

Desktop Metal™

[E-BOOK]

Case Study: Egar Tool & Die Ltd.

www.desktopmetal.com



00

Overview

Based in Cambridge, Ontario Canada, Egar Tool and Die is a leader in the production of automotive stamping dies, production stampings and welded assemblies. The company has been supplying North American Tier 1 and 2 automotive companies for more than 40 years.

01

The Challenge

The automotive industry consists of a vast network of suppliers and vendors producing millions of parts for the thousands of assemblies and subassemblies that go into every vehicle on the road.

While some of those components are cast, forged or machined, a large percentage are stamped or formed from various types of sheet metals using large stamping presses, capable of bending, cutting, forming, coining, and piercing the raw material.

To deal with constant iteration in automotive design and the demand for huge numbers of parts, suppliers must be able to quickly retool and refit manufacturing lines to minimize downtime.

And for many companies, that's where Egar Tool and Die comes in.

At Egar Tool and Die, the challenges are two-fold. First, the company must be able to quickly produce dies to meet customer requirements. But as a producer of more than 15 million stamped parts and welded assemblies annually, Egar - like many of its customers - must be able to quickly retool for different jobs.

To do it, the company is investing in state-of-the-art manufacturing technology, including metal 3D printing.

02 A Powerful Tool

For Egar engineers, 3D printing has proven to be a powerful tool to overcome those challenges - allowing them to quickly produce both end-of-arm tooling for stamping presses and custom die prototypes for both internal use and customers.



Today, the vast majority - as much as 80 percent - of Egar's 3D printing capacity is dedicated to producing end of arm tooling for their high-volume production stamping presses. Using just one Studio System, staff can design, iterate, and integrate components into their production line in less than a week - keeping manufacturing downtime to a minimum.

The other 20 percent of Egar's additive manufacturing is focused on prototyping and developing die components, particularly using materials like H13 tool steel and 4140 chromoly steel, which are often used in stamping dies.

As with end of arm tooling, 3D printing allows engineers to print and test multiple prototype end-of-arm tooling dies with subtly different geometries, and quickly refine designs to arrive at a final part.

In addition to faster production, 3D printing allows engineers to create parts with far more complexity - like optimized end-of-arm tools with high performance that couldn't be justified with traditional manufacturing - yet avoid the cost increases that often accompany highly complex designs.

Using the Studio System, Egar engineers are able to produce end-of-arm tooling and prototype dies with complex geometry - like internal cooling channels - that cannot be manufactured via casting, machining, milling or other traditional methods.

Additive technology also opens the door to lightweighting parts like transfer arms of a press to optimize performance and reduce stress on machines, as well as combining multiple parts into one (assembly consolidation.)

Additive manufacturing also allows for the use of generative design tools, enabling engineers to access new design spaces and create parts with organically inspired geometry, to create parts that are optimized for their application, but are significantly lighter and cheaper to manufacture.

In addition to the Desktop Metal™ products they already have in use, Egar engineers are eagerly exploring possible uses for upcoming materials - particularly copper - for use in a resistance welding application.

Egar has also invested in the Desktop Metal™ Fiber™ printer, and expects to begin printing parts like sensor holders for use in a gas metal arc welding system in late 2020.



By printing the mounts from high-temperature PEEK filament, they will be able to withstand the environment inside the system - which includes hot welding slag, sparks and parts being dropped, helping to reduce downtime the results from damage to sensors.

03

Why Desktop Metal™?

Before investing in the Studio System™, Egar had explored the use of plastic printers to create mounts to hold steel end-of-arm tooling inserts, and for mounting stamping die sensors.

While those efforts demonstrated that 3D printing could meet the company's needs, they still faced issues - particularly related to durability and cost - leading Egar engineers to search for a system capable of printing metal parts.

After exploring a variety of systems, Egar engineers chose the Studio System™ for its robust printer design and furnace capabilities.

While other metal 3D printing systems incorporate a similar sintering solution, they have smaller-volume furnaces which result in lower throughput.

