

Using

Simulation Software

... to navigate the perfect storm of die development: increased part complexity, stronger steels and compressed customer timelines.

BY BRAD F. KUVIN, EDITORIAL DIRECTOR

Facing the “perfect storm” of die design and development—dramatic increases in stamped-part complexity along with compressed customer timelines—led the management team at 3-Dimensional Services Group, in 2015, to invest in new simulation software. The company now regularly calls on the software to help manage blank development, evaluate stamped-part and process feasibility, and generate and simulate alternative die-face designs.

“Simulations are critical now,” shares Daniel Smith, a salesman for 3-Dimensional Services Group, a diversified group of companies offering a multitude of capabilities including CNC machining, stamping, laser cutting and robotic welding, plastic injection molding, welding, waterjet cutting, hydroforming, and prototyping. “We use the

software (a trio of modules from AutoForm) to efficiently validate tooling designs prior to putting die blocks into a CNC machine. The ability to validate our blank and die designs saves us countless hours of shop time, much of which would typically consume costly overtime hours, and cuts way down on material waste.”

Streamlining Tryout

3-Dimensional Services Group operates out of four facilities and a combined 350,000 sq. ft. of manufacturing space housing nearly 400 employees. Die development occurs at its headquarters facility in Rochester Hills, MI, and at its Urgent Design & Manufacturing facility in Lapeer, MI. While it serves a host of end-use industries including appliance, aerospace and defense, automotive is its largest market, keeping it busy developing components and assemblies for body-in-white structures, seating and chassis systems, and the like. The company operates some 160 presses, maxing out at 5000-ton capacity; it has 14 presses 1000 tons and up.

“We don’t develop or run any progressive dies here, it’s all hand-transfer work,” says Smith. “If a part requires four or five hits, that means designing and developing four or five separate

dies. The more difficult the job—whether due to material type or part complexity—the more material, and time, we would waste in tryout.”

Eliminating that waste led the firm to purchase five seats of AutoForm. “I’m told we have more solvers than some of the OEMs,” Smith says. Its team of die designers use three AutoForm modules: StampingAdvisor, DieDesigner and Compensator.

“We use them constantly,” says Primo Tongko III, CAD room senior tool-design leader. “Before AutoForm, everything was done manually. Merely developing a blank could take weeks and consume a lot of material. Now, every part that comes in we run through AutoForm.”

Evaluating Part and Process Feasibility

AutoForm-StampingAdvisor enables designers at 3-Dimensional Services Group to quickly evaluate part and process feasibility, and determine blank shape, material utilization and blank cost. It identifies any risk of excess thinning or splitting during stamping, and the potential for wrinkling.

“We use the software for early feasibility evaluations based on part geometry,” says Tongko. “I can modify the part design and within minutes the

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Three-axis laser cut blank



Hit 1



Hit 2



Hit 3

Die designers at 3-Dimensional Services Group used AutoForm to quickly develop short-run production tooling for this lower suspension bracket. They were able to quickly develop the trim and prove out the tooling concept in just a few days, rather than weeks, and went from the start of tool design to producing good, stamped parts in only 4 weeks.

software automatically will generate the blankholder surface and addendum. It also will identify potential formability issues and create the optimum blank shape, while calculating material utilization and blank cost.

“One of the more common and useful advantages provided by StampingAdvisor,” Tongko continues, “is the ability to quickly and efficiently add draw beads, a very common practice when developing three-piece tools. The software immediately identifies any hot spots so that we can adjust the blank shape accordingly. In the end, a job that might have taken two weeks just for blank development now takes two or three days.”

“We also rely on StampingAdvisor to quickly obtain formability feedback while quoting,” adds Smith, “and to provide timely feedback to our customers regarding their part-design feasibility.”

Smith and Tongko describe one such

part, a lower-suspension bracket stamped from 1.9-mm-thick high-strength low-alloy steel in three different sets of tools. A prototype job, the part included a challenging flange design formed in two directions.

“The StampingAdvisor software helped us unfold the part—a particularly complex geometry,” Tongko says, “and develop the blank. We then were able to visualize what the tooling needed to look like in order to securely hold the partially formed part in the second die—to wipe the walls down. The software then helped us precisely locate pilot holes for the third and final die, and even allowed us to develop a pre-trim operation before the final hit.”

In addition, because blanks are so perfectly developed now, 3-Dimensional Services Group is, in some cases, able to bypass five-axis laser cutting to cut holes and trim stamped parts.

“We can use our three-axis laser cutting machine to create the developed

blanks,” Tongko says. “And because the blank and the stamping process are so precisely developed, we can in some cases, already add the holes and perimeter trim to the three-axis blank and avoid five-axis laser cutting entirely.”

Develop and Test Multiple Concepts

With AutoForm-DieDesigner, Tongko and the other users at 3-Dimensional Services Group quickly can create and simulate alternative die-face designs. “Integrating die-face design with simulation lets us quickly and accurately evaluate multiple concepts for the process and tool,” Tongko shares, “and find the optimum solution based on feasibility, quality and cost.”

Finally, AutoForm-Compensator allows a designer to automatically modify tooling surfaces based either on precise springback calculation or measured springback data. This ability takes on a particularly valuable role as the firm continues to process higher-strength steels. “We’re seeing a lot of dual-phase advanced high-strength steels (AHSS),” says Smith, “and even some Gen 3 980-MPa grades.”

Cold-formable Gen 3 steels, able in some applications to replace press-hardened steels, behave like all AHSS grades, typically creating increased springback concerns.

“With these materials, in particular, I can use Compensator to clearly define the specific compensation regions within a part profile,” Tongko says. “Then, the software allows me to modify either the entire tooling surface or only selected regions to control compensation. That allows me to arrive at final part geometry in very few iterations.

“We also can set and adjust, for simulation purposes, press tonnage in AutoForm-Compensator,” he adds, “to evaluate how tonnage will affect springback. Not only does this help with process design, but it also allows us to, early in process development, decide which press we need to use for the job.”

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