# Introducing 3D Metal Printing for Mass Production

RichPort
3D SOLUTIONS
787.360.7920

Desktop Metal™

*Desktop Metal printers are available in the Caribbean through Rich Port 3D Solutions.*

# Metal 3D printing for mass production

Created by the inventors of binder jetting and single-pass inkjet technologies, the Production System™ delivers the speed, quality and cost-per-part needed to compete with traditional manufacturing methods. It's the fastest way to print metal parts at scale.

**Production System™**

## 100x faster

Breakthrough Single Pass Jetting™ technology delivers speeds up to 12,000cm$^3$/hr—more than 100x faster than quad-laser metal printers and over 4x faster than the closest binder jetting alternative. With zero tooling required, it's the fastest way to manufacture complex metal parts.

## 20x lower cost-per-part

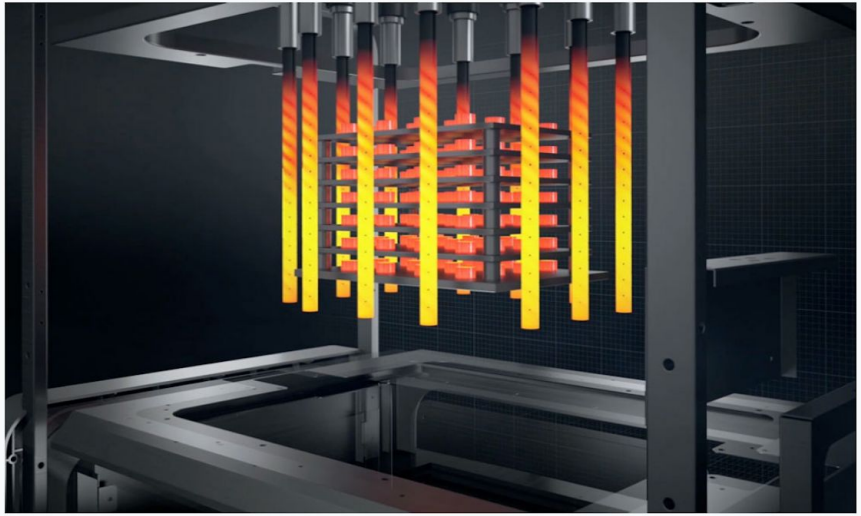
Low-cost MIM powder, high throughput, and simple post-processing deliver per-part costs that are competitive with traditional manufacturing processes—and up to 20x lower than today's metal 3D printing systems.

## 1. Print

Two state-of-the-art print bars containing 32,768 nozzles work in conjunction with powder spreaders to disperse metal powder and print in a single pass across the build area, jetting up to 3 billion drops per second.

