



UNIVERSITY OF LISBON  
INTERDISCIPLINARY STUDIES  
ON SUSTAINABLE ENVIRONMENT AND SEAS

**Beatriz Silva**

Manufacturing and Industrial Engineering  
Mechanical Engineering Department  
Instituto Superior Técnico, University of Lisbon

**Augusto Moita de Deus**

Mechanical Design and Engineering Materials  
Mechanical Engineering Department  
Instituto Superior Técnico, University of Lisbon

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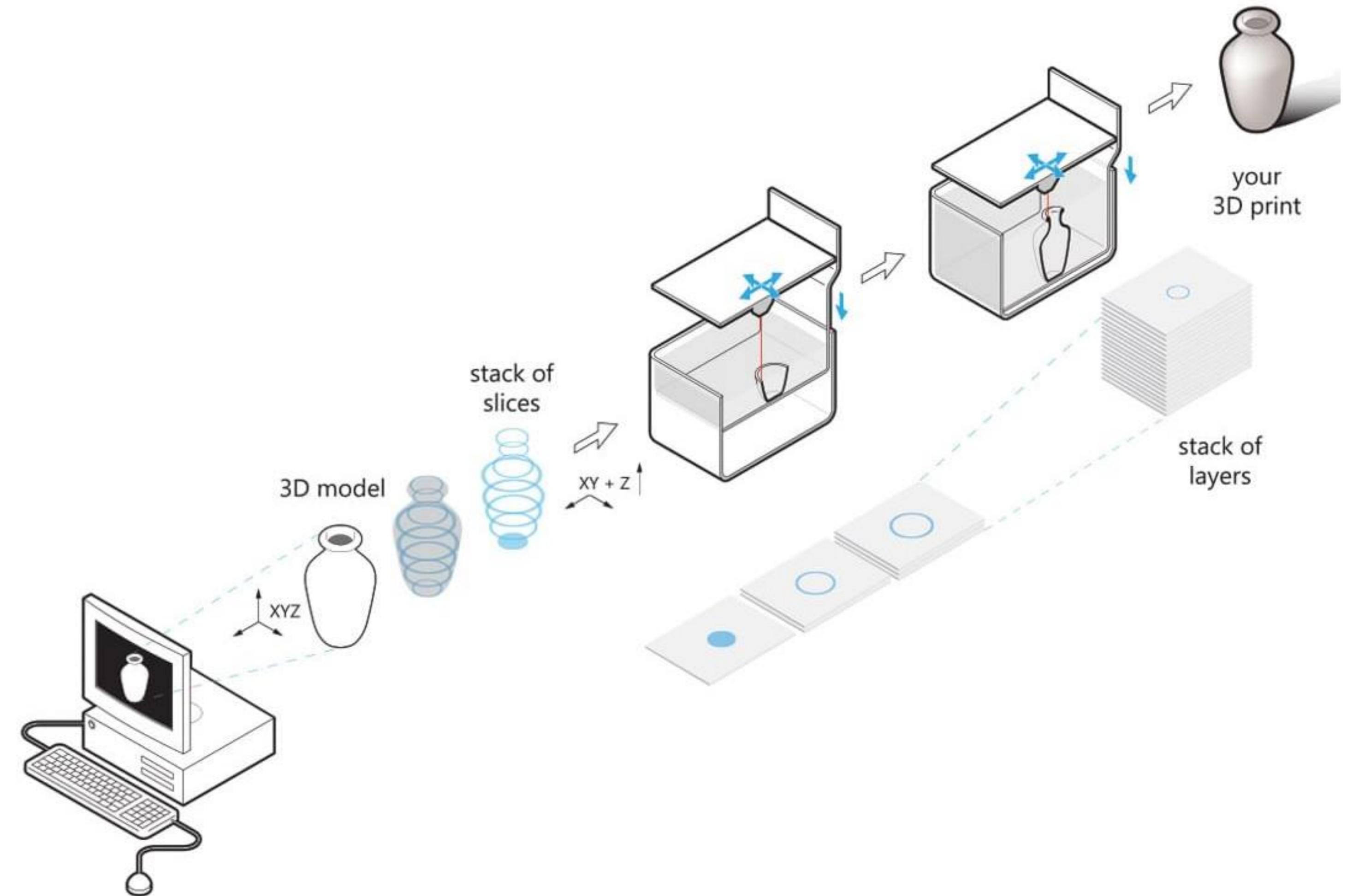


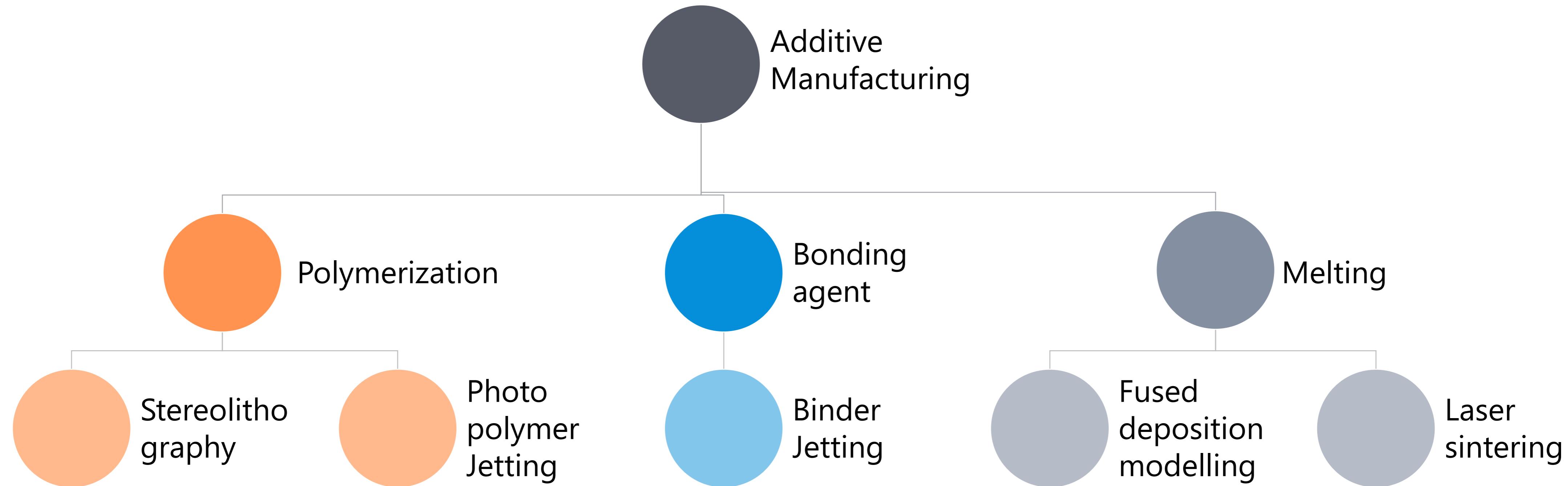


Additive manufacturing or 3D printing or rapid prototyping may be defined as a computer-controlled 3D Printing process that creates 3-D objects by depositional materials such as proper polymers, ceramics, or metals in multiple layers of equal thickness.



