FORTIFY

CASE STUDY

DEMARINI SPORTS HITS A HOME RUN WITH FORTIFY

3D PRINTING PROVES FASTER AND MORE COST-EFFECTIVE THAN TRADITIONAL MOLD TOOLING METHODS

THE CHALLENGE

The plastic injection mold industry suffers from a shortage of skilled toolmakers. To manufacturers who depend on rapid design iterations, this presents a serious obstacle, as they must prioritize their available moldmaking time based on the needs of the production floor over product developers looking for quick prototypes. The result is longer design cycles, increased costs, and above all, reduced innovation.

DeMarini Sports, a subsidiary of Wilson Sporting Goods, is one of the many companies feeling the skilled labor pinch. Management there felt that 3D printing might solve the prototyping problem, but quickly realized this would not cover all their bases. Because they had to evaluate the injection-molded materials as well as the finished part design, they needed a fast and cost-effective way to print the actual molds themselves. They turned to Fortify 3D for advice, a digital manufacturing company and developer of the FLUX ONE 3D printer.

Application /

Injection Molding

Customer /

DeMarini Sports

***To the right** / By 3D printing prototype mold tools with the Fortify process, DeMarini Sports has given its traditional moldmakers more time to work on production tooling, thus shortening lead-times and increasing the company's development capacity*

THE SOLUTION

Fortify proposed that DeMarini use the FLUX ONE to produce its prototype tooling. The FLUX ONE utilizes Continuous Kinetic Mixing (CKM) to prevent the clumping and sedimentation that otherwise occurs when printing the highly viscous, ceramic fiber-filled resins needed for injection molding tools. Further, the system's Fluxprint technology serves to align those fibers, reinforcing critical areas, increasing mold strength, and extending tool life 10X to 100X more than competing 3D printers.

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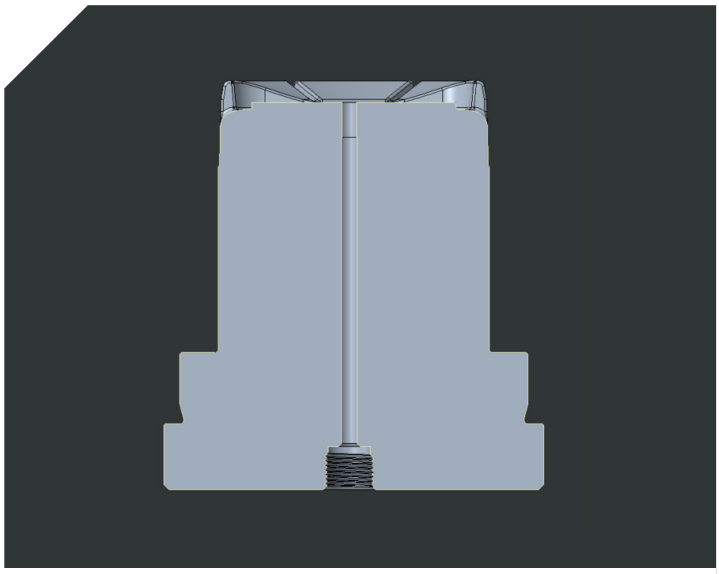
The Fortify system was a hit. DeMarini Sports can now use 3D printed tools in record time, shaving weeks off the development cycle. The shop's moldmakers can focus their attention on production tooling while less-skilled employees operate the 3D printer, easing the labor shortage. And because the Fortify molds cost far less than their steel and aluminum counterparts, and can be produced more quickly, it's also given part designers the freedom to iterate without fear of failure.