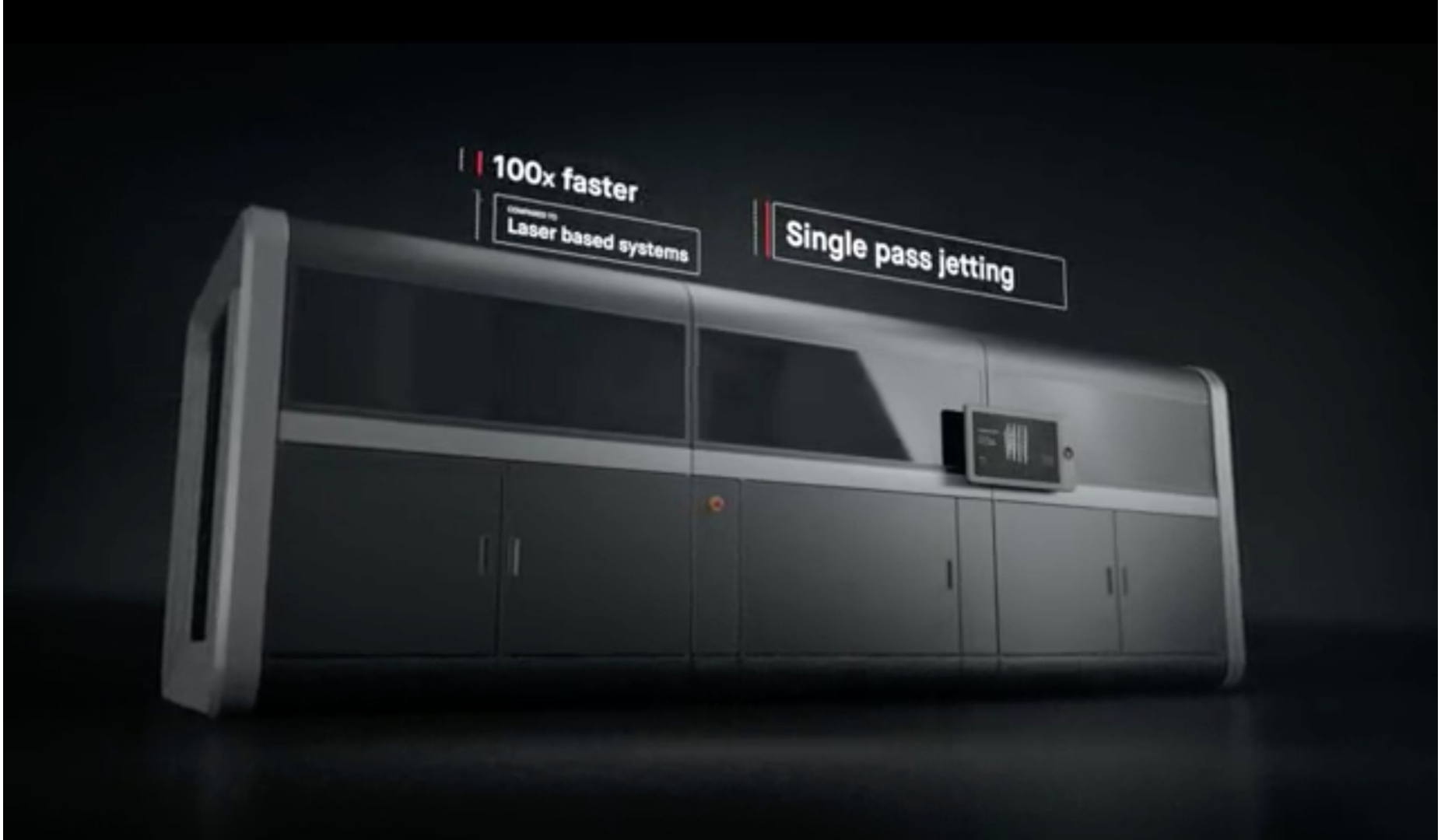
## 2. Depowder

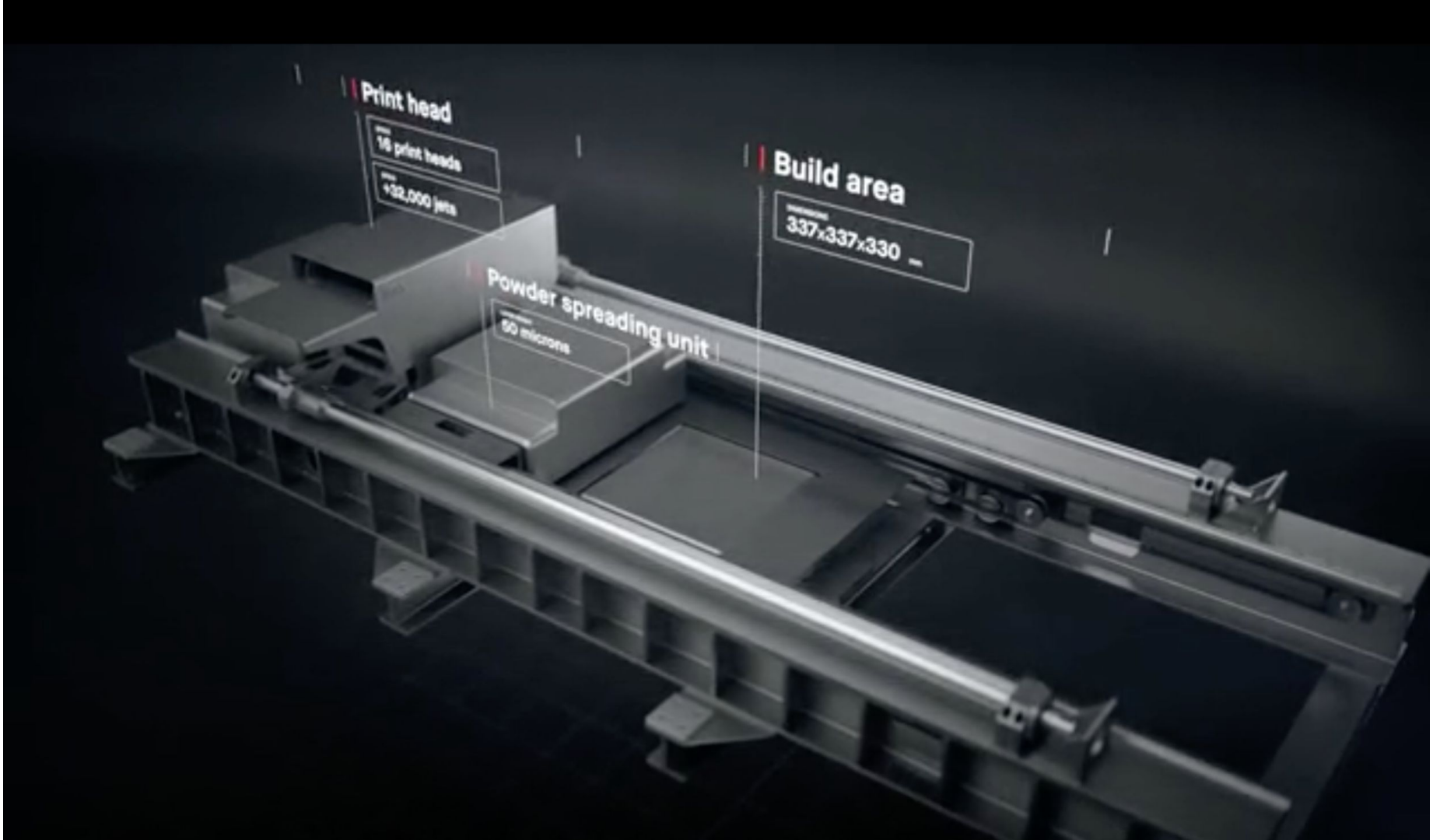
Parts are removed from the build box and cleared of any loose powder that remains in channels and crevices in preparation for sintering.



## 3. Sinter

Heated to temperatures near melting, remaining