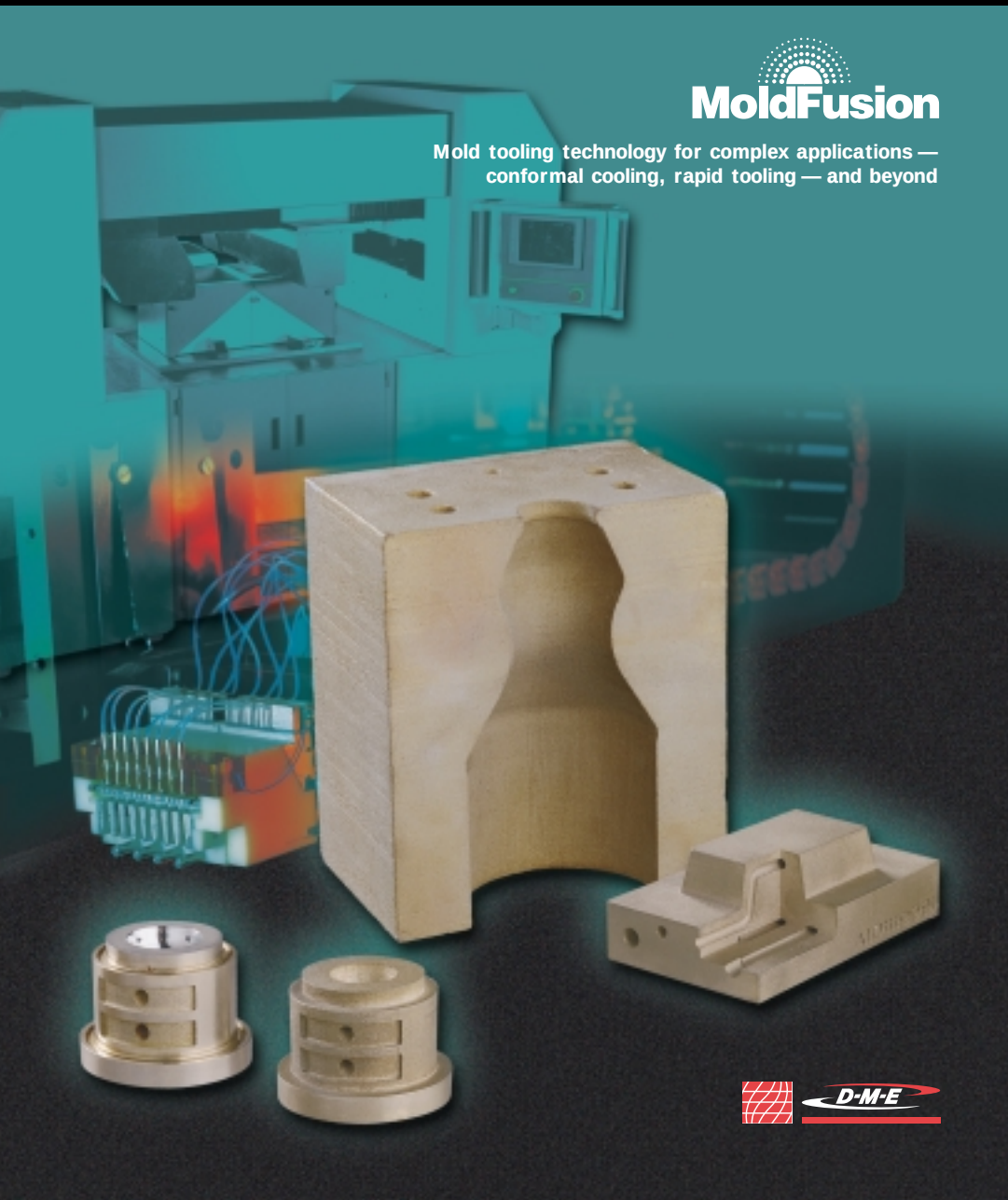
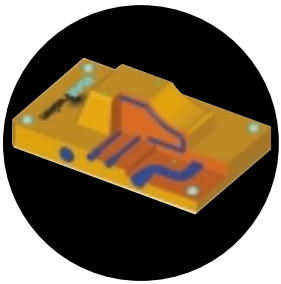
# D-M-E MoldFusion™ 3D Metal Printing

MoldFusion

**Mold tooling technology for complex applications — conformal cooling, rapid tooling — and beyond**



# Build The Unmachineable



You've seen it before – the part demands cooling in places you just can't get water, or they need to see parts yesterday, or the tool is too complex to efficiently fabricate using conventional machining – and you just can't find a way to make it happen. That's because conventional metalworking technology has limited the ability to implement designs requiring demanding mold geometries.