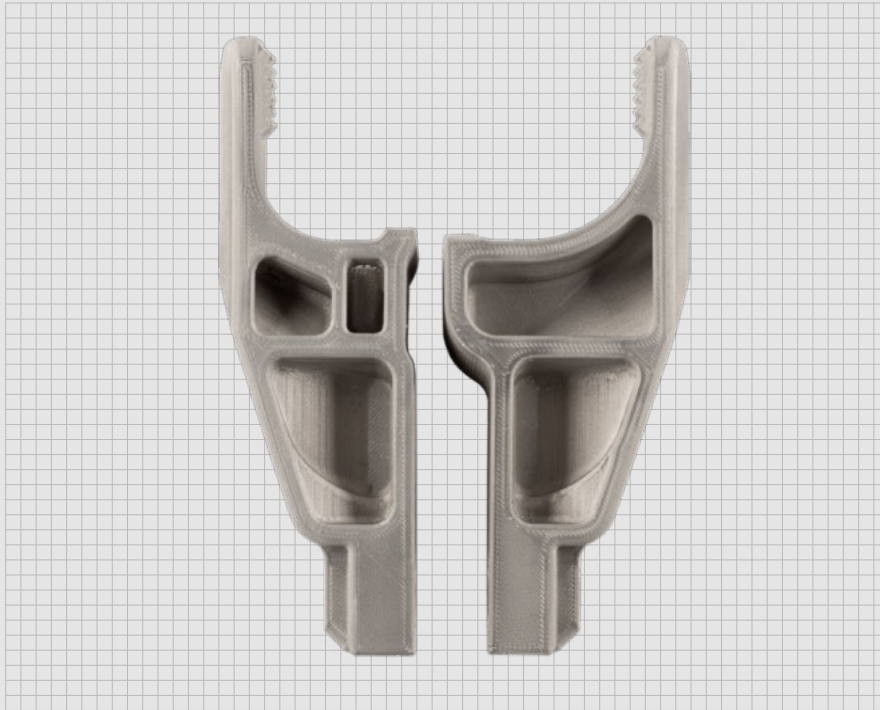
The Desktop Metal™ furnace, by comparison, features a unique, vacuum chamber design, the ability to use house gas, and a larger volume that allows for larger parts and higher numbers of parts per run, resulting in lower per-part printing costs.



3D Printing vs. Traditional Manufacturing

[Part Example]

Transfer Arm Tooling



[Material]

17-4 PH Stainless Steel

[Cost Saving]

48%

Studio System™

\$113/set

0.81 kg/set

CNC

\$216/set

1.28 kg/set

[Time Saving]

37%

*Not available to manufacture with traditional method, only 3D printing.

[Description]

Sheet metal presses perform a number of operations in quick succession. Between each step, the workpiece must be manipulated in some way, whether moved, rotated, flipped, or some combination. This is achieved using a transfer arm - a robotic arm with dedicated end-of-arm tooling specific to each operation.

The arm must quickly grab the workpiece, perform the necessary movement while the press completes its upward stroke, and places the part before withdrawing - in some cases in less than a second. During a full production run, the arm must perform the same actions tens of thousands of times.

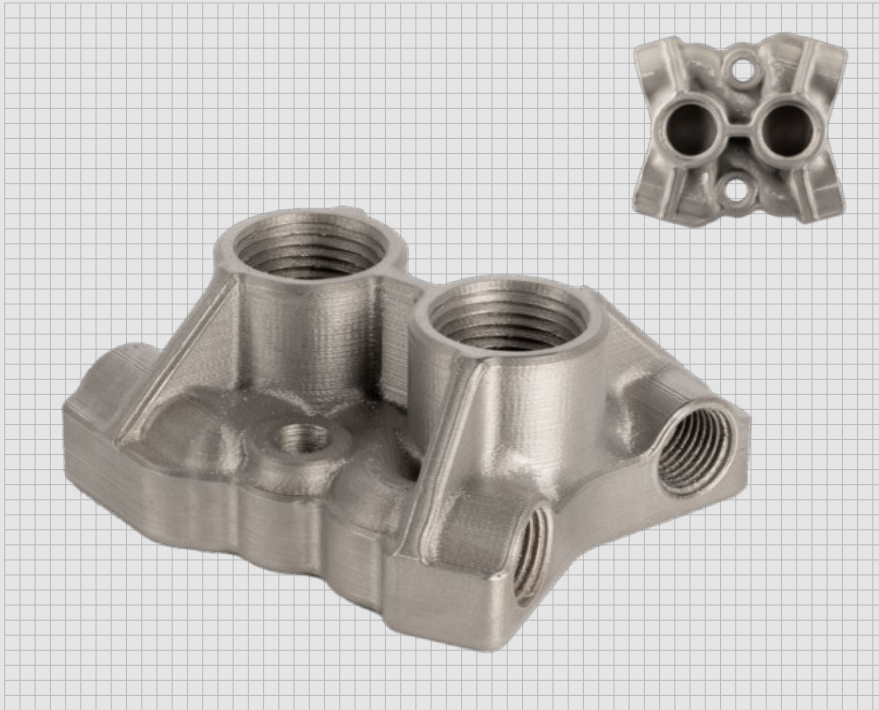
To perform over that many cycles, it is imperative that transfer arm tooling be both durable and lightweight.

