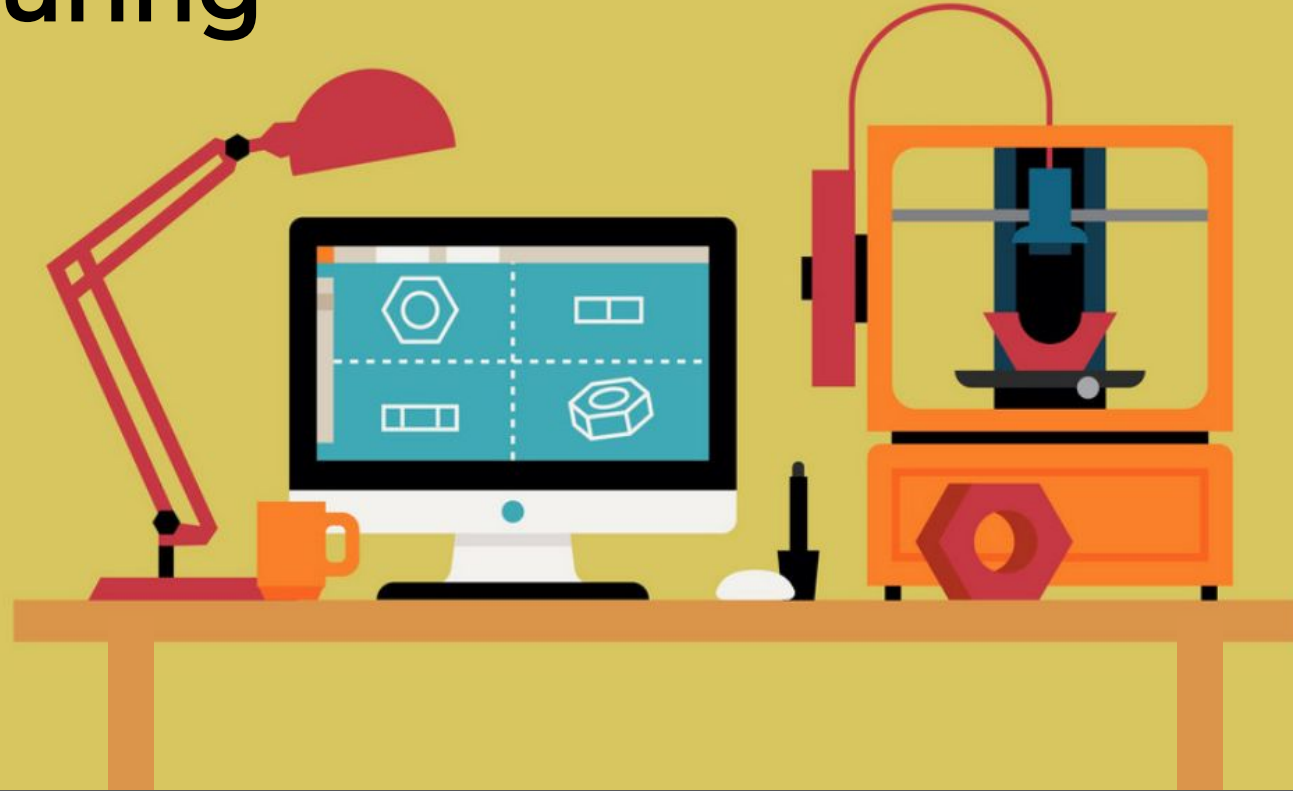


Additive Manufacturing

Group 1:

