

# Paperless Die Design and Development

**D**ies are getting bigger and more complex at Ford Motor Co.'s Dearborn Tool & Die plant in Dearborn, MI. And development time—from design through first-part-to-gauge—is shorter than ever. The firm's huge investment over the last several years in big Schuler presses allows it to run large stampings two-out, such as hood inner and outer side by side in one die. And, it's increased use of engineered draw beads help to minimize blank size and reduce scrap, critical cost savers for the big consumer of steel.

These and other technology trends has

Ford's Dearborn Tool & Die plant goes lean and mean, upping production while reducing die-build time, by moving full-force into software-based tools for die development, die build and machine-shop scheduling.

BY BRAD F. KUVIN, EDITOR

Dearborn Tool & Die driving toward innovation and facility upgrades, including employing virtual die development and tryout as much as possible. Results are impressive, according to UAW Local 600 Tool and Die Unit Chairman Jeff Laver.

"We used to take as long as two weeks to get a drawn shell—split-free—out of the press, following intensive time under the ram," Laver says. "Today, we spend just 1.5 to two shifts under the ram to produce a drawn shell in die tryout."

Since 2004, the plant has seen its hours required to build a die dramatically reduced. It's building more dies inhouse than ever before—20 percent more

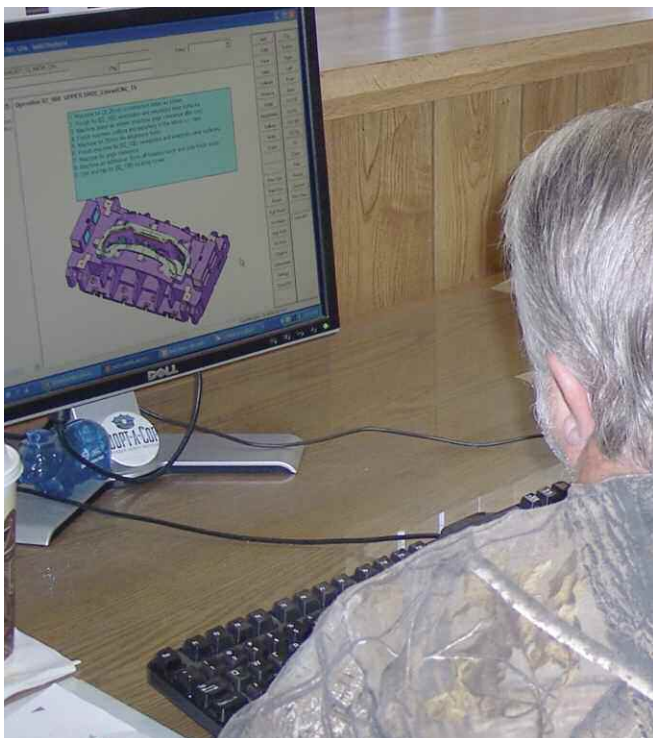
dies in 2009 vs. 2008. "That's due to simulation and machining technology," says Laver, "and better planning."

Even more dramatic are the timing improvements made since 2004—a nearly 300-percent improvement in die-build timing. This efficiency gain often allows the plant to avoid building soft prototype dies for early builds, finding that it can build some production dies quickly enough to use for early builds.

## A Paperless Die-Development Environment

Several major enablers have gotten Dearborn Tool & Die to where it is today—white-light scanning, and developing a machine-intensive process, to name two. And, along with those enablers, much of the credit for its success, says plant manager Terry Henning, goes to the firm's wholehearted and widespread acceptance of the package of die-manufacturing planning software

Dearborn Tool & Die engineer Ken Rothman uses Smirt DieBuild to view and manage the entire assembly structure of a die, allowing the company to create a completely paperless die-design and manufacturing-planning environment. The program retrieves and makes available data from a variety of CAD sources, including Catia, Unigraphics and VISI Modeling.





**Tom Morrison, Dearborn Tool & Die machining-department supervisor, demonstrates how a machine operator accesses the Smirt DieBuild operations on the shop floor, and then uses Smirt DieNC to create the required NC programs.**

from Smirtware, Inc., Wixom, MI, a division of Vero Software. The software first made its way into the facility in 2002, and Version 8 was installed earlier this year.

“Our CPA (construction, planning and analysis) team of diemakers develops a procedure for every die we build, then the Smirt DieBuild software provides the instructions for exactly how we want to build each die, step by step,” says Henning. “Those instructions route to every subcontracted die shop we use around the world, which also use Smirt (Smirt DieShop) as a die-design information-management tool and 3D viewer. That way we can control how every supplier machines our tools.”

The ease of use of the software and its ability to provide a roadmap to the tradespeople on the shop floor to optimize the die-build process has led to eagerness by all to adopt the technology and ensure that the company can continue to perform to the level of excellence expected by Ford, stresses Laver.