binder is removed causing the metal particles to fuse together and the parts to densify.


100x faster
Laser based systems
Single pass jetting

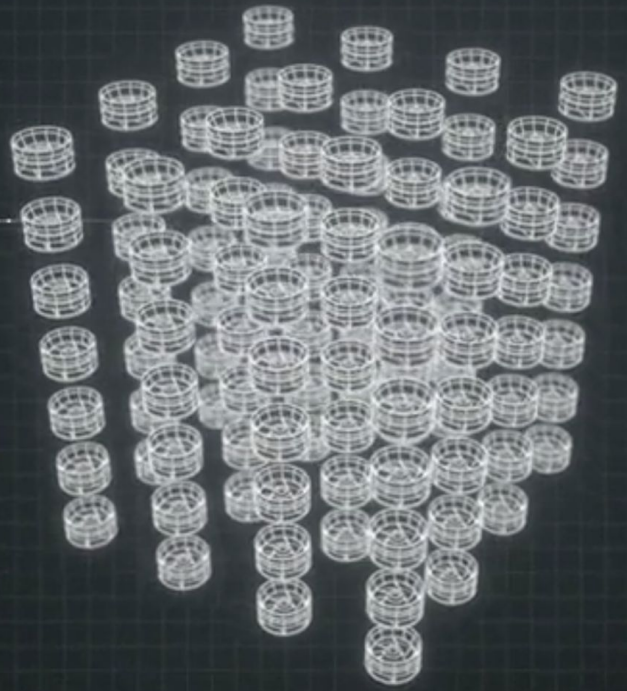

Print head
16 print heads
+32,000 jets
Build area
337x337x330
Powder spreading unit
50 microns

