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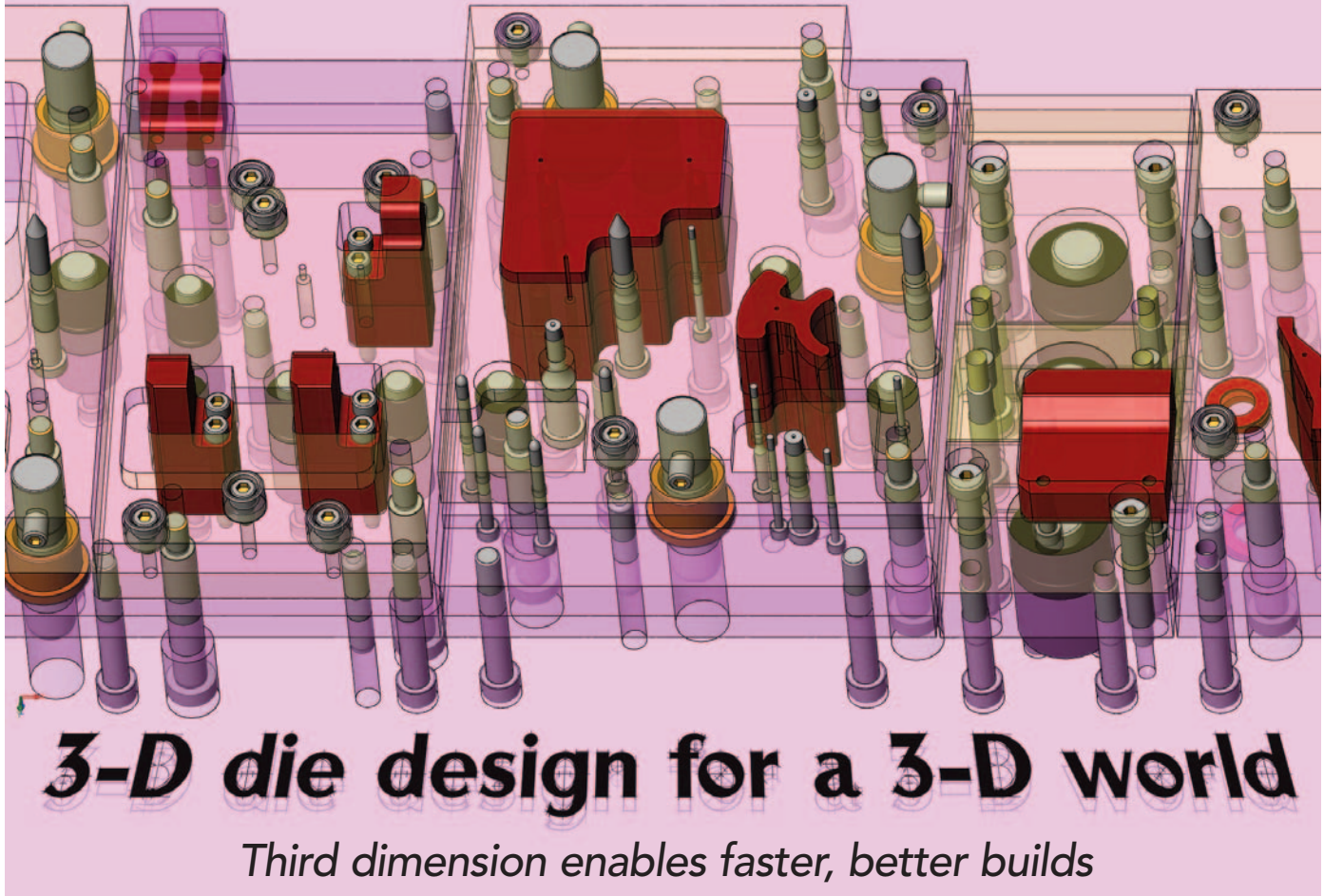
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**3-D die
design for
a 3-D
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3-D die design for a 3-D world

Third dimension enables faster, better builds

By Raymond Proeber

Who isn't feeling price pressures today? Who doesn't need to build dies faster than they used to?

Manufacturing has changed dramatically in many ways to meet price and time pressures. It's interesting to look at how far most companies have advanced in the past 20 years in terms of the communications devices, equipment, and machinery they use—e-mail, Internet, sensors, CNCs, lasers, waterjets, and so forth.

Has your die design technology kept up, or is it still the same old 2-D technology you used decades ago? You don't build dies with the same manual machines that you did two decades ago; why would you still design dies with decades-old software? Many dies are machined with 3-D CAM, so why try to design for 3-D manufacturing using 2-D design tools?

The tool and die / metal stamping industry is one of the last to fully implement 3-D as it pertains to die design software. Designing a die with only 2-D software is like building a house with only a hammer and saw. A carpenter frames a house with a completely different set of tools than the carpenter who finishes the interior woodwork. Three-dimensional

software specifically for designing dies provides a complete set of tools for the specific type of work that you do.