“Our shop-floor skilled workers are highly educated, and really embrace new technology,” Laver says, “such as white-light scanning and the Smirt software. They’re committed to ensuring that our processes and procedures result in the most efficient and highest-quality die builds as possible, to keep this plant competitive in the global market. We’ve had great buy-in from everyone as we upgrade to new versions of

the software, and continue to improve our efficiencies.”

To see how the 71-yr.-old Ford die shop has moved into the 21st century with leading-edge die-management software, we visited the die-engineering center within the hallowed halls of the 420,000-sq.-ft. landmark building that is Dearborn Tool & Die, built in 1938 by Henry Ford. There, dozens of trained tool and die makers have participated in a huge culture shift and embraced change, allowing the plant to rely on Smirt to develop its die-manufacturing plans. The plant’s employees work from die designs in a completely paperless environment provided by the DieShop software. There was not a drawing or drawing table to be found.

With dies being more complex and larger than ever, this team’s focus is on reducing build time and tryout, explains Keith Zobay, superintendent of the die-construction department.

“In the past, prints would hit the production floor and the diemakers would study them and work everything out,” says Zobay. “We were relying on their skills and expertise, and individual judgment. Now, by working everything out in engineering, we save huge amounts of time and money—time in design is much less expensive than time on the floor. We can check for interference, redesign blocks on the computer, and be proactive rather than reactive.”

## **A Bottleneck in Die Build? No Way**

Machinists use Smirt DieNC, an add-on module to DieShop, to create their own programs, and derive tool paths for machined faces and drilled holes. “We get better awareness of available machine time, fewer rush jobs and we can more accurately plan for the work, and be proactive,” adds Zobay.

As an example, he showed me a recent die designed to handle an advanced high-strength steel stamping. The die required a special coating and was so large that it would not fit inside the firm’s coating tank, so engineers had to design it as a segmented die. “Joints in the die could not be straight, or we’d get excessive burrs,” Zobay says. “So we designed it with angles, but this created fit issues after heattreat. Using the DieBuild software, we were able to develop a history for the project and a set of instructions that ultimately takes us step-by-step to successfully develop this die, and we can use those instructions for similar projects that come along later.”

Machining instructions make their way to the shop floor where operators have access to 20 computer workstations running DieNC. They can view in color every surface that needs to be machined. And, the fact that Smirt works with multiple CAD systems provides a common tool within the building to handle all of the die information required to build a die. Another six terminals in the die-tryout department provide access to Smirt to view project details.

“Smirt is the information container, it keeps the workers informed,” says Jerry McLaughlin, area manager of die tryout, quality and NC programming. “Due to the performance improvements in die construction and machining, die tryout has become an even greater constraint than it was in the past. And now that die build no longer is a bottleneck, we’re tasked with making the tryout process as efficient as possible.”

One tool being used in the die tryout department is white-light scanning of first panels to gauge. “The panels are data to us—we store the white-light scan data,

analyze, create new CAD, NC programs, and then remachine the dies," McLaughlin says. "By becoming NC-machine intensive in die tryout, we have been able to eliminate the bottlenecks created in traditional die-tryout work. The only way the sheetmetal on the vehicles will look good is if we're good at designing, building and verification of these exact processes in our stamping presses

with sheetmetal. We have made significant improvements in timing, quality, fit and finish of our vehicles, and white-light scanning has been the key enabler."

**Faster Die Development Requires Optimized Shop Scheduling**

The final piece in the die-development and production puzzle is efficient

and accurate shop scheduling, and for a shop that is as dynamic as Dearborn Tool & Die is, scheduling is a critical function. Efficient shop scheduling allows the shop to keep up with the growth in throughput without adding vast amounts of resources, particularly now that design and build happen so seamlessly and quickly. Traditionally, scheduling systems fail due to poor information feed. The DieCost module of SmirtWare Version 8, recently released and implemented at Dearborn Tool & Die in September of this year, now can feed shop-floor data in real time into the plant's scheduling system. It also assigns time to complete each DieBuild operation.

"This makes the process visible and accurate," says David Gray, the manager of tool coordination. "And, we need to not only see what is happening now, but what is about to happen, to allow accurate forecasting for next week, and next month. The software helps us manage machine time, material flow and material availability."

As Smirt moved into the design and build functional areas of the plant, it became clear to Gray and his team that as processes on the floor were becoming more and more efficient, and the timeframe to complete the dies was being squeezed further and further, those areas were outpacing the plants current system for scheduling. "That's why automated scheduling through Smirt's DieBuild and DieCost programs will help, so we can stay ahead of the shop floor. We'll be able to take the time calculations and costs and add those to our current scheduling system (Primavera software, a project-management tool). Operators on the floor will go into the software after each operation and use a check-off feature. Then, merging the Smirt production data into Primavera will automate the scheduling function and take 80 to 90 percent of the manual work out of the equation," says Gray.

That closes the CPA loop, as the changes at Dearborn Tool & Die have been centered on people, processes and technology. Henry Ford's die shop has moved into the 21st century. **MF**

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