry with the world's first open-plan office systems in the 1960s and invented the concept of ergonomic design for office seating in 1976 with the introduction of the Ergon® chair, followed by the Equa® chair in 1984.

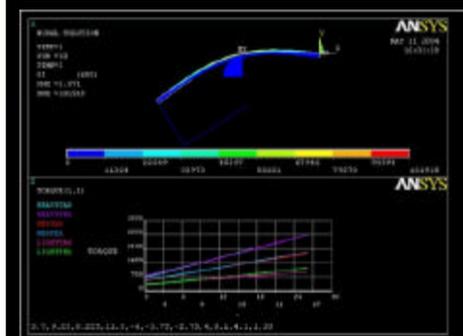
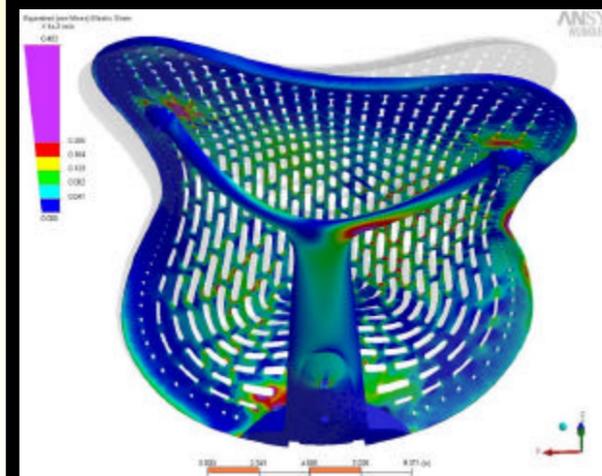
In 1994, the company launched the groundbreaking Aeron® chair. The company has been recognized as a design leader in the office furniture industry and many of its designs are in the permanent collections at major museums including New York's Museum of Modern Art, the Whitney Museum and the Smithsonian Institution.

As one of the leaders in high-performance office furniture, Herman Miller, Inc. set its sights on the long-neglected and potentially lucrative mid-price segment of the market representing half of all work chairs sold worldwide.

Testimonial

"The goal of the Mirra chair was to set a new reference point for the mid-price seating market in terms of ergonomics and adjustability. Simulation with ANSYS software certainly allowed us to meet these objectives with advanced technology that we easily integrated into our product development process. In this way, rather than merely fix problems at the last minute near the end of development, we used simulation to guide the design. As a result, the Mirra™ is probably one of our most successful and highly engineered products."

Larry Larder
Director, Engineering Services
Herman Miller, Inc.



The TriFlex back that automatically adjusts to each user was developed as a single composite plastic structure using analysis to determine the coupled response of the back and its supporting spine.

Herman Miller's new award-winning Mirra office chair was developed through virtual prototyping using ANSYS software.



Challenge

The goal was to develop the Mirra as an entirely new class of affordable office chair with ergonomic comfort for a wide range of body types and postures, easy adjustability for fit and feel, and high quality consistent with the company's 12-year warranty program - all while keeping costs as low as possible through reduced parts counts and effective use of structural materials developed completely under Design for the Environment (DFE) protocols. Given these many complex and potentially conflicting requirements, developing the chair through cycles of trial-and-error physical testing was considered impractical because the approach is expensive, time-consuming and limits the number of design alternatives to be evaluated. Engineers needed a way to optimize the design early in the development by investigating a wide range of possibilities early.

Solution

To determine stress and deflection, every part on the chair was analyzed with ANSYS Structural. Engineers routinely used DesignSpace in developing major components such as the base, arms and pedestal. For more complex analysis, DesignSpace models were used by an analyst as the basis for detailed simulation with ANSYS Structural software. ANSYS Structural played a key role in the development of one of the chair's key assemblies: a cantilever leaf spring and moving fulcrum tilt mechanism providing resistive force for people to lean back comfortably. Torque curves were generated to represent the force required to support various body types in three seat positions: upright, fully tilted and midway. Output from ANSYS included spring deflection and stress distributions, giving engineers insight into each design so they could select and refine the configuration that worked best.

Benefits

Developed an optimal chair design that delivered required functionality while maintaining the company's high quality standards of wear and reliability.

Minimized prototype testing time with a physical mock-up used to verify the functional performance established through analysis.

Enabled engineers to consolidate parts into integral modules, thus minimizing parts counts and lowering manufacturing costs significantly.

Product margins for the Mirra have met target objectives. Manufacturing output of the chair is currently 200% over first-year projections. Customer satisfaction surveys indicate the product is well received by the market, and warranty costs have been well below typical levels for new models.