- 1. 3D CAD model**
- 2. Tessellation**
- 3. Slicing**
- 4. Tool path**
- 5. AM Process**
- 6. Final 3D object**

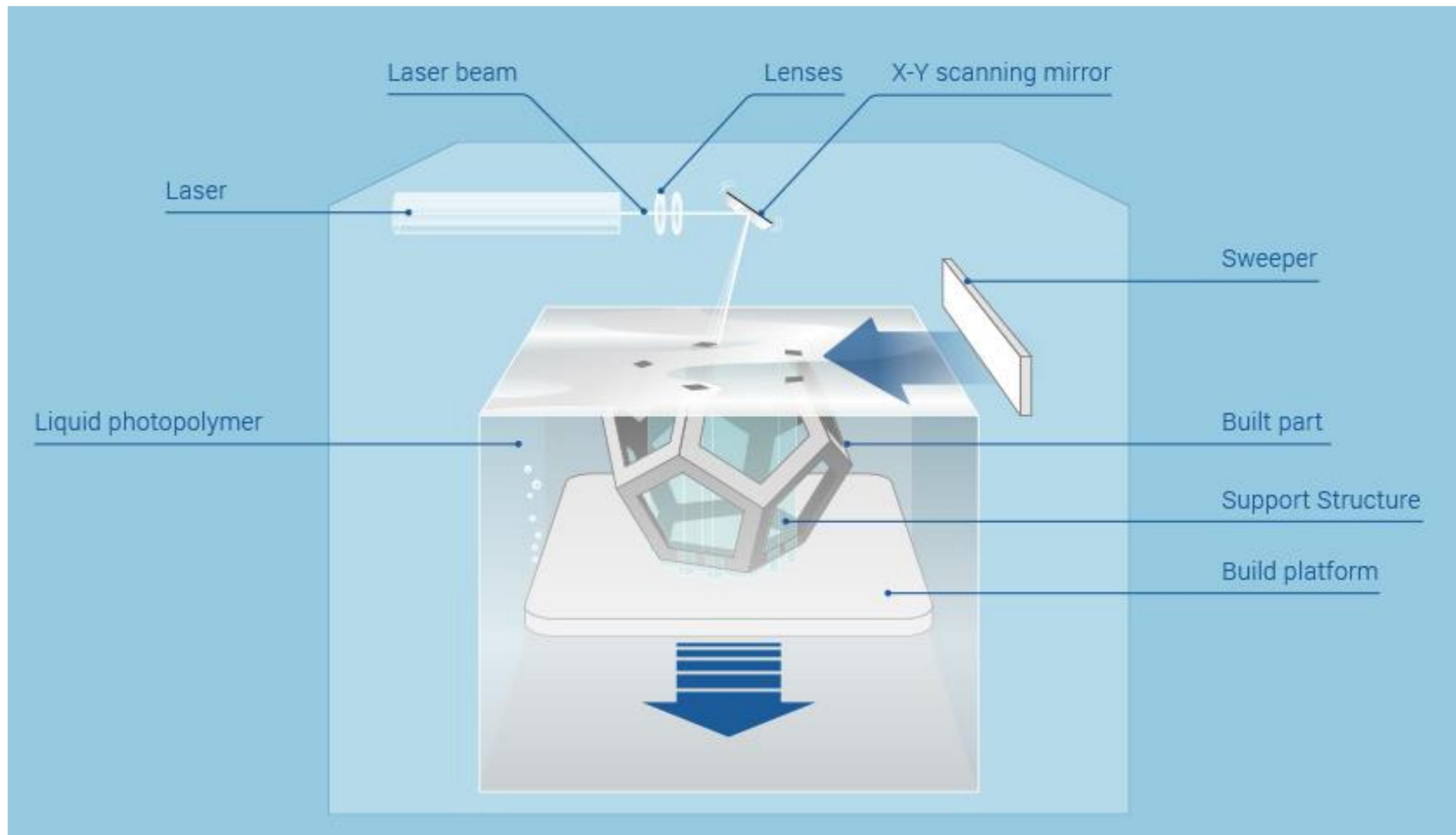




## Stereolithography, SL or SLA

A UV laser is curing a liquid photopolymer in a vat.