What 3-D Die Design Does

So what can 3-D die design software do that 2-D cannot? The answer can be boiled down to two things—efficiency and communication.

Three-dimensional die design software allows you to build the die on the computer screen, fully assembled and ready to run as if it were built and sitting out on the shop floor. In fact, it is better than that, because in a matter of seconds you can see inside of the die by dragging a section view through the 3-D model. Or if you are using semitransparent components in your model, you can already see inside of it.

Some software even allows you to then simulate the die running in the press. Even better, it detects crashing and strip-feeding interference problems on your computer screen rather than *after* the die has been built (see **Figure 1**).

Visualize Part, Debug. It is much easier to visualize a die design by looking at a 3-D model than a flat, 2-D, static print. This allows better, faster designing

because you won't miss the details you might miss if you were looking at a 2-D design.

One of the more dramatic areas of efficiency is in debug and development time. Using 2-D die design, it is nearly impossible to design and 100 percent detail a medium-size to large die without making any mistakes whatsoever. When it comes to 3-D, it's a whole different story. That's not to say that any inexperienced person can become a great designer very quickly just because he or she is using 3-D die design software. However, it is much easier to catch mistakes or bad practices with 3-D die design software during the design phase.

Faster Die Builds. How much faster will you be able to complete die designs with 3-D die design software? That is an extremely difficult question to answer because of all of the variables. On average—in an apples-to-apples comparison—most designers find that it makes the die design process about 30 percent faster. But the significant savings are realized in the downstream processes.

Because the 2-D drawings created from the 3-D model are all parametric, you can be confident that they are correct. Today's

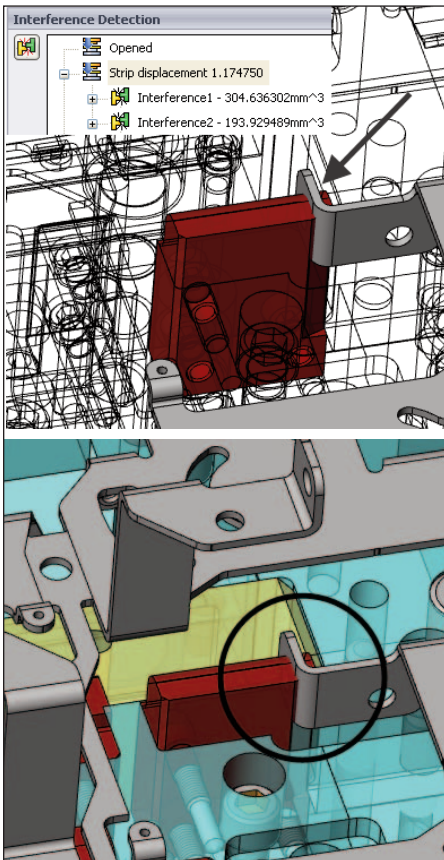


Figure 1

A common mistake that is difficult to detect without dynamic interference detection is not designing the strip to lift high enough to progress over the bottom form inserts. If not caught at the design stage, this mistake could easily cost thousands of dollars and weeks in lost time.

modern CAM programs can automatically recognize tapped holes in the 3-D model. When CAM programs are set up properly, it is not uncommon to be able to program blocks in a matter of seconds rather than minutes. When the die contains 3-D double-curved forms (as with automotive parts, for example), modeling the blocks is complete when the die design is finished. There is no need for the CAM operator to try to figure out what the block needs to look like based on 2-D drawings.

2-D and 3-D. Doing die design in 3-D doesn't eliminate the need for 2-D drawings. In fact, 2-D drawing creation is easier with 3-D die design software. This is especially true of creating section views.

Some 3-D die design software packages even generate most of the 2-D drawings automatically as you create the 3-D model. This takes place in the background

