ALTAIR | TRUEINSIGHT

CUSTOM BELLOW FORMING SIMULATION

ALTAIR® HYPERWORKS® HELPS INTERLAKEN CONDUCT EFFICIENT BELLOWS FORMING SIMULATION

About the Customer

Interlaken Technology Company, headquartered in Chaska, Minnesota, is an engineering firm specializing in systems and processes around material formability and hydroforming. Interlaken embraces virtual design validation, making extensive use of tools within the Altair® HyperWorks® design and simulation platform to gain insight into part geometry, tooling surfaces, and process development during forming.

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A key benefit of using Altair® HyperWorks® is the flexibility to create workflows that impact setup time for each simulation. After working with Altair to develop the bellows setup workflow, Interlaken has seen a significant increase in simulation iterations. This has created a faster path to understanding the effects of adjustments made to tooling profiles or recipe variables. The team at Altair and their tools have been a very valuable resource for us.

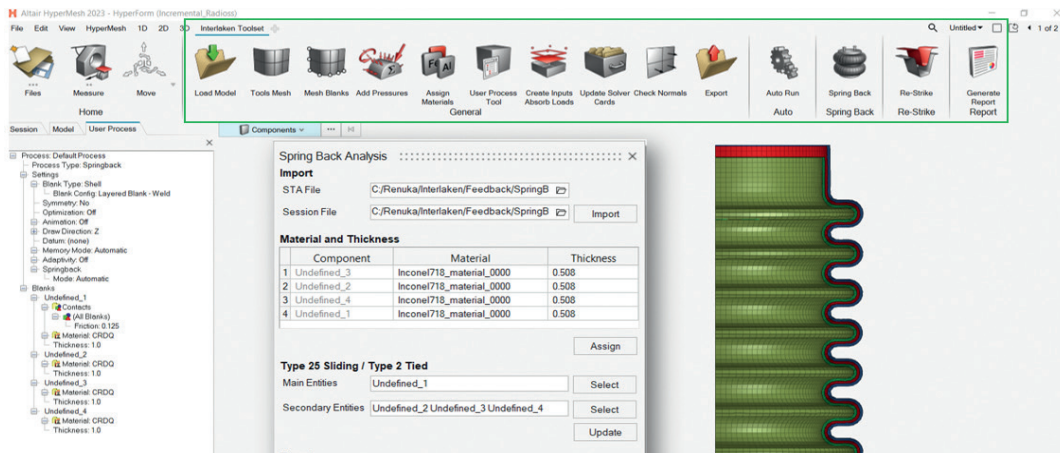Robb Bass, president, Interlaken Technology Company

Figure 1

Figure 2

Figure 3

Their Challenge

Interlaken were awarded projects to develop processes and tooling for manufacturing bellows – accordion-like devices used often in rocket propulsion systems – from tubular stock for aerospace OEMs. To ensure the production of high-quality bellows with minimal development costs and time, Interlaken needed to study the bellow forming process for various tool geometries, tool kinematics, process conditions, and stock tube geometry and material. Doing this with physical prototypes would add several weeks to the development time and involve multiple iterations. To shorten this process and minimize physical prototyping, Interlaken sought leading CAE-based simulation tools. Altair was ready to help Interlaken meet their goals.

Our Solution

Together with Altair, Interlaken set up a bellows forming process simulation comprising a multi-layered tube using Altair® HyperForm®, Altair® Radioss®, and Altair® HyperView® to visualize and analyze finite element analysis (FEA) results through a guided 3D workflow (Figure 1). The goal of this analysis was to virtually validate the tooling design concepts in combination with process parameters that would produce bellows that met design tolerances after springback and were free from defects (like splits or wrinkles).

Interlaken was delighted with HyperForm's virtual modeling capabilities, which showed the complex tool motion involved in the bellow manufacturing process (Figure 2). With it, they achieved excellent correlation between physical tests and simulations when analyzing material deformation, thickness distribution, splits, forming pressure, and springback after forming (Figure 3).

Results

With confidence in the simulations from Altair's tools, the Interlaken team was able to iterate upon several design concepts, optimize the forming process, and compensate the tools for springback to manufacture high-quality parts – all while meeting design goals, minimizing costs and effort, and speeding time to market.

Thanks to the open architecture and automation capabilities of Altair's tools, Interlaken could create a custom bellows forming tool. This sped the entire workflow from a day to few hours – even for bellows with 30+ convolutes (a setup time reduction of 1,500% in the CAE process). Overall, Interlaken's new bellow forming workflow helps engineers perform quick, easy, reliable, and efficient design iterations of bellow forming simulation, increasing their competitiveness and propelling them into a simulation-driven mindset.
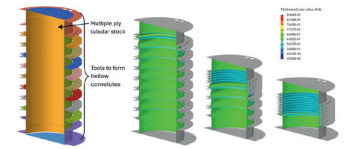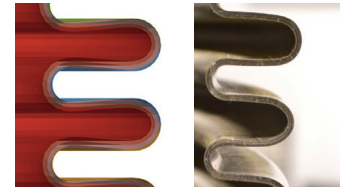
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