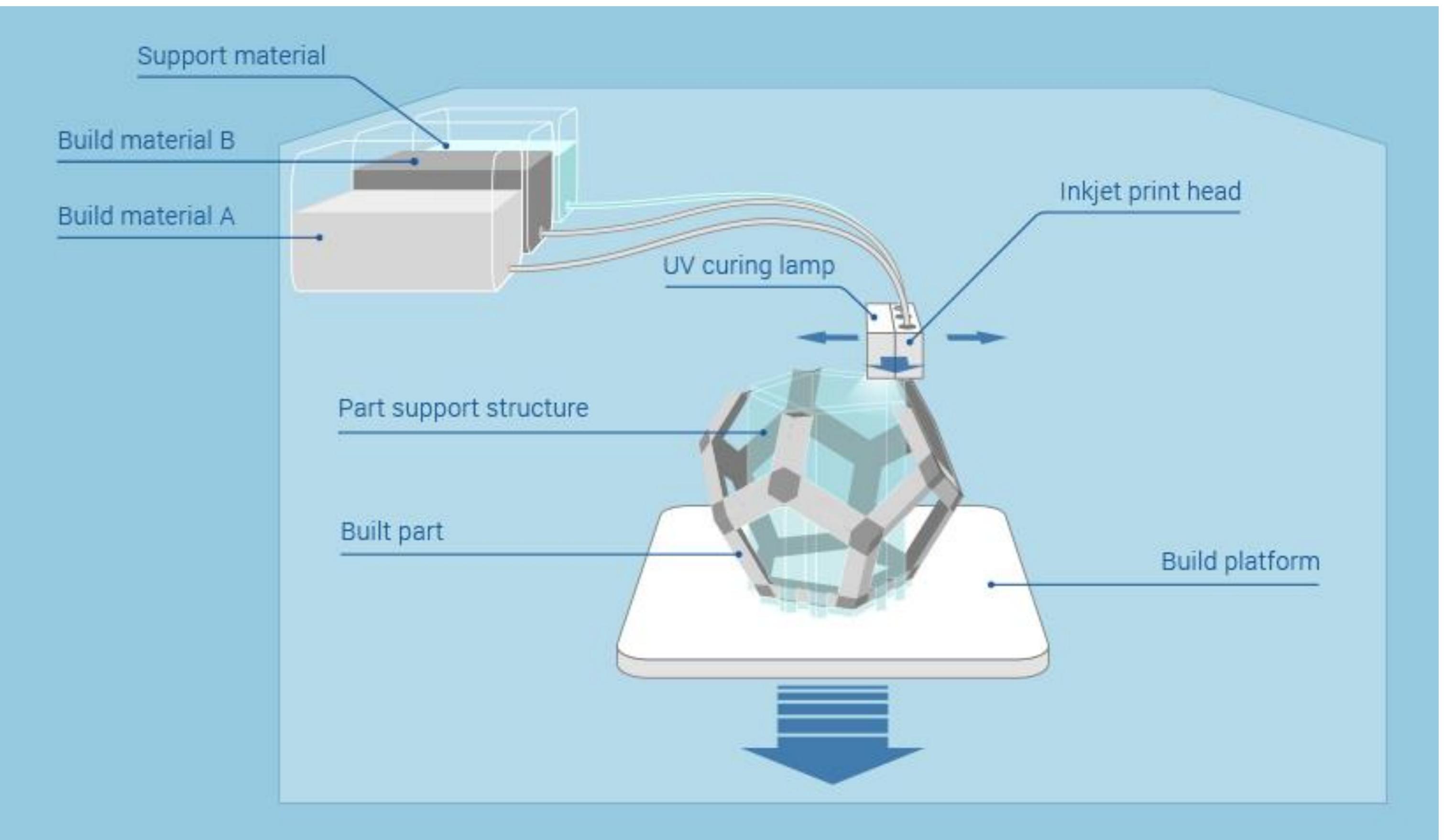
The part is built by lowering the build platform.