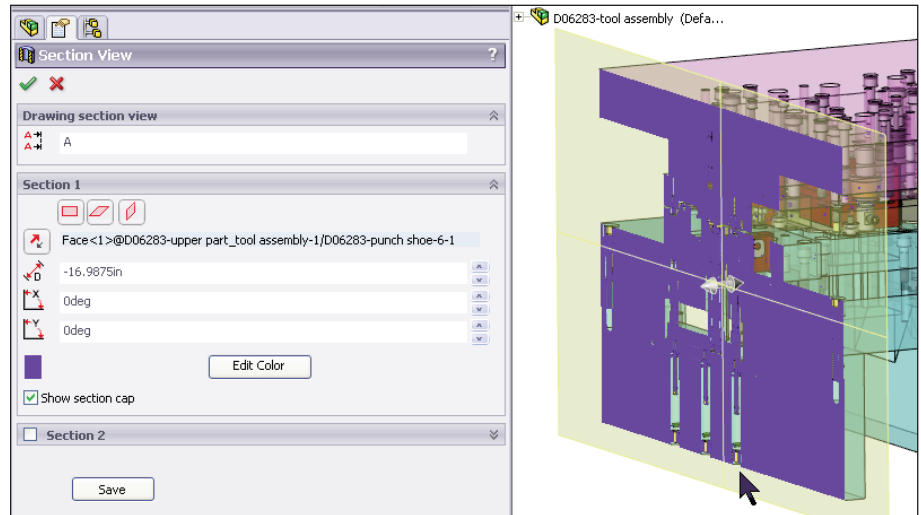


Figure 2

By clicking on a face of the model, picking the section view icon, and then clicking on the double arrows, you can drag a section view. Releasing the mouse button makes the solid blue become transparent like the rest of the model faces.

and requires very little initial setup.

For example, if you have a sensor switch assembly consisting of several parts that you use over and over, you simply put this solid model assembly and the related detail drawings together in a folder.

When the assembly is inserted into the die and subsequently resized to fit this particular die, the drawings are copied automatically into the current folder at the same time and are parametrically updated with the new sizes as well as with your job number for this design.

With generic plates and parts that are completely unique to each die, the drawing still is copied as the die is modeled, along with some information. Of course, additional detailing is needed since these items have features that are unique to this design. You are likely to find this automatic drawing creation feature extremely helpful.

Simplified Section Views. Section views are especially easy to create with 3-D. Once a 3-D model is created, it is simply a matter of drawing a line through where you want the section to be and clicking on the section view icon.

The downside is that section views are 100 percent accurate. Designers using 2-D had been accustomed to “cheating” when making section views by drawing items out of place. With 3-D, you often have to generate more, smaller section views to capture all the details.

Diemakers can use a free viewer and just drag a section anyplace they wish to

through the model. So it is logical to question why you need to see section views on paper; you can see more detail, including context, more quickly on-screen.

Better Design Reviews. Three-dimensional die design can enhance the productivity and effectiveness of design reviews. It is commonplace for reviews to occur in a group setting in a room with a projector and screen. In a matter of seconds, you can reveal only the lower half of the die with the strip overlaid, or turn off the strip, or provide any combination of the four main assemblies (die half, punch half, stripper, and strip layout) to the viewer. You can click on any surface and drag a section view through the tool in real time (see **Figure 2**).

Additionally, by using the right combination of colors and transparent models, you can look at the entire die assembled on the screen—like a doctor looking at an X-ray (see **lead image**).

3-D Design Don'ts

Many questions arise about both the pros and cons of 3-D die design software and what to expect during and after implementation.

Not Quick to Learn. First, there is no question that the learning curve for 3-D die design software is higher than for 2-D software. This is because with 3-D you are doing much more than just creating lines and circles. You have to allow time to get

up to speed. Be patient and the higher learning curve is likely to pay off big dividends in the long run because you are building a virtual model of the die.

Don't Depend on Old, Slow Hardware. The most overlooked area that can cause the biggest roadblock to success is also the least expensive one—the computer hardware itself. This cannot be overstated.

Imagine buying a beautiful, custom-built sports car with everything but the engine. Your die designer is the driver. Your goal is to win races. If you put an old, worn-out engine in this sports car, things can go very wrong very fast. You must be prepared to invest in a fast computer and the complete package to get a fast finish with 3-D die design software.

Two-dimensional die design doesn't require much power. But with the automation that takes place using 3-D die


design software, you need power. It is also important that it is the *right* computer hardware for your software and that you don't just buy an expensive computer and think this is what you need based solely on its cost. It needs to be tailored to the software that you select. Good computer hardware for 3-D die design will cost between \$3,500 and \$5,500. Of course, the faster the computer, the faster you'll get things done.

Doesn't Come Cheap. The outlay for computer hardware and software for 3-D die design is more than you would pay for 2-D hardware and software. Stampers and die shops are used to paying \$250,000 for a punch press, or \$50,000 for a machining center. But paying \$15,000 for software is something shops are not used to doing.

Calculating the return on investment (ROI) of 3-D die design software as if it

were a machine will provide a realistic evaluation of its value. The cost of a die design is relatively low compared to the cost of the rest of the die. Design process improvements pay off on the bottom line—from monetary, timing, and quality standpoints.

More Than Lines and Circles

Three-dimensional die design software does more than create lines and circles. Once you are up to speed, you get much more in return. So much computing power and know-how is available. Why not take advantage of it? 

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This includes:

- 3D Die Design software
- Unbending software
- Flattening software
- Forming Analysis/Simulation software
- Quoting software

(We also still provide die design services and flat blank / forming analysis services)



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13 Station Die
2 Joined Die Sets



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