## Part: Water pump impeller

Total parts: **112**

Time to print: **4.5 hours**

Cost per part: **$5.69 USD**



View build platform

Side view

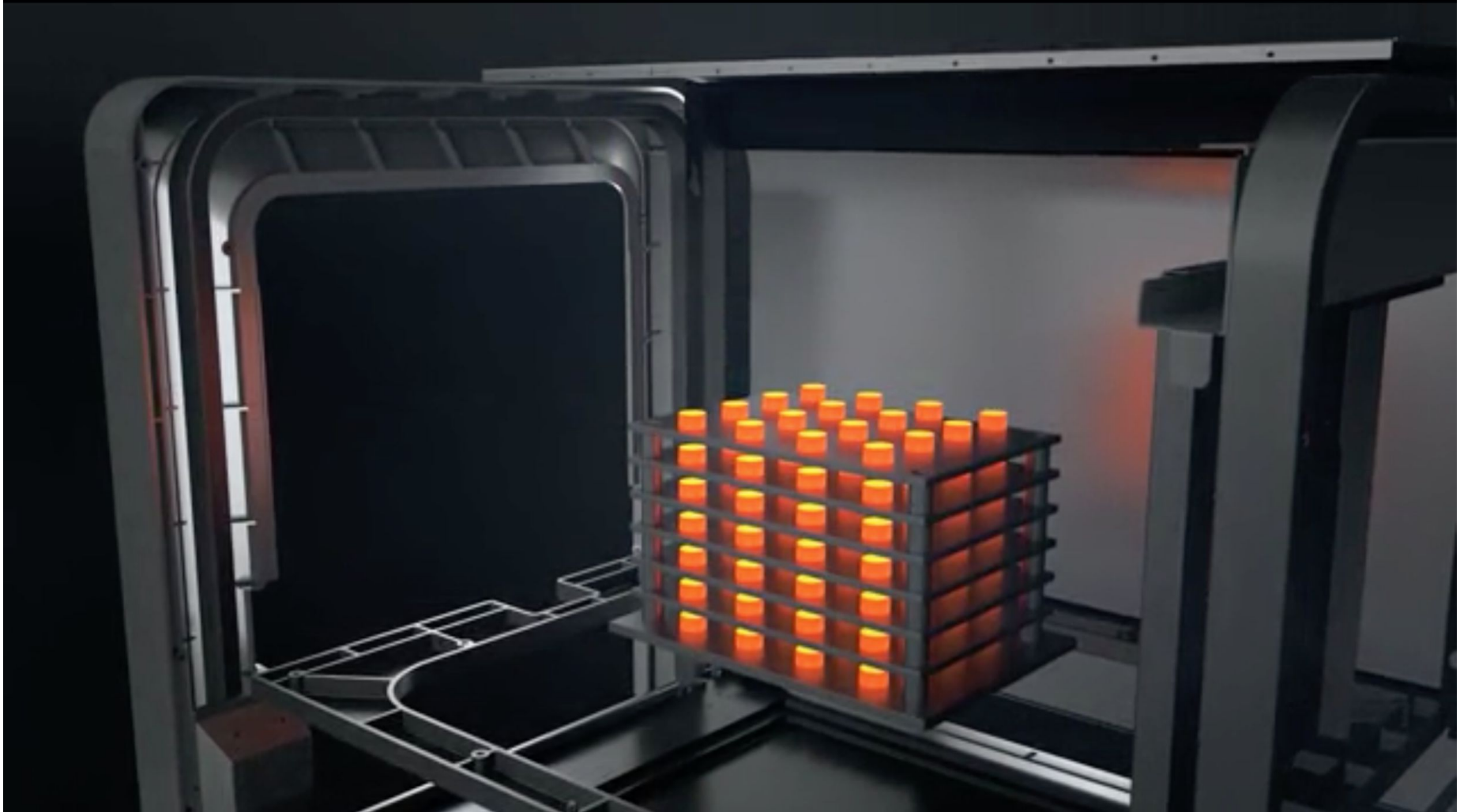
Layer **245/550**
Time remaining: **4h 30m**
Material remaining: **100%**