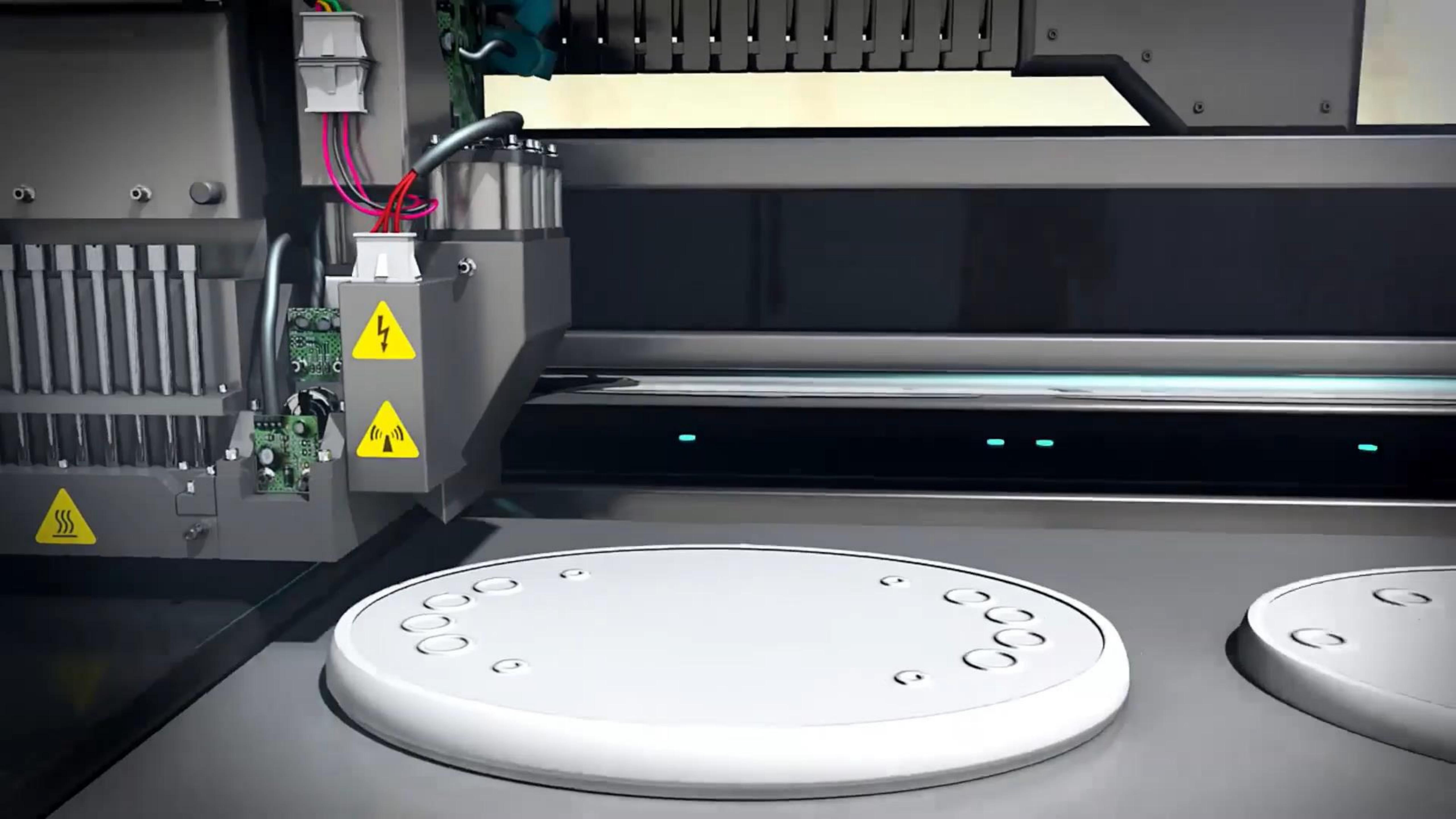




## Photopolymer Jetting or Polyjet

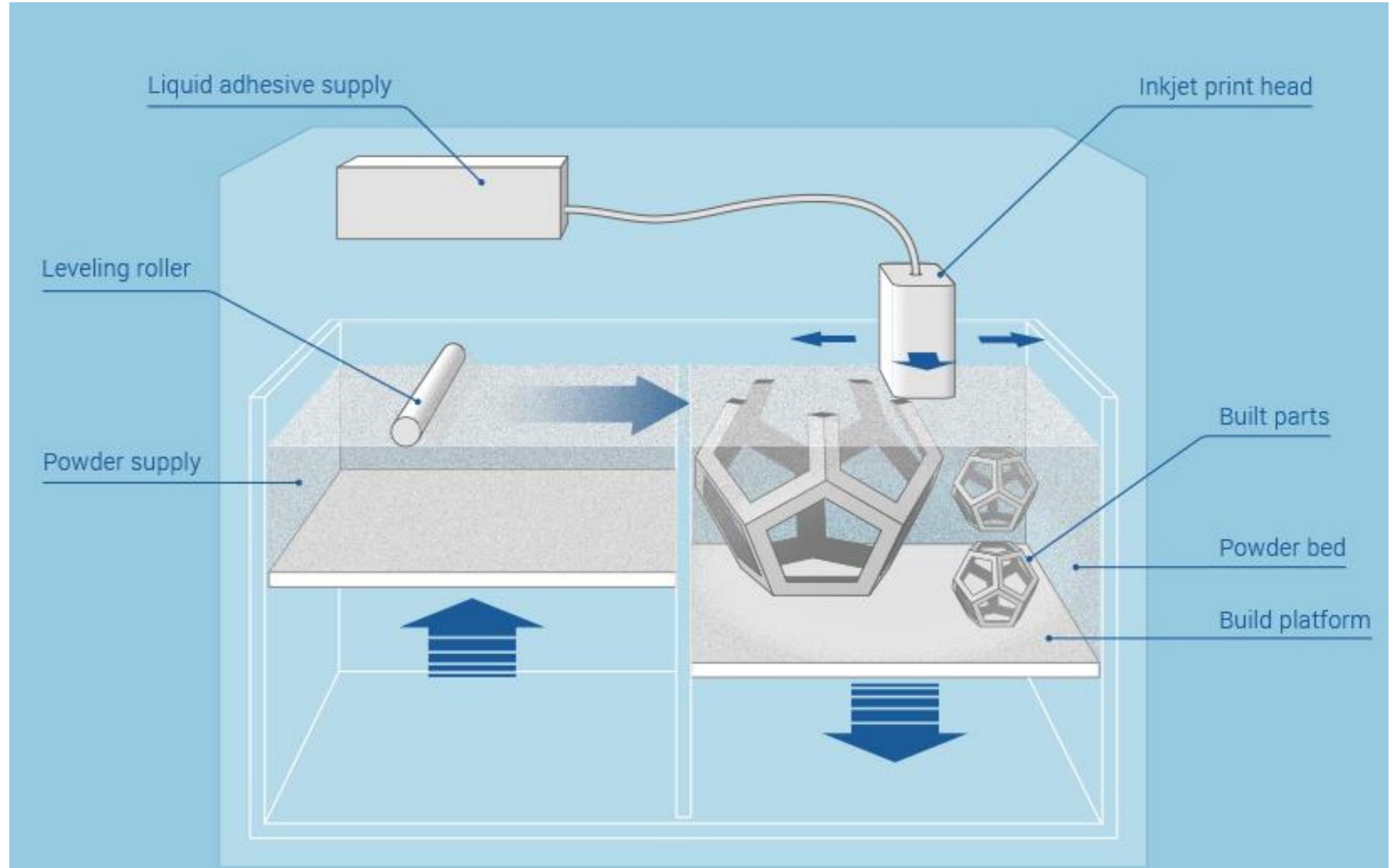
Inkjet print heads are used to jet liquid photopolymers onto a build platform. The material is immediately cured by UV lamps.