48 Prabhav Pandya
49 Omkar Prabhune
50 Pranav Tambaku
53 Pritesh Pawar

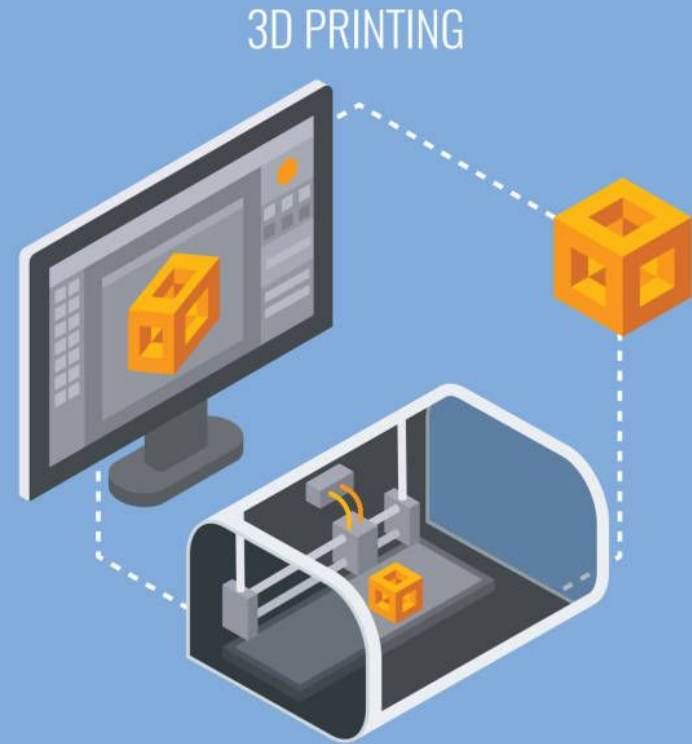


Introduction



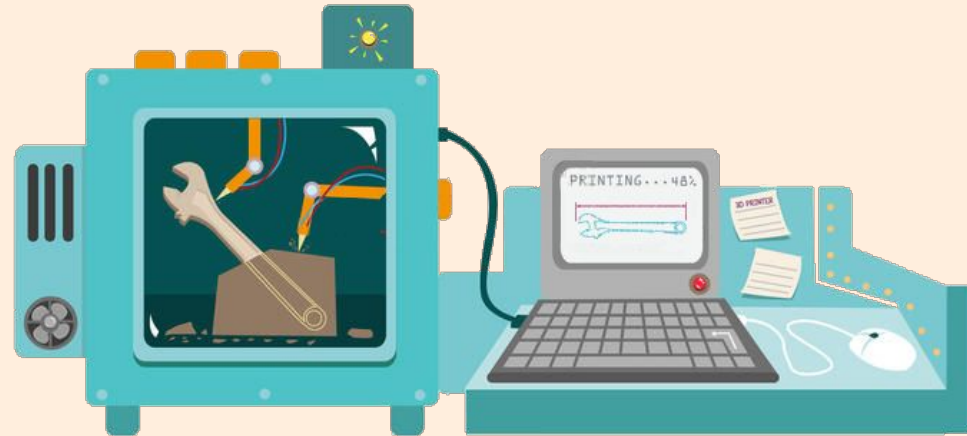
What

- Layer by layer process
- Commonly known as “3D printing”
- Additive process
- Design for manufacturing to manufacturing for design
- Not like traditional subtractive machining techniques



How

1. Apply a thin layer of the powder material to the building platform.
2. Fuse the powder at exactly the points defined before
3. Apply another layer of powder
4. Fuse and Bond again.



Why

Advantages

Freedom of design

Complexity for free

Potential elimination of tooling

Lightweight design

Elimination of production steps

Disadvantages

Slow build rates

High production costs

Considerable effort required for application design

Discontinuous production process

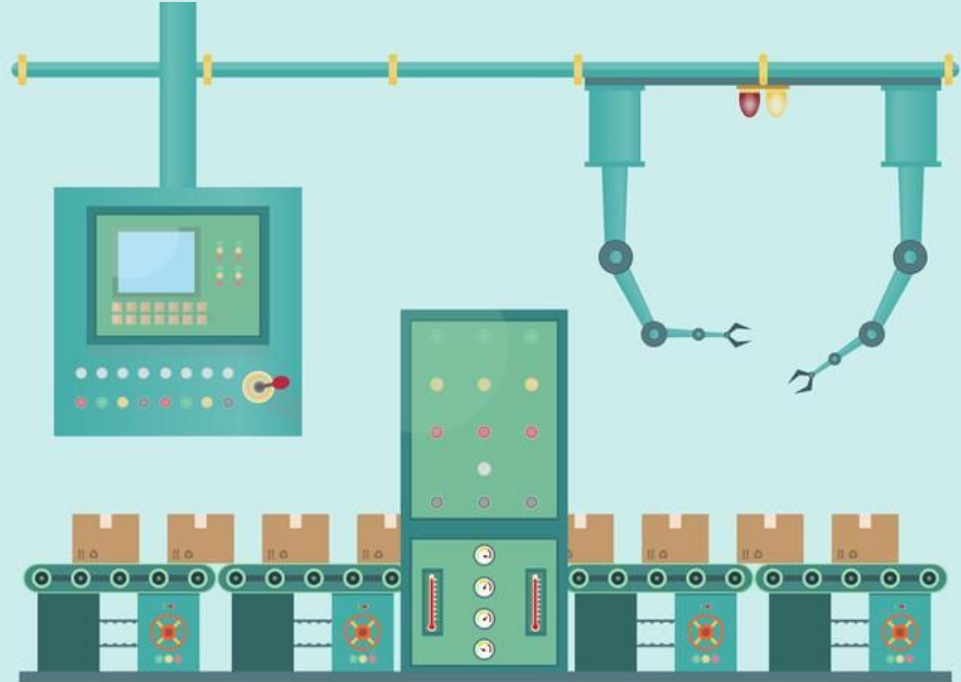
Limited component size.