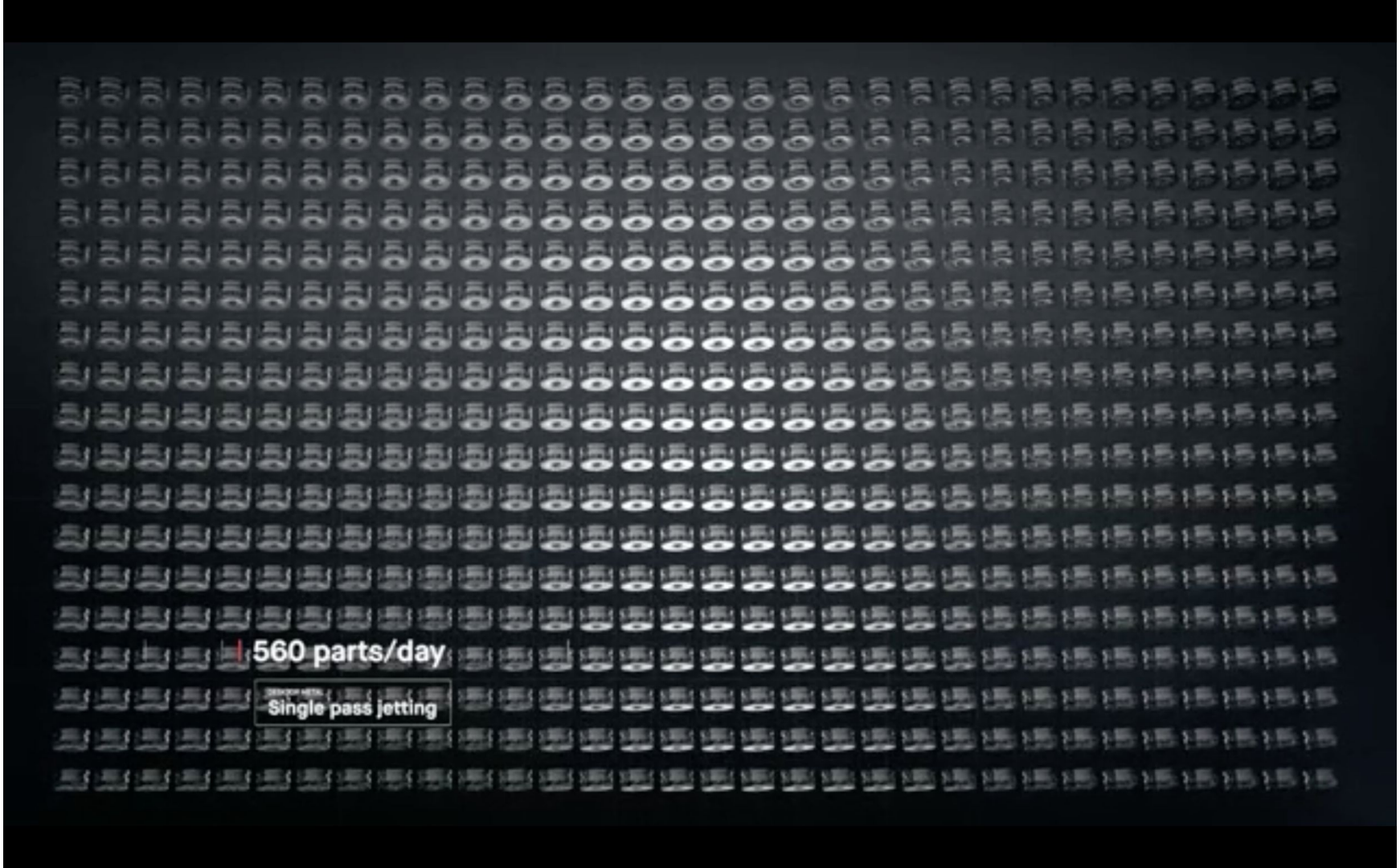
Build start time: 3:32 PM 09/09/2016

Ready to print

0

3hrs




560 parts/day
Single pass jetting

Cost per part for mass production

$5.69 / part

# Applications for high-volume manufacturing with the Production System



## Process capability

Custom gears

The Production System enables mass customization at mass production efficiency by eliminating bottlenecks and costs associated with per-unit customization. The flexibility of the print technology allows for an entire build volume of custom parts to be rendered at once. For example, a variety of gears-varying in size, number of teeth, and tooth profiles-can be printed in one batch without any specialized fixturing, tooling or dedicated molds. Thus enabling high-mix runs of single-unit or low-volume parts that may otherwise not warrant associated setup costs. Custom features like serial numbers can also be easily produced as they are printed directly into the part, eliminating the need for application during post-processing.

