



CASE STUDY

Binder Jet 3D Printing Enables Higher Quality Production of Automotive Seating Mold Tooling

Millions of automotive seats and other interior components are now benefiting from Michigan-based Dundee Castings' investment in binder jet 3D printing technology to deliver updated tooling designs



Benefits of 3D Printing at Dundee Castings

- Improved quality
- Faster production times
- Complex tools delivered with ease
- Reduced demand for hard-to-find patternmakers
- Shift to digital storage to free up physical storage
- Improved acquisition of new business

Changing the way automotive seats are made

Tucked next to a high school in a small village in southeast Michigan, a small, family-run foundry is helping to transform the way automotive seating is manufactured with binder jet 3D printing technology. Dundee Castings is a Tier 2 supplier of premium, automotive seating molds to most of the world's leading global automakers.

With patternmakers in short supply, and one of his last tradesman on the verge of retirement, the company invested in two industrial sand 3D printers from ExOne, a brand owned by Desktop Metal, to print patterns. The first system was installed in 2021, and the second one followed quickly.

“It’s completely changed how we do business,” said Austin T. Crawley, Program Manager at Dundee Castings, and part of the family that has owned and operated the foundry since his grandfather bought into the business in the 1960s. Historically, the foundry created patterns for seat mold tooling by CNC machining Ren board models and or laying up plaster. But Crawley said it’s been years since they’ve operated that way – ever since adopting binder jet 3D printing.

That change was driven by wanting to stay ahead of the technological curve to ensure the future of the business, partially driven by the changing dynamics of the labor market. “Patternmaking is a dying trade,” Crawley said. “It’s not a skill that’s really taught anymore and technology is giving us new options.”

CUSTOMER

Dundee Castings

LOCATION

Dundee, Michigan

ALLOYS POURED

Aluminum

INDUSTRY

Automotive

APPLICATIONS

Seat foam molds,
interior mold tooling

3D PRINTERS

Two S-Max® Pro

MATERIALS

Silica sand with furan binder

WEBSITE

www.dundeecastings.com



Austin T. Crawley walks through the Dundee Castings sand 3D printing building where two S-Max Pro binder jetting systems produce seat foam molds and other complex geometries.

*“Using 3D printing,
our quality is better.”*

Austin Crawley, Program Manager, Dundee Castings



Before adopting the binder jetting, Dundee Castings used the technology through service providers to test its accuracy and reliability.

Today, Crawley said all the seat foam molds produced at the company use ExOne binder jetting technology and that the shift has improved their quality and enabled more complex mold designs that give the automakers increased design freedoms. “Anything we’ve done in the past five years has come off the sand 3D printer,” Crawley said, emphasizing the shift of the entire industry in this direction because of the many benefits, which also includes higher efficiency and freedom to easily change designs and eliminate storage of patterns. All designs are now stored digitally on a computer instead of the warehouse.

Precision results drive adoption of more complex molds

Engineers by training, Crawley and Dundee Castings leadership thoroughly tested the new 3D technology and examined the quality data before concluding it was robust enough for production jobs. The team built parallel tooling using both ExOne binder jet 3D printing and its established in-house process. “We scanned things at every step of the process and the 3D printing was better, more precise,” Crawley said. Eliminating the human error and tolerance stacking of multiple manual processes through digital sand production led to a more accurate part. He concluded: “Using 3D printing, our quality is better.”

By using binder jetting and printing the complexity directly into the part, consistency and quality at the foundry have improved. The team is also able to print a new level of intricacy into designs that were previously unachievable, or only achieved through additional manual processes. “Everything is done in CAD. I can add features into the print that used to be hand built,” Crawley said.



“One thing that changed with 3D printing – we used to not be able to walk through here,” Austin Crawley explains while showing off space needed to store traditional tooling that is replaced with digital binder jetting files.

Pointing to a design feature of a 3D printed mold for a 40% automotive rear seat back, Crawley explained how the digital prep and layer-by-layer production of binder jetting enables complex features to be created with ease. “This detail would get lost with a traditional mold.”



Showing off a void printed into the same mold where magnets are inserted after casting, he explains how 3D printing makes operations more efficient. “If I tried to do this off a plaster pattern, we would need a core and all the work, and core shifting, that goes with it.”



Small, yet important details like this parting line ridge would be impossible to produce with traditional molding technologies, nor could machining of the cast mold produce the needed feature. On the S-Max Pro, the detail is 3D printed into the mold design with ease.



“It cuts a lot of time out for us... If we print it tonight, tomorrow someone can be getting it ready to cast.”

Austin Crawley, Program Manager, Dundee Castings



Future of growth with binder jetting

Founded in a small warehouse in 1946 as an aluminum, bronze, and brass foundry, Dundee Castings today operates a sprawling facility combining CNC, 3D printing, and foundry technologies. The shop even has multiple mold carriers in-house to verify tooling fit before it ships to customers.

And while neither Crawley nor his father, Edgar Crawley, Vice President of Dundee Castings, planned on joining the foundry the grandfather bought into, today the family-run business is looking toward the future. A future where additive manufacturing plays a large role.

Binder jetting increases operational efficiencies, which is especially important in a shrinking labor supply. “It cuts a lot of time out for us,” Austin Crawley said. “There’s CAD work upfront, but if we print it tonight, tomorrow someone can be getting it ready to cast.”

Binder jetting technology has become so essential to the operations of the foundry that Dundee Castings invested in a second S-Max Pro in 2022 to ensure it had redundancy to support its customers.

The second binder jetting machine also provides opportunity to accept more external jobs to ship out 3D printed sand. As demand for binder jetting as a service grows, the team is ready with the capacity to nest additional jobs around a seat mold build to maximize the efficiency of a large-print on either of its two S-Max Pro 3D printers.

“It’s changed from a pretty rough shop to one where we have a lot of technology,” Edgar Crawley said. “Today we have large orders coming in because we have the 3D printers, and I think we’re at a tipping point where we can grow into the future,” he concluded.



Expanding its binder jet 3D printing services, Dundee Castings prints ready-to-ship containers with intricate cores inside to ensure the parts are supported in transit to the foundry.

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Edgar Crawley, Vice President, Dundee Castings



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ABOUT DUNDEE CASTINGS

Dundee Castings is a family-owned Aluminum Foundry & CNC Machine Shop located in Southeast Michigan and supporting varying industries around the globe. Dundee Castings specializes in automotive interior aluminum mold tooling, both cast and billet cut. The team offers dedicated customer service for projects from start to finish and offer support through the life span of the program.

ABOUT EXONE

ExOne is now part of Desktop Metal's group of #TeamDM brands, which exist to make Additive Manufacturing 2.0 a reality so we can unlock the vast benefits of 3D printing at meaningful production volumes. Our 3D printing systems quickly transform powder materials – including metals, ceramics, composites and sand – into precision parts, metalcasting molds and cores, and innovative tooling solutions. Industrial customers use our technology to save time and money, reduce waste, improve their manufacturing flexibility, and deliver designs and products that were once impossible. As home to the world's leading team of sand binder jetting experts, ExOne also provides specialized 3D printing services, engineering, and design consulting.

