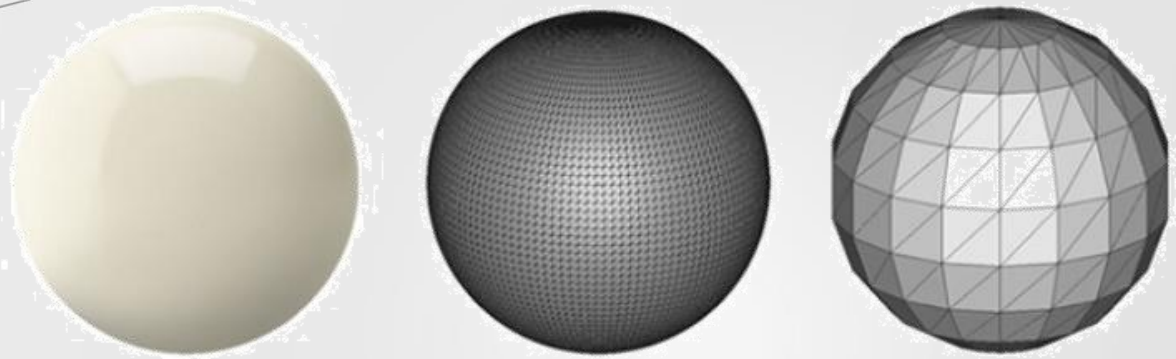
Part Preparation in AM

Post-processing

Adjust STL resolution



Very high-resolution STL file: A file with a resolution that is too high will make your file too big and sometimes impossible for us to handle. This will make it harder to upload your files and share them with coworkers or friends. It might also contain an extreme level of detail that the 3D printers simply cannot print.

Low-resolution STL file: It's important to be aware that a poor-quality export will never allow us to provide you with a good print. Low-resolution means that the triangles in your STL file are big and the surface of your print will not be smooth. It will lead to a somewhat "pixelated" print.

If you can see clear facets and flat spots in your model when highlighting faces with your mouse, you probably need to increase the resolution of your STL file.

Layer thickness

The staircase effect can be clearly observed between 3 deg and 45 deg(up-skin surfaces)

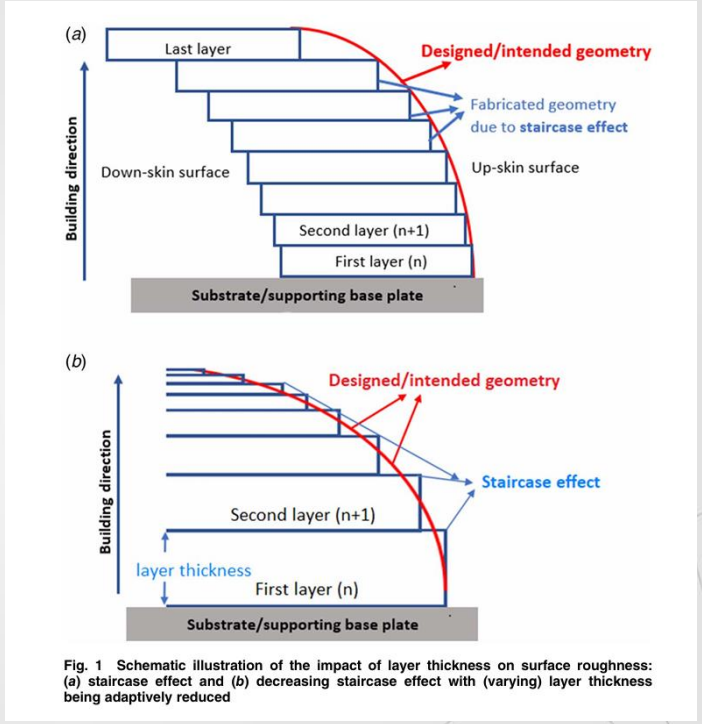
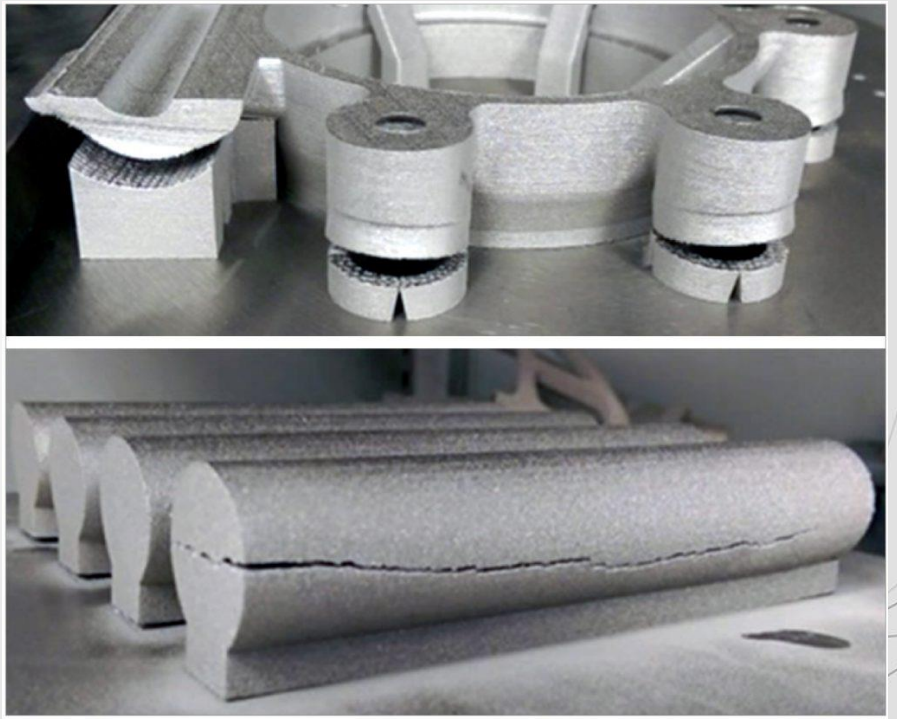


