CASE STUDY

Oak Ridge National Laboratory and ExOne

3D printed core saves thousands in tooling costs and reduces lead time by weeks, compared to traditional manufacturing.

INDUSTRY	Manufacturing
APPLICATION	Tooling & Fixtures
LOCATION	Oak Ridge, TN
PARTNER SINCE	2015

OAK RIDGE National Laboratory

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ORNL Partner Challenge

Injection molders need tooling that can be produced quickly. Traditional tools, which are machined, are not easily able to incorporate advanced conformal tooling, which impedes productivity levels. Manufacturers would like tools that can be produced quickly with complex cooling for high productivity.

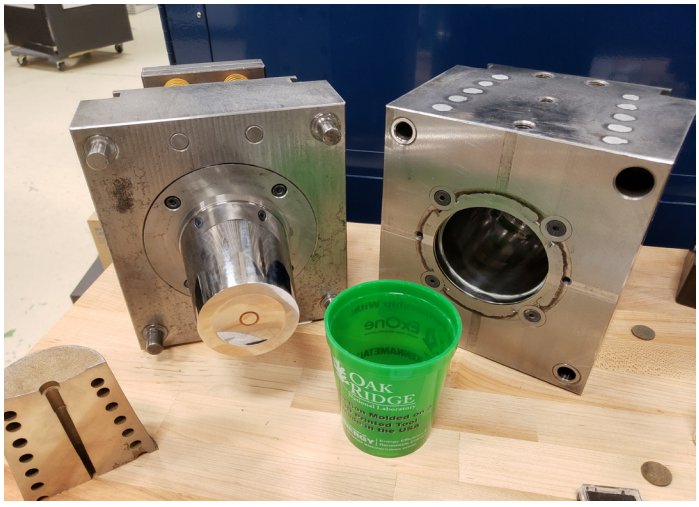
The Solution

Researchers at ORNL 3D printed H13 Tool Steel on the ExOne M-Flex® metal 3D printer and then sintered the tool to full density. The sintered part was then machined, polished, and fitted onto a molding fixture. Molded cups were produced off the printed tool in less than 32 hours, demonstrating the viability of this manufacturing approach for tooling. Conformal tooling adds additional value to a tool through speeding up the cooling step.

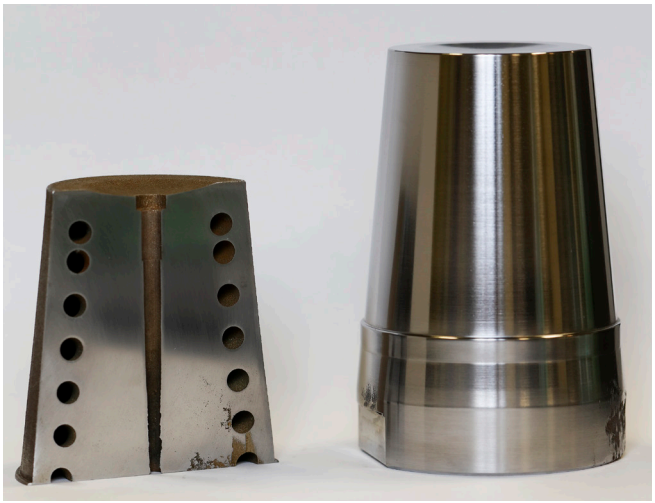
The ExOne Competitive Advantage

Using binder jetting allows parts to be made on demand – rather than waiting for a billet of steel to be machined. Further, because binder jetting is an additive manufacturing process, complex internal cooling passages can be incorporated into the tool at virtually no extra cost. In summary, not only can binder jetting produce tools quickly, but the tools can have more complexity and productivity.

> ***"We believe that using the right additive manufacturing technologies in the right applications like tooling will not only drive down cost and time but also produce tools that outperform traditionally manufactured ones."***
>
> **Amy Elliott, Ph.D.**
> **Research Scientist, Oak Ridge National Laboratory**



Injection molding tool and finished cup



(Left to right: Molding core; sintered part, machined & polished)

Highlights

- Partner: Oak Ridge National Laboratory
- Part: Molding Core for Injection Molding
- Process: Binder Jet 3D Printing on an ExOne M-Flex
- Material: H13 Tool Steel
- Total Weight: 10 lbs
- Key Features: Advanced Conformal Cooling

Key Benefits

- Production Time: Less than 32 hours (includes 3D printing and sintering)
- Machine and Polishing Time: 4 hours
- Cost: $700 including printing, sintering, and machining
- Performance Benefit: 55% reduction in cycle time
- Design not possible with traditional manufacturing methods

LET'S SOLVE THE TOUGHEST PROBLEMS.

AND CHANGE THE WORLD.

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