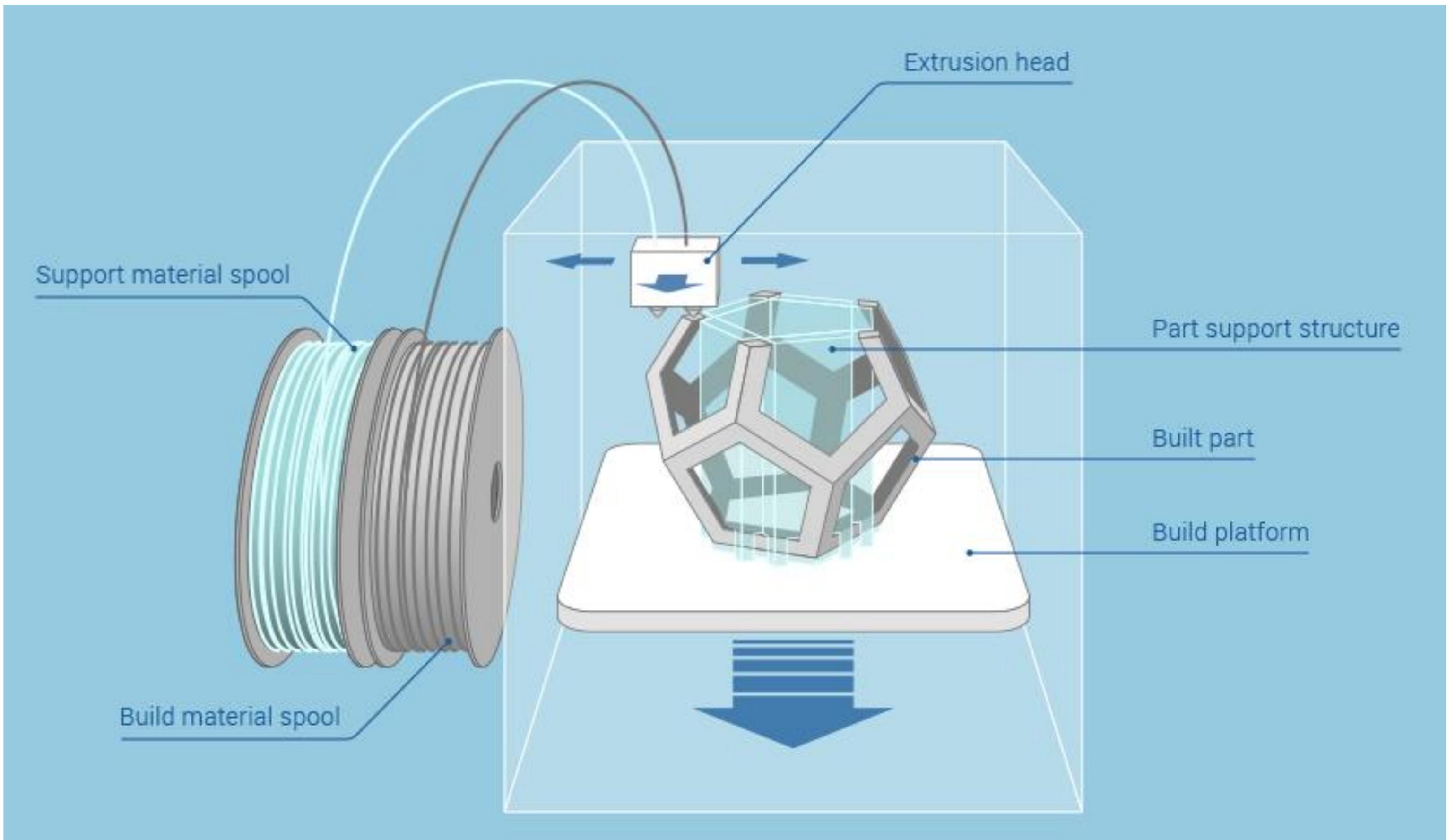
## Binder Jetting, BJ

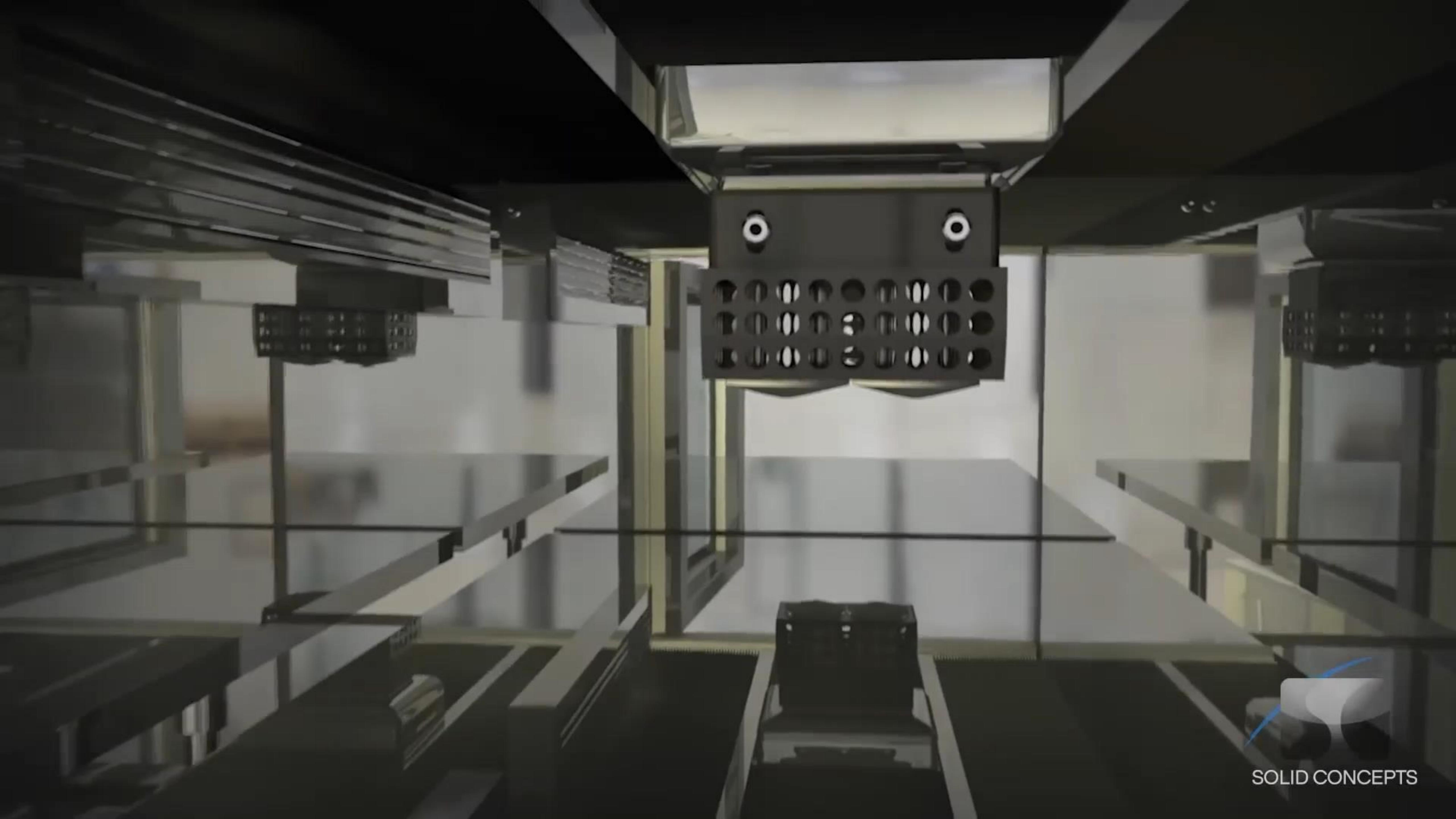
Inkjet print heads apply a liquid bonding agent onto thin layers of powder. By gluing the particles together, the part is built up layer by layer.





**Fused Deposition  
Modelling, FDM**  
A plastic filament is  
melted and extruded  
through a nozzle.  
Parts are built by  
laying down layer-by-  
layer.