## Process capability

Print-in-place hinge

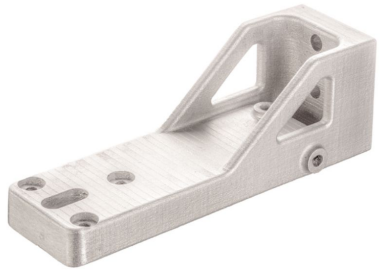
A typical hinge design consists of two leaves bound by a central pin. As the size of the hinge gets smaller, assembly becomes increasingly challenging-requiring special tools and equipment for precision manufacturing. Assembling mini hinges in high volume has a significant impact on lead time and dedicated labor required. The Production System enables print-in-place hinges with the pin printed directly into the knuckle of the mating leaf-eliminating the need for post-assembly and reducing the risk of disassembly after repeated use. With speeds up to 12,000 $cm^3$/hr, the Production System can print over 20,000 pre-assembled 12 x 5 x 6 mm hinges in a single four-hour build.

# Applications for high-volume manufacturing with the Production System

## BMW

Water wheel

Typically manufactured as an assembly of plastic components, water wheels in BMW production vehicles are, as most components, designed for manufacturability and cost. Utilizing DMLS methods, the company was able to re-engineer this part for maximum performance as a single metal component; however, they were only able to introduce this new design to their racing vehicles as the parts are too expensive and slow to manufacture at scale. With the Production System, BMW will be able to manufacture complex parts like the water wheel at a competitive cost (~$5.56/part) bringing high-performance parts from the racetrack to the road.

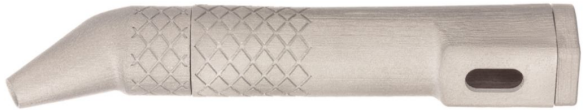


## Audi

Custom fixture

A custom fixture from Audi demonstrates the Production System's ability to print-in-place conformal cooling channels that would not otherwise be manufacturable as a single part. The cooling channels, spanning the base and the wall, would typically require the part to be manufactured in pieces and then welded back together. The process required to manufacture a single fixture is not scalable-in terms of cost or time-as production volume increases. With the Production System, the fixture is printed as a single part with cooling channels intact.

# Applications for high-volume manufacturing with the Production System

## Milwaukee Tool

Spauger bit

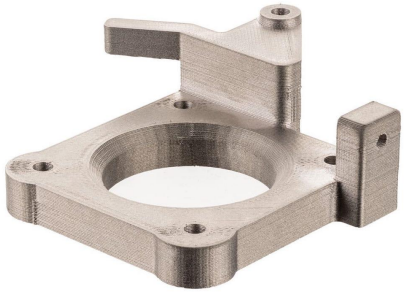
The spauger bit features complex geometry requiring more than 20 manufacturing steps when using traditional methods. Many of these operations-including milling, turning, and grinding-require dedicated setups. The high number of individual operations required to achieve the complex geometry and their associated costs represent major challenges for manufacturers. In a single run, the Production System produces more than 600 spauger bits which can then be post-processed to achieve desired hardness and surface finish. The result is a reduction in manufacturing complexity-reducing the number of independent operations required from about twenty to four.

## Ultra Machining Company

Surgical tool assembly

Evaluated on their ergonomic comfort as much as their functionality and performance, surgical tools are precision-engineered to optimal geometries. Traditionally, this involves several machining and finishing operations which can inhibit iteration and customization. The Production System produces near-net-shape parts with complex features, such as knurling, printed simultaneously with the core geometry-reducing production time and material costs. The design flexibility inherent to Single Pass Jetting introduces new capabilities to medical device manufacturing and makes it easy to accommodate surgeon-specific customized tools.



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