THE PROCESS

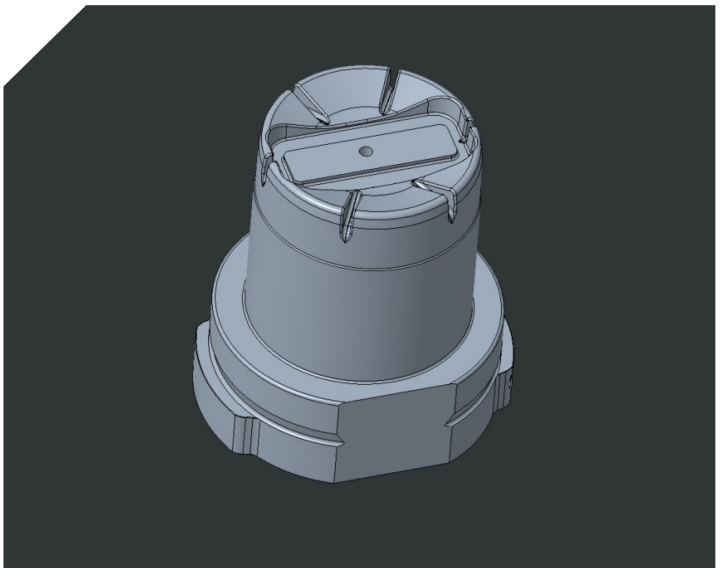
Demarini Sports came to the game with a preliminary mold design well-suited for additive manufacturing (AM). It contained fine cavity details and intricate core features ideal for 3D-printing while the bulk of the mold frame could be machined out of metal. This is a strategy that Demarini had previously developed to speed development of their traditional aluminum molds, but found that the polymers available with most 3D printers weren't up to the task. Fortify changed all that.

THE MOLD

The mold set consists of a core half, a cavity half, and two slide components. All four of these fit into larger metal frames, providing additional durability. The core half is curved and contains deep ribs. Radii were added around some of the features to aid with the ejection and mitigate any potential stress concentrations. Finally, an air channel was added through the center of the core along with printed threads to create an air ejection feature on this part.

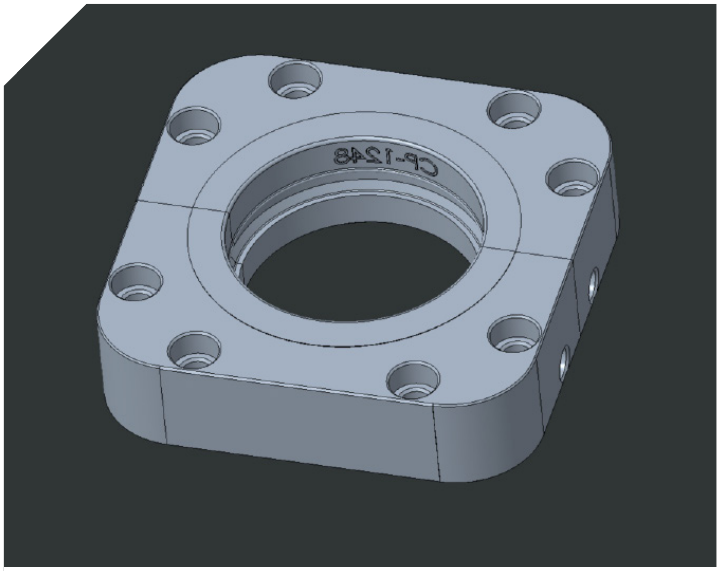


***Above** / CAD image of the compressed air ejection system*



***Above** / CAD image of the mold core*

***Above** / CAD image of the mold cavity*



***Above** / CAD image of the slider assembly*

THE BENEFITS

The cavity in this mold contains details that are challenging to produce in a traditionally manufactured tool. For example, the surface contains faces that deviate in height by only 250 um (0.01”). The inclusion of aesthetic patterns would require an EDM step, and would rarely be used on a prototype tool. Thanks to the Fortify process, however, it required no additional time to manufacture. A part number was also included, illustrating Fortify’s ability to print fine text.

The two slide components are also a great example of the benefits that Fortify brought to the plate. To start with, the wall thickness on these parts never exceeds 20 mm (0.787”), which means there is minimal “extra” material needed for these components. In addition, one of Fortify’s favorite design tools was employed—a raised parting line. Although it doesn’t look like much more than a raised circle, it is a powerful feature, since it provides a robust seal around the parting line that’s especially important for molding polymers with a low viscosity. Pair this with the ability to run presses at a lower clamping tonnage and it’s clear that Fortify-printed tools are a home run for anyone doing plastic injection molding.