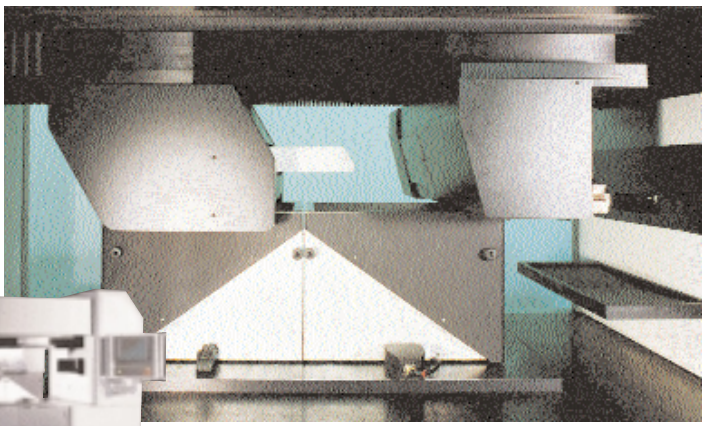
D-M-E, the leader in mold tooling technology, introduces MoldFusion™ 3D Metal Printing – a solid fusion technology using metal powder to actually print the most complex external *and internal* geometries in a finished tool.

**A better way to build better tools**

MoldFusion technology was developed by MIT to enable the fabrication of a solid part from powdered metals. MoldFusion is an additive process that builds the final solid shape from a 3D CAD solid model. This technology allows construction of tooling in ways that are not possible (or practical) using conventional subtractive machining methods.

**Not a replacement – an alternative**

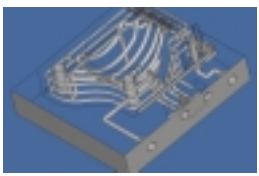
MoldFusion isn't a replacement for conventional tooling, just a solution for applications that aren't efficient or reasonable using normal metalworking. With MoldFusion, we can even help you achieve shapes, paths and geometries that were previously impossible – it's like having a rubber drill.



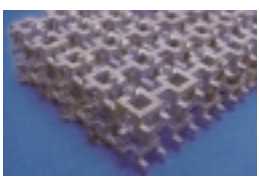
**What applications are well-suited to MoldFusion?**

With MoldFusion technology, you can break free from the limitations of conventional metalworking techniques to implement almost anything you design.

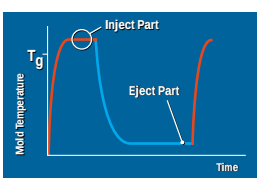
Some key applications include:



Conformally cooled inserts — place cooling lines closer to the part to speed heat evacuation and reduce cycle time up to 35% or more



Structural mass reduction of tooling — replaces material mass with structural support in the tool to improve thermal profiling and reduce tool weight




Dynamic thermal cycling — combines structural mass reduction with selective heating and cooling of the mold to improve finished part quality and enable more complex designs

Quick production tooling for prototype and short-run applications not suitable for conventional techniques or which would have high machine time demands

**From partners you can trust – D-M-E and Extrude Hone**

D-M-E has been helping to advance mold tooling technologies for almost six decades. We've developed an industry-leading reputation for solutions you can trust and service you can count on. Extrude Hone Corporation, working with experts at MIT, developed the ProMetal process for 3D metal printing of completed tooling parts. For over 30 years, Extrude Hone has been the leading developer of advanced manufacturing processes including Abrasive Flow Machining.

**How does MoldFusion work?**

MoldFusion is a 3D metal printing technology that builds a metal component by selectively binding metal powder layer by layer. The finished structural skeleton is then sintered and infiltrated with bronze to produce a finished part that is 60% tool steel and 40% bronze.