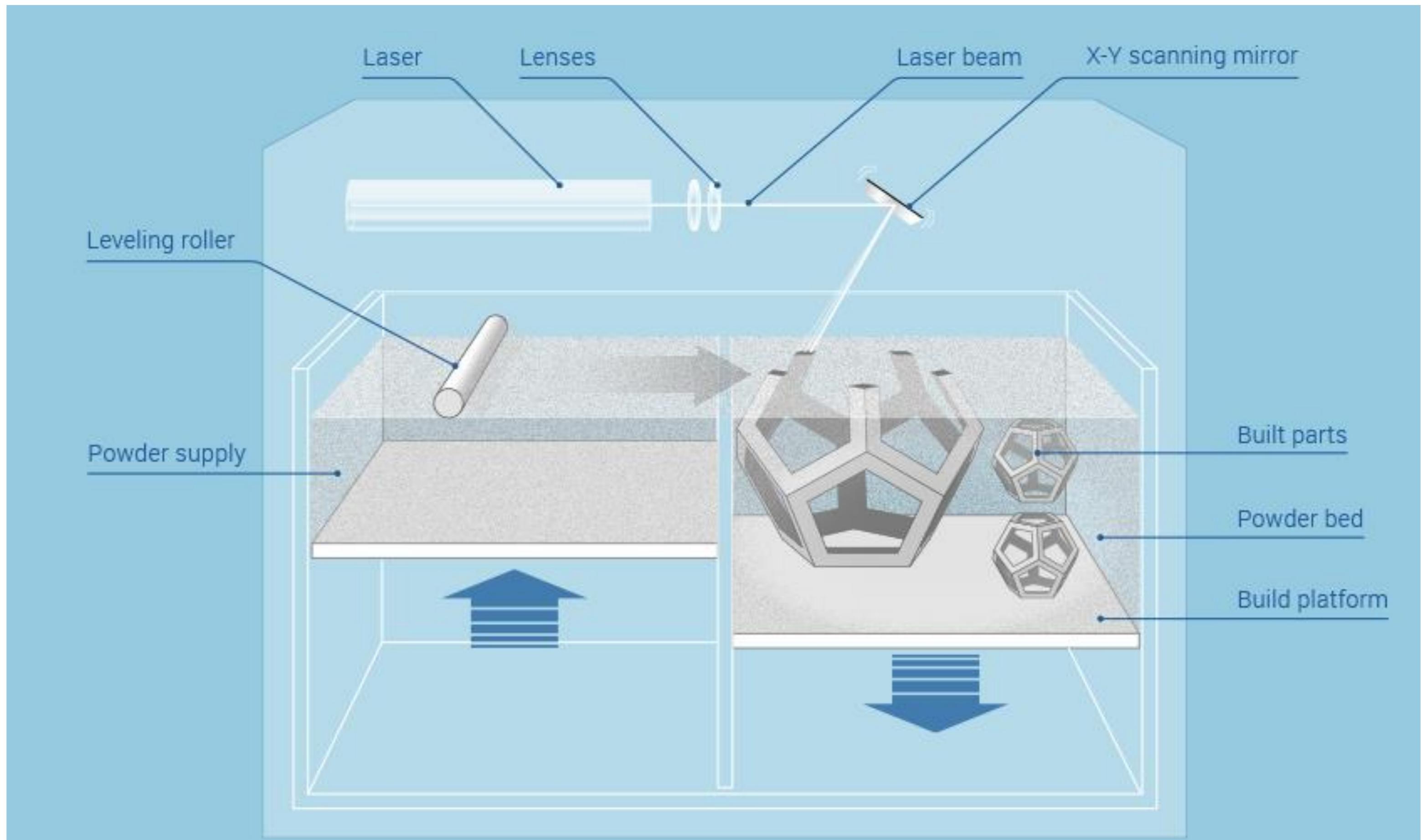


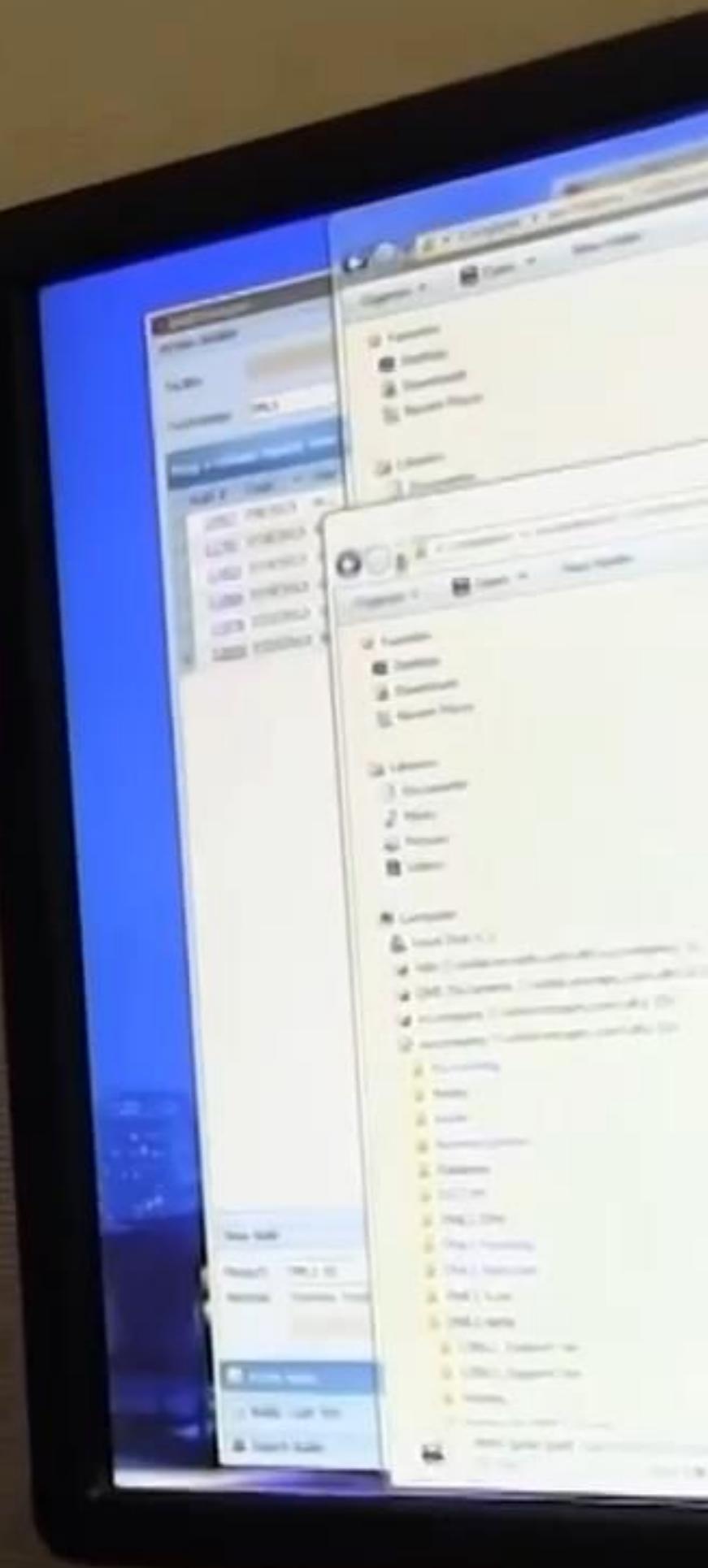
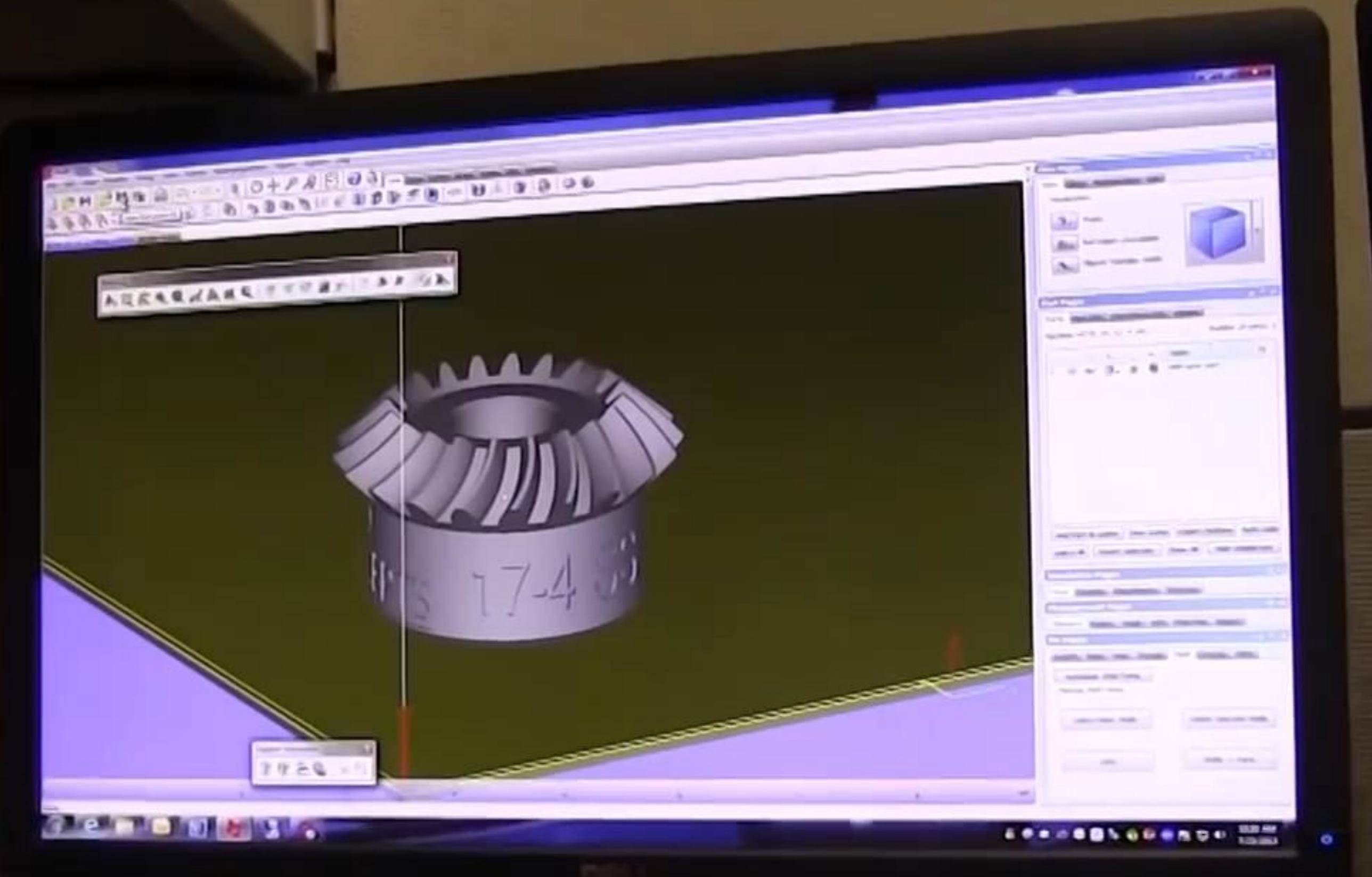
SOLID CONCEPTS

## Laser Sintering, LS

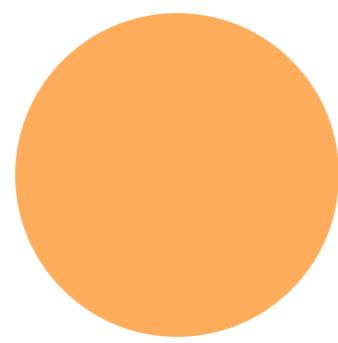
A thin layer of plastic powder is selectively melted by a laser.