ABOUT DEMARINI SPORTS

DeMarini Sports, a subsidiary of Wilson Sporting Goods, is a vertically-integrated manufacturer of high-performance baseball, fastpitch, and slowpitch bats. The company’s team of 100+dedicated employees in Hillsboro, Oregon shares a relentless focus on innovation, using materials and manufacturing processes that keeps them well ahead of the

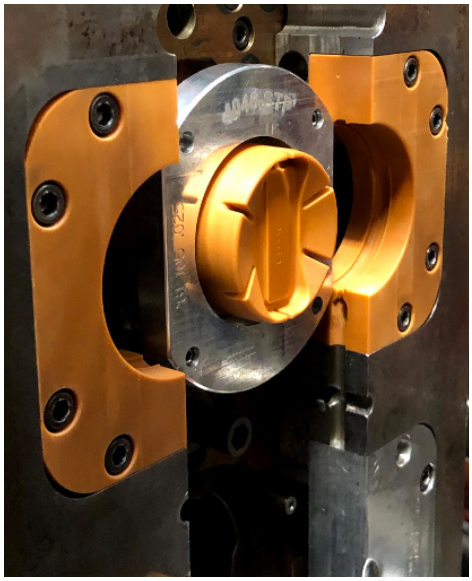
competition. Every year, DeMarini launches at least 40 new aluminum baseball bats that meet safety regulations and the top quality standard customers expect. Each of these incorporates unique plastic components that require significant prototyping and testing.

To address their rapid development cycle, DeMarini turned to 3D-printed prototypes, but found they are inadequate for the manufacturer's rigorous testing process. Because the company uses a proprietary material that is lightweight yet tough enough to withstand the forces required to hit repeated home runs, quality control technicians must test bats made with the same material and injection mold process used for the final product. This is why DeMarini Sports has turned to Fortify's mold tool technology, which offers the time and cost benefits of 3D printing while allowing manufacturer to produce parts from end-use material.

> "Fortify's technology has greatly accelerated our product development cycle while allowing me to save my moldmaking talent for where it's needed most, our production tooling. It's also given us additional capacity, so that we now have the opportunity to entertain customer projects that we wouldn't normally have the bandwidth to consider.
>
> For us, Fortify has delivered a home run. I went into this with the goal of making more tools in less time. The Fortify process is roughly twice as fast as machining, so not only can we build mold components much more quickly but use a less-skilled person to do it.
>
> Glen Mason,
> Manager of Advanced Innovation and Industrialization for DeMarini Sports, a subsidiary of Wilson Sporting Goods

◀ ***To the left** / Overmolding is but one of DeMarini Sports' many specialties. The company is said to focus on "combining advanced materials and processes to produce parts that are otherwise cannot be built," a goal made much easier with 3D printing technology from Fortify.*

***To the right** / Shown here is a Fortify 3D-printed mold assembled in the press frame. By incorporating ceramic fibers in the printing process and then aligning those fibers to the optimal orientation, Fortify's 3D printed tools offer increased strength, stiffness, and heat deflection.* ▶



> “ Fortify’s FLUX ONE 3D printer and its Digital Tooling Resin deliver unmatched mechanical properties in 3D printed tools. By incorporating ceramic fibers in the printing process and then aligning those fibers to the optimal orientation, the technology offers a significant boost in strength, stiffness, and heat deflection, allowing tools to perform under the extreme stresses of a production molding press.
>
> Ben Arnold,
> Vice President of Business Development at Fortify

Fortify printed the mold cavity on an in-house FLUX ONE 3D printer with Digital Tooling Resin, powered by LOCTITE 3D IND147 HDT230 Tough Natural. The LOCTITE resin offers a high heat deflection while providing a smooth surface finish for mold production.

LOCTITE®

***Above** / DeMarini Sports needed a way to quickly evaluate and test a range of polymers and part designs without tying up its production toolmakers. The solution? 3D printed plastic injection molds from Fortify.*

***Above** / The mold for this DeMarini bat end cap required 12 hours to print and produced the desired 20 parts, cutting weeks off the development cycle. As manager Glen Mason said, his team now has the freedom to “fail as quickly as possible, then move on to the next design.”*

Fortify has developed a comprehensive program to help companies like DeMarini verify that the molding process will achieve results like the ones described here. To learn more about Fortify and this program, please visit us at www.3dfortify.com/mold-tooling.