Additive Manufacturing Processes



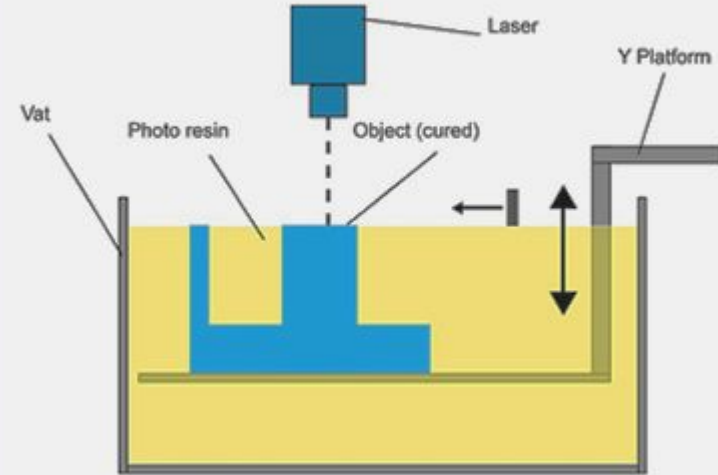
Classification of AM Processes

- Vat Photopolymerisation/
Stereolithography
- Material Jetting
- Binder jetting
- Material extrusion
- Powder bed fusion
- Sheet lamination
- Directed energy deposition



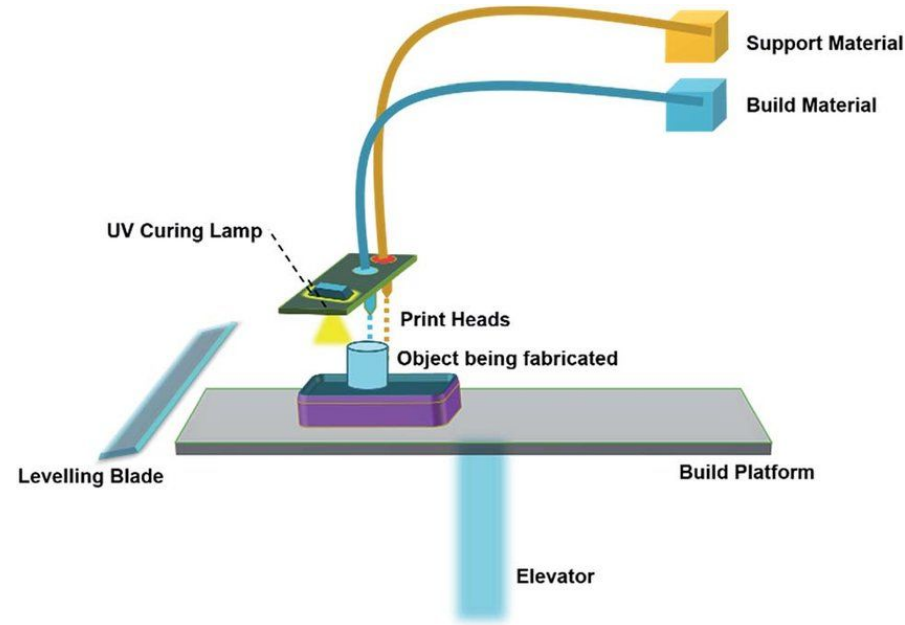
VAT Photopolymerisation/ Stereolithography

1. Lower build platform
2. Cure with UV Light
3. Provide a smooth resin base to build the next layer on.
4. Vat is drained and the object removed.