The parts are built up layer by layer in the powder bed.





17-4  
17-4  
17-4  
17-4



Stereolitho  
graphy

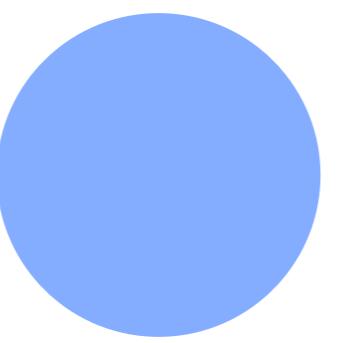
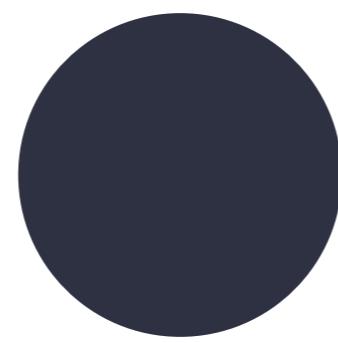
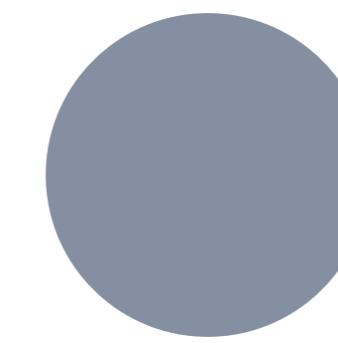


