BiggerBoat Solutions Makes Waves in Auto Industry Using HyperForm to Cut Die Development Costs and Time

BIGGERBOAT SOLUTIONS LTD.
Forming Simulation, CAE/CAD, Die Development & Design
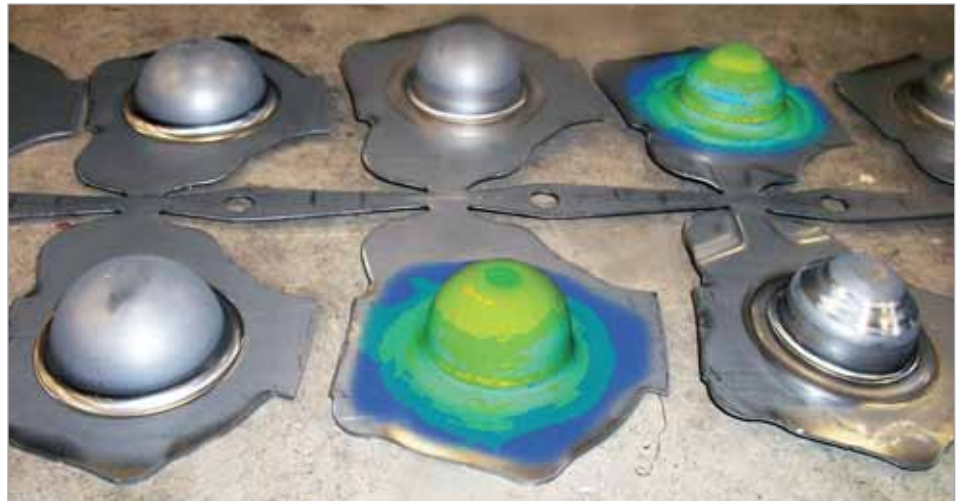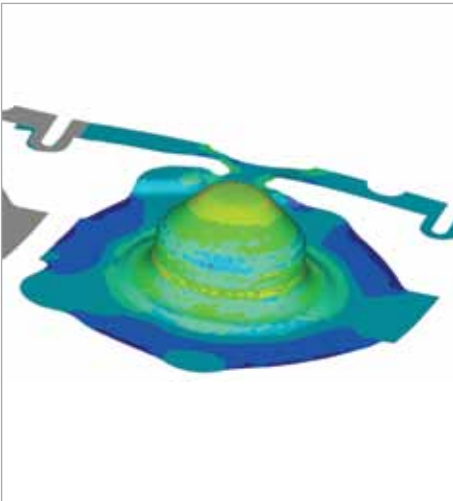
Key Highlights

Industry
Automotive

Challenge
Reduce costs and complexity of sheet metal parts tooling

Altair Solution
HyperForm and RADIOSS for forming and springback simulation

Benefits
- Accurately study part feasibility
- Optimize the forming cycle
- Reduce physical tool try-outs

Customer Profile

When the auto industry crashed in 2008 and the tool shop where Jay Weiner worked closed its operations, he started his own company, called BiggerBoat Solutions Ltd. He carries out metal-forming simulations for major tooling suppliers and original-equipment manufacturers. With 15 years of experience in tooling design, Weiner and his Toronto-based practice offered a service that no one else had perfected but that was crucial to a key process in automotive manufacturing: the simulation-based die design for stamped sheet-metal parts.

The Challenge: Reducing costs and complexity

In the auto industry, as elsewhere, expenses are rising for the cost of steel, fuel and labor, so automotive manufacturers must constantly find ways to minimize their expenses.

At the same time, a variety of advanced high-strength steels are being used more frequently, posing new challenges in both the design and manufacturing phases of metal parts.

Furthermore, complexity has become an issue. As Weiner explains, "Before about 2004, when you designed a process or die, you had more leeway in the number of forming stages you could use, sometimes employing three to five stages to create the part. Today, the OEMs usually want parts formed in just one or two hits; they don't want the cost of big, long dies anymore."

As a result, the challenge has become to minimize the number of forming stages to make a part. "That requires some creative die design," Weiner observes, "since you cannot compromise with the quality of the part."