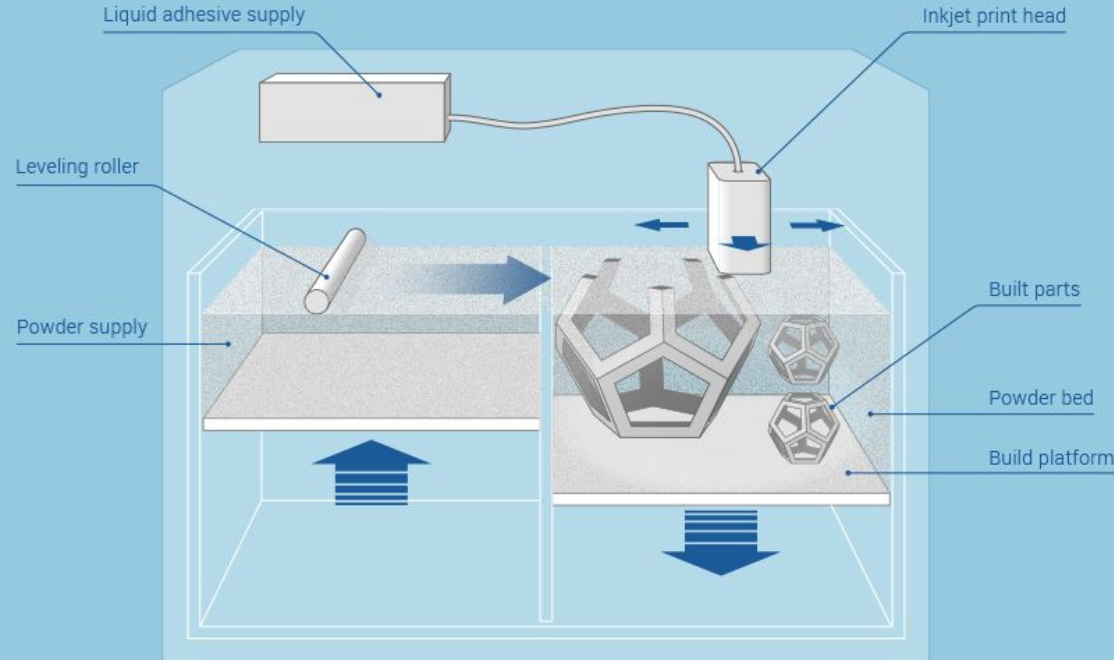
Material Jetting

1. The print head is positioned above build platform.
2. Droplets of material are deposited
3. Droplets of material solidify.
4. layers are built on top of the previous.
5. Layers are cured by UV light



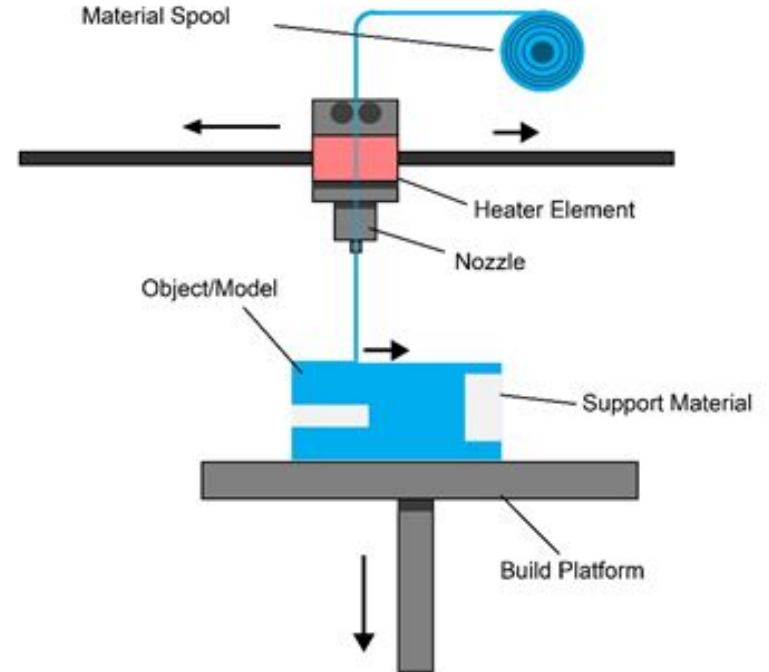
Binder Jetting

- Powder material is spread.
- Print head deposits the binder adhesive.
- Build platform is lowered.
- Another layer of powder is spread
- Unbound powder remains in position surrounding the object.
- Repeat the above