Misfires or delays in the movement of the press can result in impacts, which end-of-arm tooling must survive with minimal damage. Weight reductions, meanwhile, reduce wear and tear on the servos, motors and other components driving the press, and allow the press to move faster - since the arm can move faster - increasing the rate of production.

3D Printing vs. Traditional Manufacturing

[Part Example]

Air Manifold



[Material]

17-4 PH Stainless Steel

[Cost Saving]

73%

Studio System™

\$76.93

CNC

~\$300

[Description]

Some end of arm tooling requires pneumatic or hydraulic actuators to open and close grippers.

Pneumatic systems may be cobbled together using multiple airlines, regulators and other components, all of which add weight to the arm and can be so bulky they interfere with operation of the press.

Using additive manufacturing's ability to print complex internal channels, Egar was able to consolidate a complex multiple part pneumatic system into a single air manifold.

In addition to considerable cost savings, the Studio System™ allowed Egar engineers to shrink the size of this manifold - a CNC part would need to be significantly larger, which could potentially interfere with other machinery.

Printing this part from steel also provides the strength needed to withstand the high pressures used.

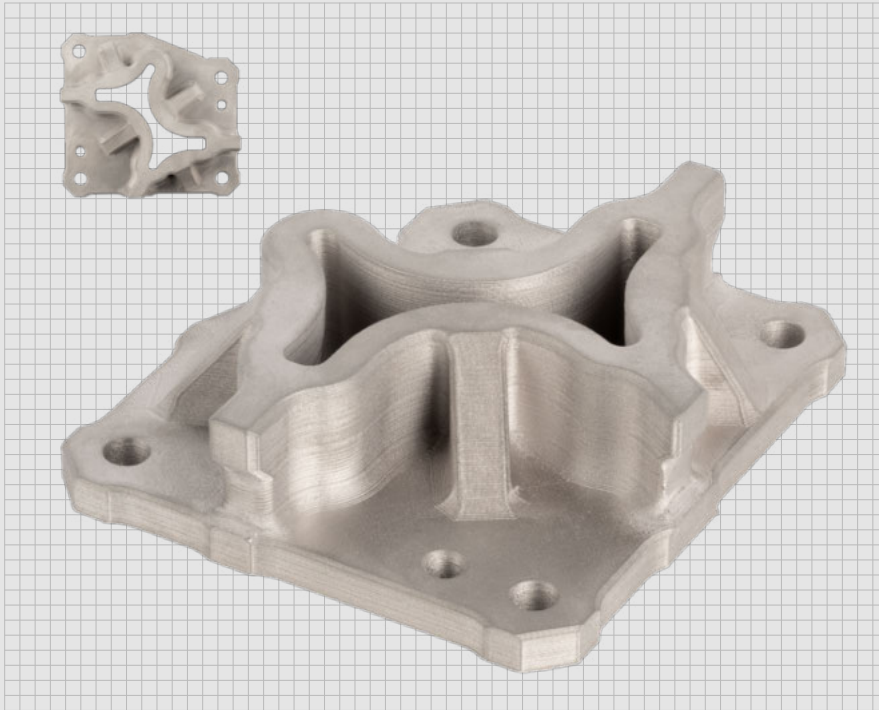
3D Printing vs. Traditional Manufacturing

[Part Example]

H13/4140 Die Section

[Material]

H13 Tool Steel
4140 Chromoly Steel



[Description]

This part is a stamping die used in Egar's manufacturing line. This part will go through thousands of cycles as parts are stamped for a particular production run, so it must be strong enough to withstand repeated stress.

For that reason, Egar engineers chose to print these dies using H13 tool steel and 4140 chromoly steel. The H13 die was later fully heat treated and the 4140 part was flame hardened to increase their hardness, enabling them to stand up to the stamping process.

The use of 3D printing allows Egar engineers to quickly create dies for their production lines, and to retool and refit in a matter of days, as opposed to weeks or more.