Keywords: HyperWorks, BiggerBoat Solutions, HyperForm, RADIOSS, Steel, Die

Bigger Boat Success Story

"In an industry with increasingly complex components, tightened timelines and stricter cost requirements, by leveraging Altair's HyperForm technology, I have been able to provide my customers with the most accurate and precise results in the fastest, most efficient manner, ultimately contributing to better parts, shorter cycle times and reduced costs."

Jay Weiner, B.S., M.Sc.(Eng)
CAE/FEA, Forming Specialist
BiggerBoat Solutions Ltd

The industry sets strict quality guidelines for metal-forming. For example, thinning cannot exceed 20 percent, and thickening or wrinkling cannot exceed 10 percent.

The Solution: HyperForm gets it right, "right out of the gate"

Since 1999, Weiner has been using Altair's HyperForm simulation software to design and validate tools for metal forming. "Being able to run many forming scenarios before the steel is cut, with countless iterations, helps minimize die and blank development times and helps manufacturers validate their process reliability," he says.

With HyperForm, part of Altair's HyperWorks computer-aided engineering software platform, Weiner reports that "the forms work right out of the gate, with little or no development needed later on."

HyperForm's 3D modeling has proved especially useful to Weiner in designing for steel springback. "Steel doesn't want to stay where you put it when you form it," Weiner explains. "It springs back, like a diving board, so you have to bend and twist it more to get it to end up where you want it. Depending on the physical properties of the steel type, you need to do different

degrees of springback compensation to get the results you want. HyperForm simulations tell me how much the part will spring back and give me the tools to do the compensation necessary to get the part within specification." Customers often come to Weiner with parts to seek out potential process flaws through simulation long before the dies are physically built. Weiner uses HyperForm right from the start.
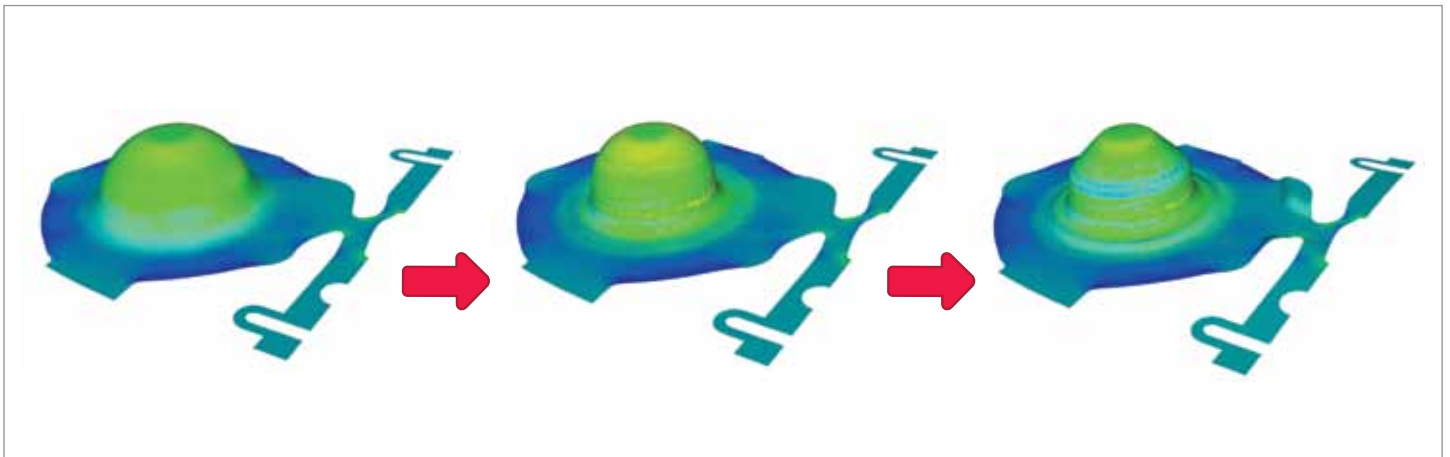
"When I get a part from a customer, the first thing I do is load it into HyperForm and carry out a quick feasibility study to see where likely problem areas will be," he says.