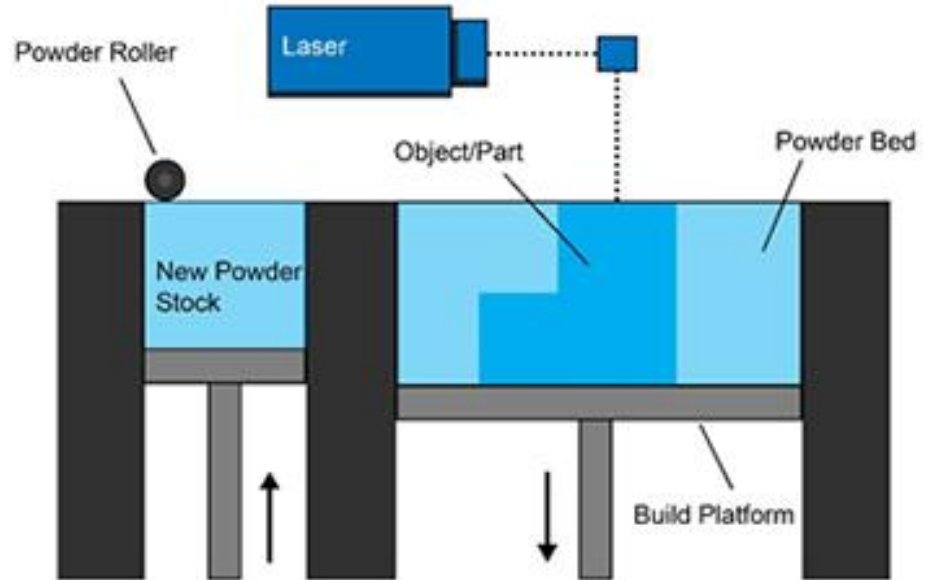
Material Extrusion

- deposits material onto the cross sectional area of first object slice.
- layers are added on top of previous layers.
- Layers are fused together



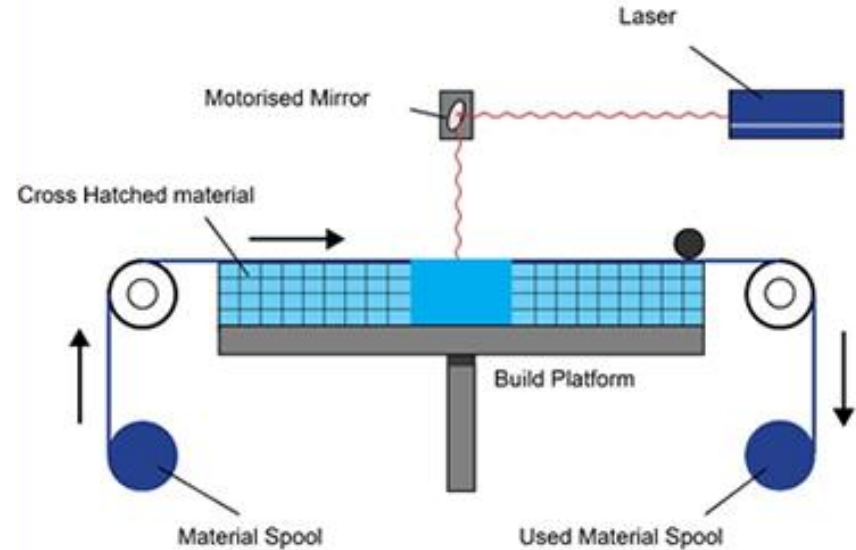
Powder Bed Fusion

- A layer of material is spread
- A laser fuses the first layer or first cross section of the model
- A new layer of powder is spread
- Further layers or cross sections are fused and added.
- The process repeats