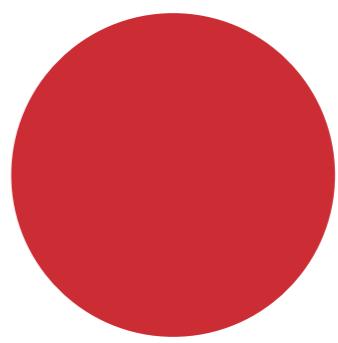
Photo  
polymer  
Jetting



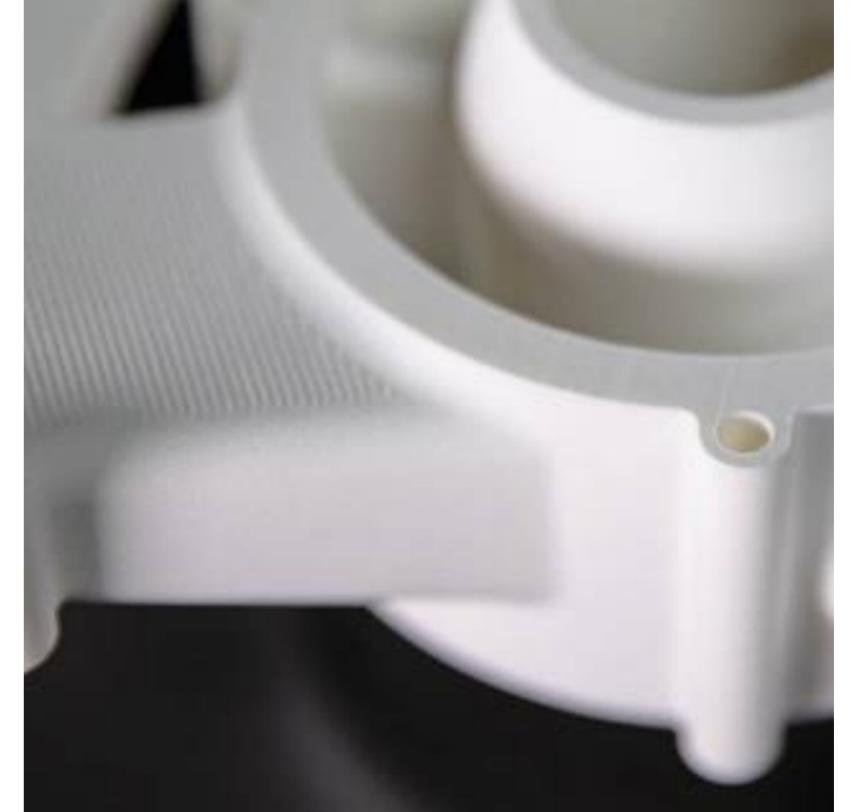
Binder  
Jetting

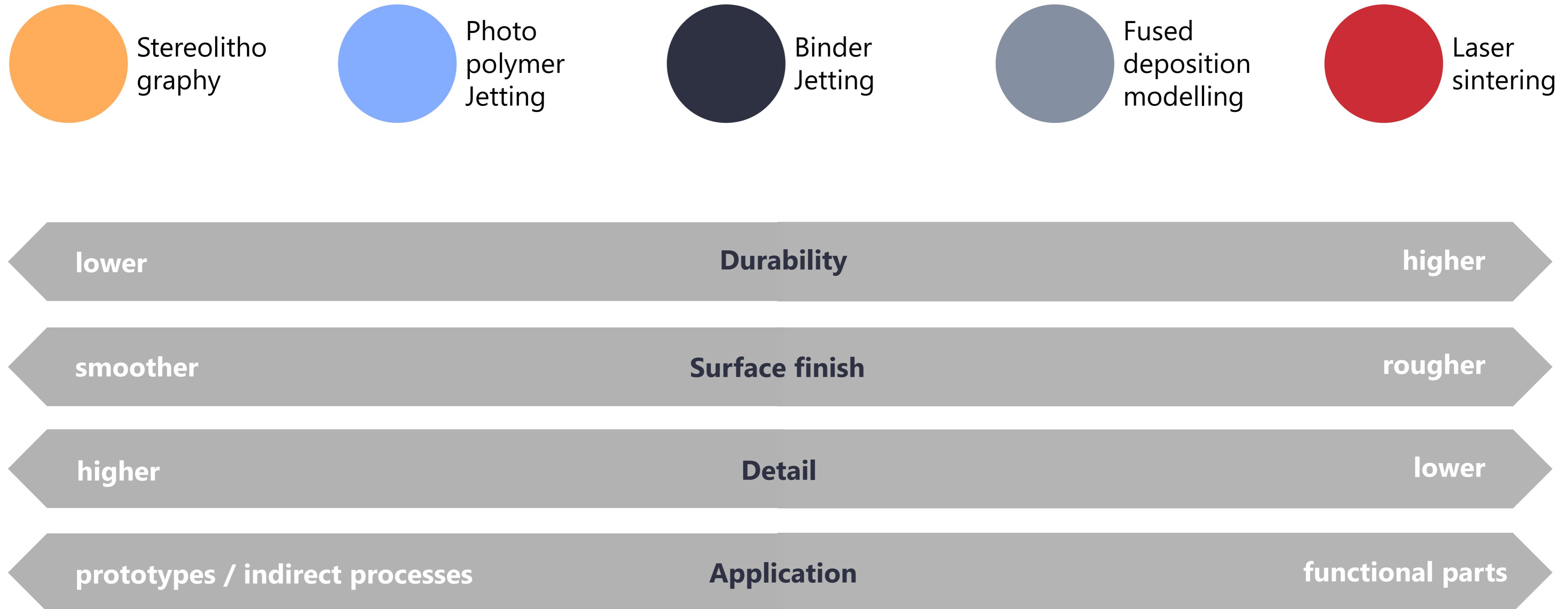


Fused  
deposition  
modelling



Laser  
sintering





## Conventional

- Geometric limitations
- Subsequent processes for multiple geometries
- Needs stocks and creates waste
- Efficient for mass production

## Additive Manufacturing

- Geometric freedom and complexity  
(some constraints for large size parts)
- Final geometry in a unique process
- Layout simplification in flexible productive scenarios
- Zero stocks and waste
- Efficient for mass customization

The background of the image is an underwater scene. A large green sea turtle is swimming in the foreground, looking towards the camera. In the water above it, there is a significant amount of plastic waste, including a large plastic bag and several plastic bottles of various colors (blue, green, yellow). The water is a deep blue, and the surface is visible in the background where sunlight is filtering down. The overall theme of the image is the impact of plastic pollution on marine life.

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