Metal Additive Manufacturing

CMTC®
California's Manufacturing Network

INTRODUCTION

Components that would not have even been possible just a few years ago can now be made to high standards using a wide range of metal additive manufacturing (AM) techniques. No longer solely a prototyping technology, Additive Manufacturing is now being used for the production of series components for the most demanding applications.

As systems and technologies advance and processing time is reduced, the use of AM for producing large quantities of parts is becoming a viable option. AM complements a vast group of production processes, allowing designers and engineers to improve existing process chains, as well as offering new opportunities for production. These high volume metal AM systems will soon to hit the market.

Desktop Metal - Production System

The Production System provides metal AM for mass production. It delivers the speed, quality, and cost-per-part needed to compete with traditional manufacturing processes. Desktop Metal features include:

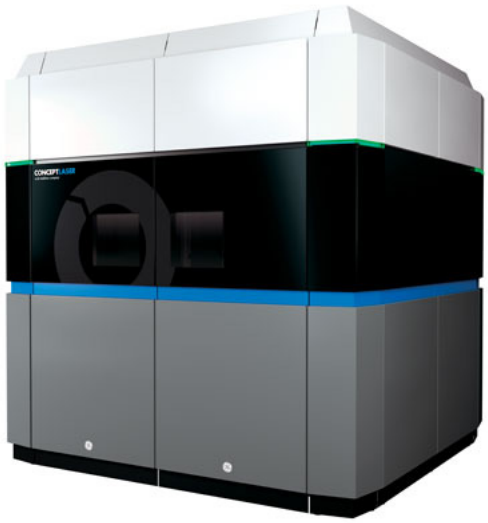
- Printing speeds to 12,000 cm^3 per hour
- Build volume of 750 x 330 x 250 mm
- Use of 32,768 piezo inkjet nozzles that enables the broadest range of binder chemistries to print an array of metals - including tool steels, low alloy steels, titanium, and aluminum - at a rate of 3 billion drops per second
- Industrial inert environment, including gas recycling and solvent recovery, to safely print reactive metals in mass production
- Capability to print more than 60 kilograms of metal parts per hour

HP Metal Jet

Produces strong, functional final metal parts with HP's isotropic mechanical properties and proprietary binding agent. Compared to selective laser melting, HP Metal Jet produces more isotropic grain structure in the sintered part that results in more uniform material properties. HP Metal Jet features:

- Build volume of 430 x 320 x 200 mm
- Low-cost, high-quality final parts for serial production up to 100,000 parts
- 1200 x 1200 dpi addressability in a layer 50 to 100 microns thick
- Finished parts with isotropic properties that meet or exceed ASTM and MPIF Standards
- High reusability of materials can reduce materials cost and waste
- Density after sintering > 93%, similar to MIM

GE Additive - Project ATLAS



GE Additive launched Project ATLAS. (Additive Technology Large Area System) aimed at developing the next generation of large additive machines suitable for customers in industries such as aviation, space, energy and automotive. Knowing the intense level of quality demanded by these industries, Project ATLAS utilized aerospace engineers to build on the technology previously developed by GE and combine it with Concept Laser's expertise in Direct Metal Laser Melting additive machines. Project ATLAS features include:

- Build volume is 950 x 810 x 300 mm
- Gantry-based architecture
- Up to 4 x 1.5kW lasers
- State-of-the-art scanner with 3D focusing
- Discrete dosing
- Optimal air-flow control over the print area
- Best-in-class feature resolution
- Process and Machine Health Monitoring (enabled by Predix)

ExOne - X1 25PRO™ Mid-scale Production 3D Printer

The X1 25PRO™ print quality is achieved through ExOne's patent-pending technologies that allow for the printing of MIM powders. Built on long standing MIM powder processing, the X1 25PRO™ works with a wider range of standard materials. At present, 316L, 304 L, and 17-4PH stainless steels; Inconel 718® and 625; M2 and H11 tool steels; cobalt chrome; copper; tungsten carbide-cobalt and many other alloys are 3D printable on the X1 25PRO™. ExOne's features include:

- Build dimensions of 400 x 250 x 250 mm
- Build speed: up to 1800 cc/hr
- Layer thickness: > 50 micron
- Print resolution: Minimum 50 micron
- Resolution and throughput can be optimized by changing printhead droplet size and layer thickness

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