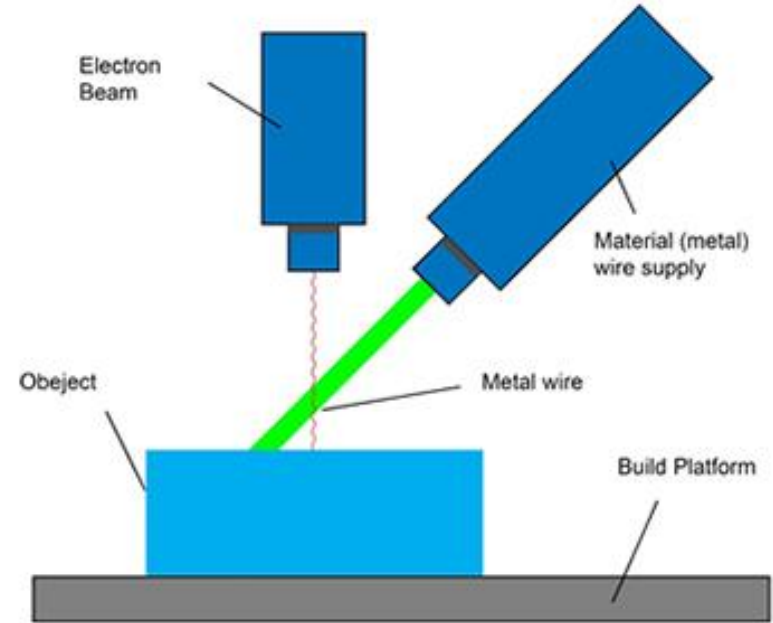
Sheet Lamination

- The material is positioned in place on the cutting bed.
- The material is bonded in place, over the previous layer.
- The required shape is then cut from the layer, by laser or knife.
- The next layer is added.



Directed Energy Deposition

- Material is deposited
- Material is either provided in wire or powder form
- Material is melted using a laser.
- Further material is added layer by layer and solidifies.

