3D métal printing

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A metal binder jetting additive manufacturing process

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3D metal printing, also referred to as Metal Binder Jetting, provides economic and productive solutions for the manufacture of small complex components

No use of manufacturing supports, increased productivity, good surface condition are just some of the advantages provided by 3D metal printing which serves to manufacture very complex small parts thereby limiting the need for rework in comparison with other additive processes.

Context

- Metal additive manufacturing comprises various process families, one of which includes technologies without fusion. Amongst these technologies, metal binder jetting must help to substantially reduce the cost of parts and broaden the scope of additive manufacturing applications to series production.

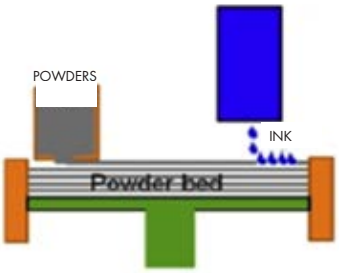
Technological principle

- The principle for manufacturing a component with 3D metal printing involves 2 phases:

- Forming of the part by successively layering metal powders agglomerated by a binder. The binder, which was initially polymer, is selectively projected by a multi-jet printing ramp. An unsintered "green" part is obtained.

- After removing the binder by combustion (debinding), the unsintered "green" part is consolidated and densified by sintering to obtain a functional metal component. This sintering gives the part its mechanical properties.

Forming by 3D printing

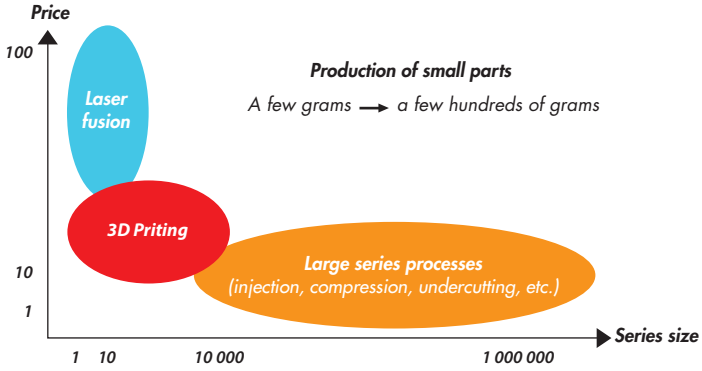


Consolidation by sintering

Industrial sectors and stakes

- 3D metal printing has outlets in sectors such as micromechanics, aerospace, medical, fluid, electric, watch-making and hardware industries.
  The components in question are parts of a few tenths to hundreds of grams for small and medium series productions (unit to several thousands).

The industrial stakes essentially relate to profitability of smaller series instead of larger series processes (bar turning, casting, metal injection moulding – MIM, compaction-sintering) or a reduction of the time for development of large series applications (expedite the manufacturing of metal prototypes). Eventually, 3D printing fosters the development of innovative products thereby opening up additive manufacturing to new markets.

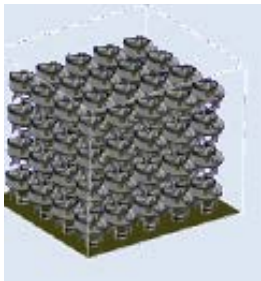


Advantages

- The various advantages specific to metal binder jetting play a role in the current and future potential of the technology:
  - no manufacturing supports
  - optimum filling of the manufacturing volume
  - high manufacturing speeds.

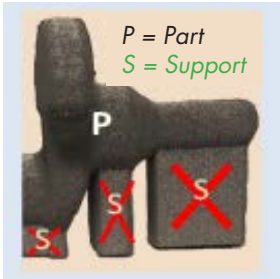
  All these properties grant this technology its potential for productivity and a genuine economic advantage.

Productivity



Part stacking
High manufacturing speed

Reduced costs



Elimination of costs related to the supports: material, machine time, removal

Examples of 3D printing applications at Cetim

Very vast field of eligible materials:
Already available: Titanium, 316L and 17-4PH stainless steel
Development: Copper and Inconel...
Eventually: all steels

Aerospace

Précision mechanical parts

Transmission parts, micromechanics

Injection de fluides, secteur médical

Watch-making

Cetim has:

- 3D metal printing and sintering resources
- a team of specialists in additive manufacturing and powder metallurgy
- experts in (re)design and adapted numerical tools (topological optimisation, calculation, CAD, etc.)
- adapted resources and expertise in inspection and tests (non-destructive testing, fatigue, metallurgy, etc.)

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