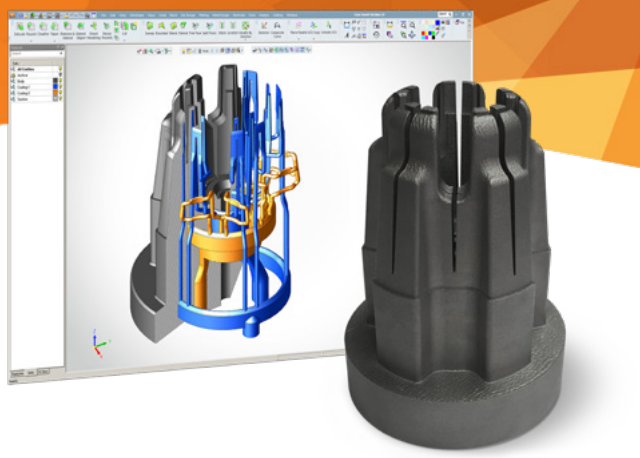
CIMATRON



How to minimize injection molding cycle times and boost part quality with conformal cooling solution

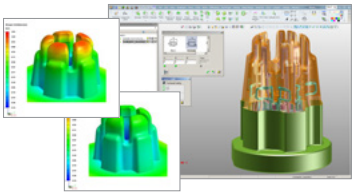
Challenge

Cooling is a critical process for plastic injection molds, affecting both cycle time and final part quality. Ideally, injection mold cooling channels would follow or conform to a part's geometry and maintain a uniform distance from the surface throughout the entire part. Yet, when it comes to complex parts, traditional drilling and milling methods cannot produce these optimized conformal cooling channels. As a result, the cooling process is suboptimal and may lead to longer cycle times, warpage and sink marks on the part.

Additive manufacturing solves these challenges and enables the production of mold components with conformal cooling channels for faster cycle times, better part quality and a more efficient cooling process.

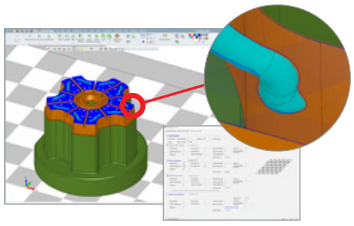
Solution

3D Systems' end-to-end solution for conformal cooling design and production enables mold makers to detect areas that would benefit from conformal cooling channels, design the mold with an optimal combination of conventional and conformal cooling channels, 3D print the component, and reap the time, cost and productivity benefits of conformal cooling. Cimatron®'s conformal cooling solution is also available as a standalone seat that can work alongside other mold design systems



Design and Simulate

- Design the mold using Cimatron®'s dedicated toolset for mold designers and tooling manufacturers
- Validate cooling efficiency, part quality and cycle time using mold filling simulation
- Optimize your part quality and reduce manufacturing costs by adding conformal cooling inserts to your overall cooling solution. Use both traditional and conformal together where appropriate
- Design conformal cooling channels easily with fast and automated tools that will save you hours of design work
- Manually adjust and optimize the design using dedicated analysis tools
- Verify and validate your new cooling design with your mold filling and cooling simulation



Prepare for print

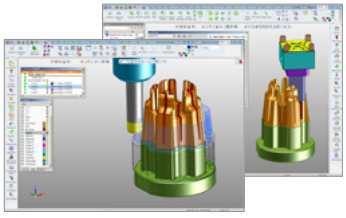
- Prepare the mold component for 3D printing and post-processing using 3DXpert™
- Define and apply optimized laser and printing strategies for successful printing
- Simulate the 3D printing process to ensure a successful and accurate print

Print

- Achieve high-quality, high-strength and long-lasting mold components using 3D Systems' DMP metal printers and LaserForm® materials, or order final parts through 3D Systems' On Demand Manufacturing services
- Benefit from the ability to print internal cooling channels without the need for support structures

Post-Processing

- Post-process (drill and mill) the printed component with the required accuracy and quality using Cimatron®
- Design fixtures and gages to mount the printed component, considering the actual printed geometry
- Achieve fine, accurate details with Cimatron's electrode application



The more even cooling provided by the conformal cooling design created with Cimatron® made it possible to reduce the injection molding cycle time and increase productivity throughput by 30%.

Jarod Rauch, 3D Printing Manager, B&J Specialty

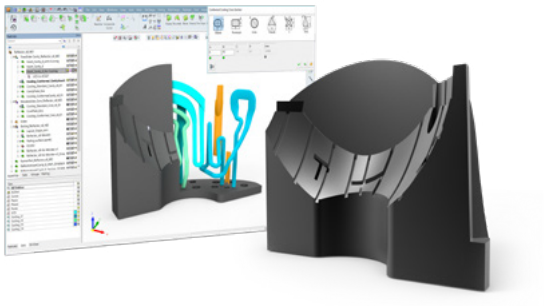
Use Case

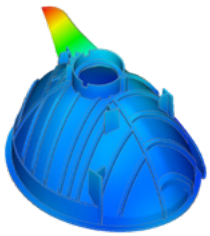
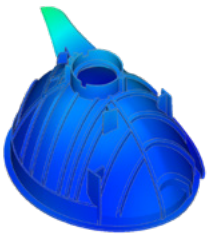
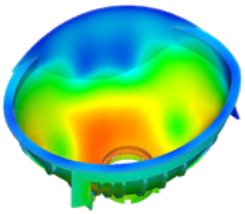
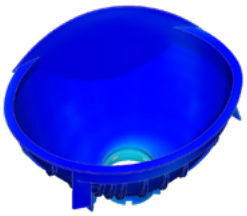
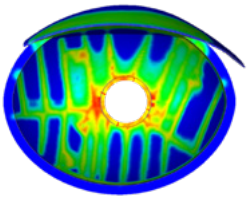
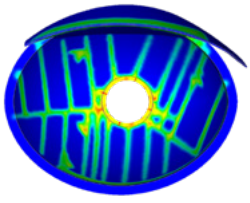
Car Reflector Headlight

This example demonstrates how conformal cooling reduces injection molding cycle time and improves part quality.

Conformal Cooling Can Reduce:

- Cycle time by 17% (from 40.3 sec to 33.4 sec)
- Warpage by 62%
- Part temperature deviation by 73%
- Sink mark affected areas by 50%



	CONVENTIONAL COOLING	CONFORMAL COOLING
Warpage, Total Displacement (Reduced by 62%)	 0.71mm 0.27mm 0.0mm  (Max. = 0.71mm)	 (Max. = 0.27mm)
Part Temperature Deviation (Reduced by 73 %)	 Δ=24.24°c Δ=8°c Δ=0°c (90°c)  (Max. Deviation = 24.24°c)	 (Max. Deviation = 6.45°c)
Sink Mark Indicator (Reduced Max Value by 10%) (Reduced Risk Area by ~50%)	 -1.757 -1.580 0.0mm  (Max. = -1.757)	 (Max. = -1.580)

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