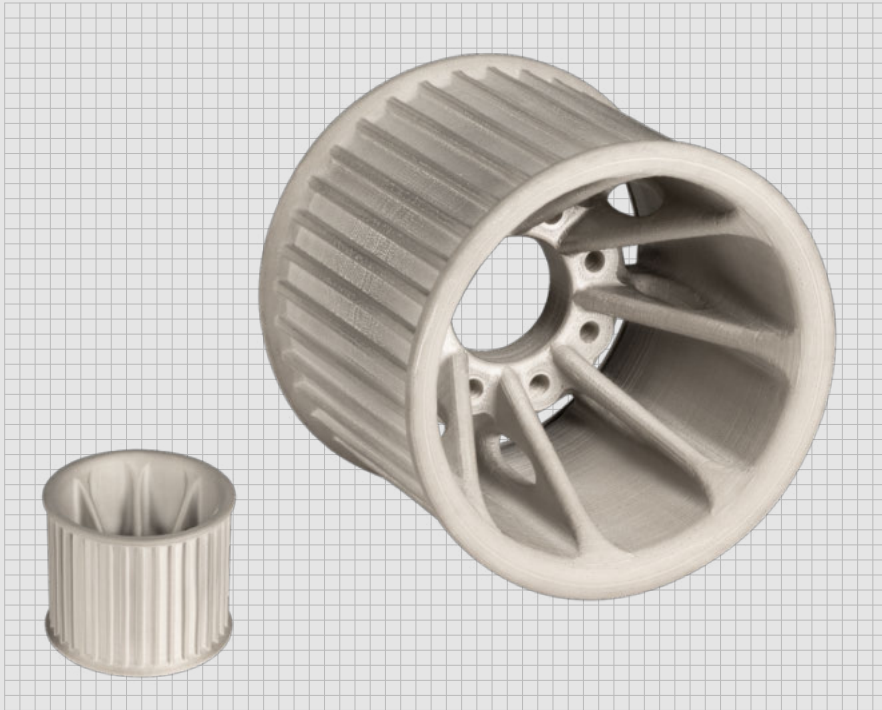
3D Printing vs. Traditional Manufacturing

[Part Example]

Timing Belt Pulley

[Material]

17-4 PH Stainless Steel



[Description]

This timing belt pulley attaches to a servo motor, and is a key part of the manufacturing environment at Egar Tool and Die

The design of this part is based on an assembly built from an aluminum extrusion, two screwed-on end plates and a clamp collar. The extruded part also requires extensive machining after extrusion.

By redesigning the part, Egar engineers were able to consolidate the entire assembly into just one piece. This also significantly reduced the weight of the part, allowing the servo motors to run faster, leading to an improved manufacturing environment.

04 Evaluation

The Studio System™ has been a major success for Egar Tool and Die - with it, Egar engineers have been able to quickly create everything from stamping dies to tooling that are precisely tailored to their different applications.

The variety of materials available for the Studio System™ allows the company to produce stamping dies in tough materials - including H13 tool steel and 4140 chromoly steel - which can stand up to the demands of manufacturing.

For end-of-arm tooling, meanwhile, engineers printed parts from 17-4 PH stainless steel, producing parts that are both lighter and more durable than existing tooling, which consist of plastic parts with steel inserts.

"I'm very excited for the future of AM in both metal and plastic. There has been and continues to be great advancements in both areas.

In my opinion Desktop Metal™ is at the forefront of these advancements, and I am looking forward to seeing what printer or technology they will come up with next."

—
Colin Kools
*Director of Additive Manufacturing
Egar Tool and Die Ltd.*

Those new parts allow machinery to run faster and for more efficient manufacturing, enabling Egar to quickly produce stamped parts with less downtime on their manufacturing floor.

About Desktop Metal Inc.

Desktop Metal, Inc. is accelerating the transformation of manufacturing with end-to-end metal 3D printing solutions. Founded in 2015 by leaders in advanced manufacturing, metallurgy, and robotics, the company is addressing the unmet challenges of speed, cost, and quality to make metal 3D printing an essential tool for engineers and manufacturers around the world. In 2017, the company was selected as one of the world's 30 most promising Technology Pioneers by the World Economic Forum, and was recently named to MIT Technology Review's list of 50 Smartest Companies. For more information, visit www.desktopmetal.com.

About Egar Tool & Die LTD.

First opening in 1978, Egar Tool and Die is a world-class manufacturer of automotive stamping dies, production stampings, and welded assemblies. Egar Tool and Die has been supplying complex progressive and transfer dies to the North American Tier I automotive industry. All tools are designed in-house by a skilled design team using the latest CAD/CAM modeling software and simulation tools. Once designed, dies are manufactured in our tool room equipped with large bed CNC machines and high capacity overhead cranes. After production they are thoroughly tested in our dedicated press shop. To better meet the requirements of our Tier I customer base, Egar Tool and Die has expanded its operations to include high volume production stamping and welded assemblies. With large bed presses ranging in capacities from 400T to 1200T, we produce over 15 million stampings a year to various worldwide suppliers. Egar Tool and Die has invested in modern metal forming technology including a link press and servo-transfers.