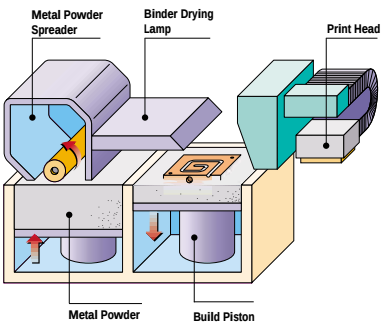
**Excellent for short-run and prototype tools**

With MoldFusion, you can cost-effectively create prototype and short-run tooling that would have previously required dozens of machine hours — hours you might never recover in the final tool. Tooling components made with the MoldFusion process are near-net shape parts, requiring only final machining.

**Maximize labor and capital investment**

Because MoldFusion is a service from D-M-E, you get expert implementation straight from your CAD file, without having to buy costly capital equipment. You pay only for the tooling parts you need. MoldFusion also helps you optimize machine loading by enabling an alternative for high material removal applications.

MoldFusion




1

Your 3D CAD solid file is transferred to D-M-E via FTP, e-mail or BBS. Our applications engineers review your CAD file and make appropriate modifications to meet your application requirements.


5

The resulting “green” part is removed from the machine and excess powder is brushed away.

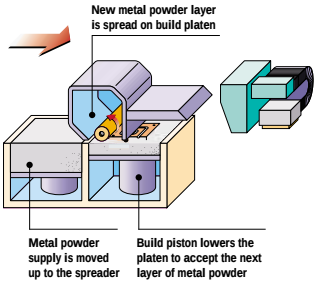
### Material properties

MoldFusion parts have properties similar to D-M-E #3 and P-20 steels, with improved thermal transfer.

| Mechanical Properties | 316+Bronze | 420+Bronze |
|---|---|---|
| Hardness | 60 HRB | 26~30 HRC |
| Ultimate Strength | 59 KSI | 99 KSI |
| Yield Strength | 34 KSI | 66 KSI |
| Modulus | 21.5 MPSI | 21.4 MPSI |
| Elongation | 8.00% | 2.30% |
| **Thermal Properties** | | |
| Thermal Conductivity | 560 Btu.in/ft$^2$.h.°F | 590 Btu.in/ft$^2$.h.°F |
| Mean CTE | 8.3 µ.in/in.°F | 7.2 µ.in/in.°F |
| Specific Heat | 0.0955 Btu/lb./°F | 0.1098 Btu/lb./°F |
| **Physical Properties** | | |
| Density | 8.10 g/cc | 8.07 g/cc |

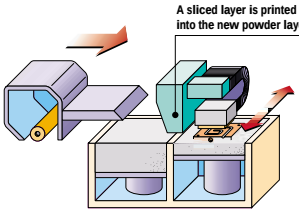
**2**

The refined CAD design is transferred to the MoldFusion 3D Metal Printing system. A very smooth layer of steel powder is spread onto the part build piston.



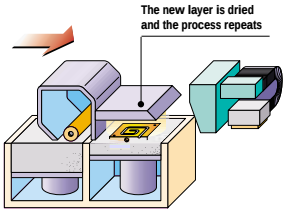

**3**

The CAD image is printed with an ink jet printhead depositing millions of droplets of binder per second which quickly dries.




**4**

The part build piston drops approximately 120-170µ (0.005"- 0.007"). The process is repeated until the part is completely printed.




**6**

The printed part is loaded into a furnace and sintered to create a structural skeleton of 60% density and eliminate the binder.

**7**

A second furnace cycle infiltrates the part with molten bronze via capillary action for full density. A near-net part is ready for final machining.

Serving customers in over 70 countries worldwide, no one equals D-M-E for injection molding tooling solutions and support. D-M-E has manufacturing and distribution locations in North America, South America, Europe and Asia to ensure rapid delivery, no matter where you are.


**D-M-E Company**
**World Headquarters**
29111 Stephenson Highway
Madison Heights, MI 48071
Toll Free 800-626-6653
Tel 248-398-6000
Fax 888-808-4363
E-mail dmeinfo@dmeco.com
Website www.dmeco.com

**D-M-E of Canada, Ltd.**
6210 Northwest Drive
Mississauga, Ontario, Canada L4V 1J6
Toll Free 800-387-6600
Tel 905-677-6370
Fax 905-677-5280

**D-M-E Europe**
Industriepark Noord
B-2800 Mechelen, Belgium
Tel 32-15-215011
Fax 32-15-218235



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