Initial validation of the forming process
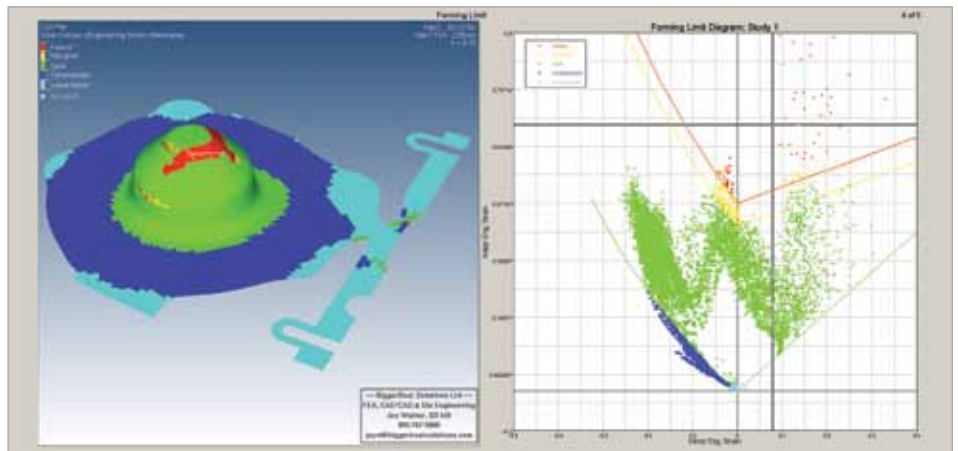
Forming Limit Diagram (FLD) plot of a 2 mm thick formed part prior process optimization

An incremental simulation of the process sequence with HyperForm helps defining and optimizing the shape for each forming station (pre-forming, 1st and 2nd forming), reducing the final maximum thinning to less than 20%

"Then I determine the forming orientation, create the tooling, develop the stages and then simulate them, modifying and tweaking as I go, depending on the problems that arise."

Frequently, the simulations find problems in surprising areas, sections of the part design that Weiner and his customer never would have anticipated being troublesome. "HyperForm points out unexpected issues that could really hurt you when they come up during the die designing process," he says. "An experienced toolmaker can usually spot potential trouble areas and account for them; the benefit of simulation is pointing out the extremely unexpected problem areas that will devastate your timeline and costs if not uncovered early. With the shapes of parts becoming more complicated today, it's not as easy to predict what will happen just by looking at the part."

In other instances, a customer will give Weiner a die that is producing bad parts 30 or even 50 percent of the time. "They'll have me simulate the existing process and repair it," he says. "Instead of their trying multiple iterations to correct the issues, they'll simply say, 'Here is our failing process; replicate it and fix it'—and it all needs to be done within days."

Results: What it says will happen, happens—every time

According to Weiner, BiggerBoat has noted five principal benefits from using HyperForm:

• HyperForm's solver, Altair RADIOSS, is extraordinarily accurate. "Over countless parts, what it says will happen, happens— every time. Customers tell me everything worked exactly the same as the simulation—every wrinkle, every ripple."
• It is a fast solver that can provide quick results.
• It is extremely versatile. "HyperForm can handle any problem I throw at it, no matter how complicated."
• Customers require fewer physical tool trials, so HyperForm accelerates the production process.
• BiggerBoat customers minimize their costs in building a die. "That's the bottom line— to produce a high-quality die and part with the least cost."

Now manufacturers place so much trust in Weiner's simulation techniques and experience that they often give him parts well before the customer is awarded a job. "They know development may take a period of weeks, and if they waited until they got the job, it might not be done on time.

I'm helping them guarantee they'll get the job; they can show they have a good process, have tried it out and can get the result more quickly than competitors can."

Weiner typically has very strict project timing and deadlines that are driven by the demands of his customers. "The HyperWorks support team members have a great respect for the time-critical nature of everything I do," he notes. "They generally resolve my problems the same day or the next day at the latest. Altair's support is second to none."

Weiner says he is looking forward to a long relationship with Altair to help develop and use the cutting-edge capabilities that have helped his business succeed.

"The fact that my customers keep coming back to me means I must be doing something right," he quips. "With HyperForm, I'm able to give them a part that is in spec after the first run through the die, sharply reducing their cycle time and ultimately their costs."

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About HyperWorks®

Performance Simulation Technology

HyperWorks is an enterprise simulation solution for rapid design exploration and decision-making. As one of the most comprehensive, open-architecture CAE solutions in the industry, HyperWorks includes best-in-class modeling, analysis, visualization and data management solutions for linear, nonlinear, structural optimization, fluid-structure interaction, and multi-body dynamics applications.

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