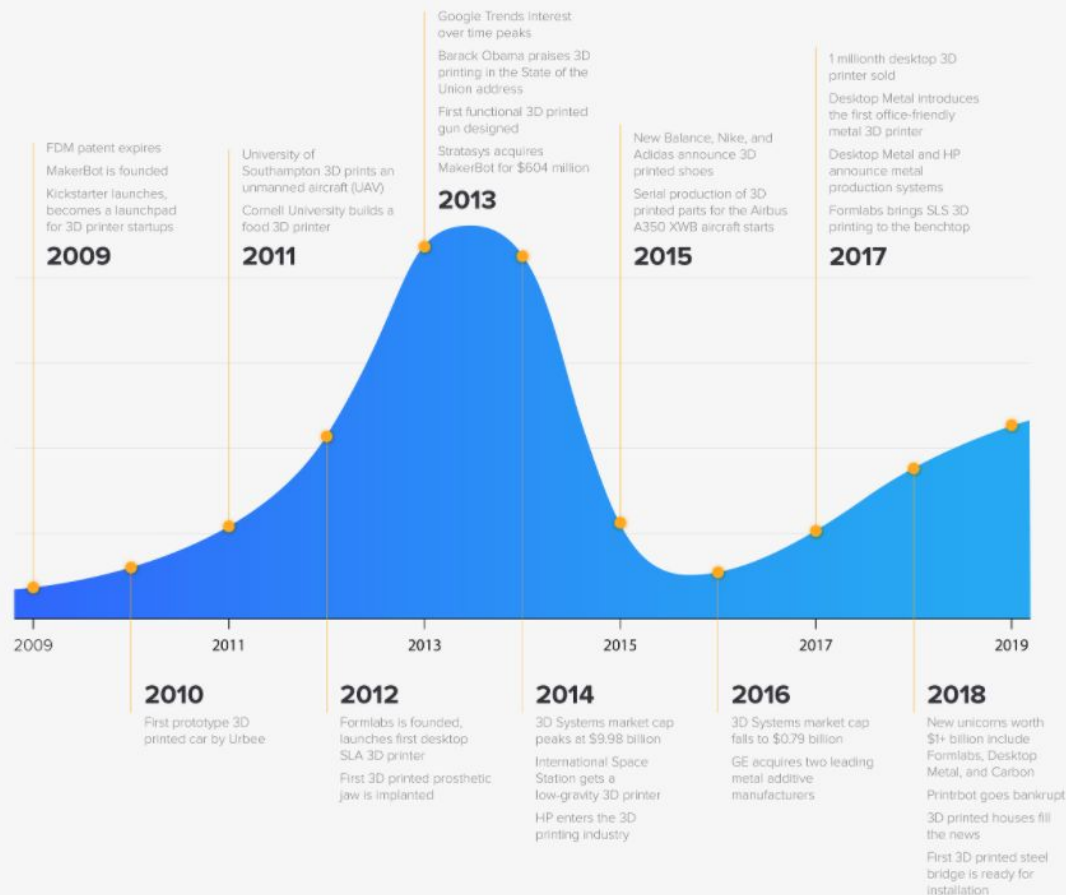


Trends & Future

- Less than 8% market penetration
 - Three key industries:
 - Automotive
 - Aerospace
 - Medical
- have adopted AM for various reasons
- Advances in material
 - Improving Economics for Manufacturing



After its initial hype burst, the 3D printing industry is healthier than ever

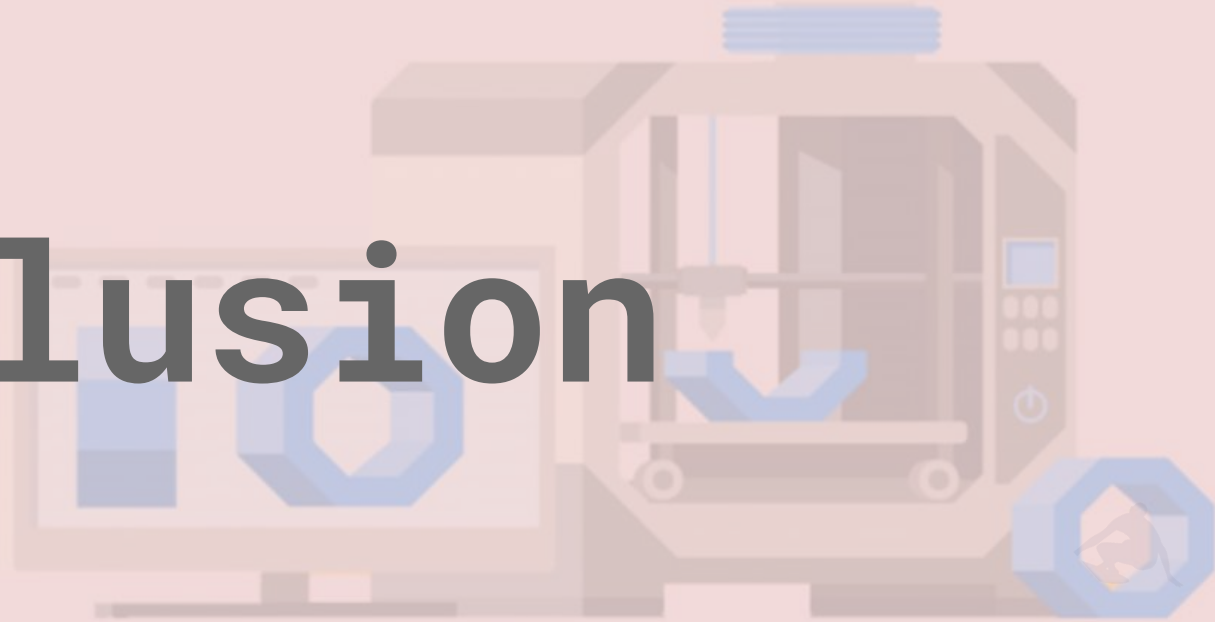


Applications

- Aerospace
- Medical
- Transportation
- Energy



Conclusion



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- “Understanding Additive Manufacturing”, GE Additive, <https://www.ge.com/additive/additive-manufacturing>
- Beck, J.E.; Fritz, B.; Siewiorek, Daniel; Weiss, Lee (1992). "Manufacturing Mechatronics Using Thermal Spray Shape Deposition". Proceedings of the 1992 Solid Freeform Fabrication Symposium
- “Additive Manufacturing: Industry trends and Outlook”, Formlabs, <https://formlabs.com/asia/blog/additive-manufacturing/#Key%20Trends%20in%20Additive%20Manufacturing>



Thank You!