Fig. 1 Schematic illustration of the impact of layer thickness on surface roughness: (*a*) staircase effect and (*b*) decreasing staircase effect with (varying) layer thickness being adaptively reduced

(PDF) Surface Texture Characterization of Metal Selective Laser Melted Part With Varying Surface Inclinations (researchgate.net)

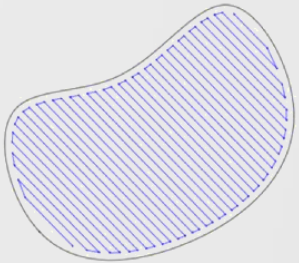
Residual Stress

Many factors can cause residual stress in a part, but the chief one is controllable through design. Residual stress is a result of temperature gradients from the surface to the center of an AM part during cooling. It can have a particularly severe impact on parts with large masses of material, as the material inside the mass cools slower than the material on the outside, inducing stress in the part.

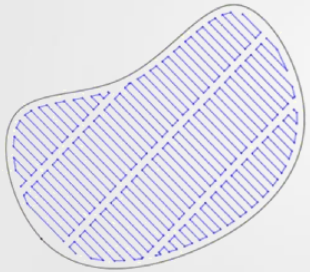


Residual Stress

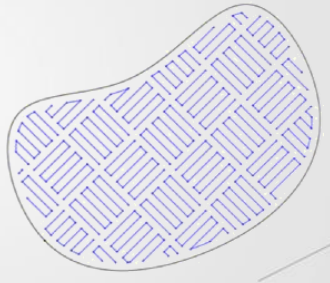
Within the metal AM process, strategies can be employed to reduce residual stress formation. The hatching strategy used can play a significant role in reducing residual stress. Smaller chessboard hatch patterns will, for example, create less residual stress than bigger ones or large meander-type patterns. However, they will also slow down the process somewhat. Rotating each hatch scan, usually by 67° for each layer, can also prevent stress from building up vertically, compared to scan strategies that occur one on top of another. As with almost everything in metal AM, choosing between a scan strategy that minimizes stress versus minimizing speed can be a compromise.



Meander hatch pattern
High build rate
Higher residual stress
Suitable for small/thin parts



Stripe hatch pattern
Medium build rate
Medium residual stress
Suitable for large parts



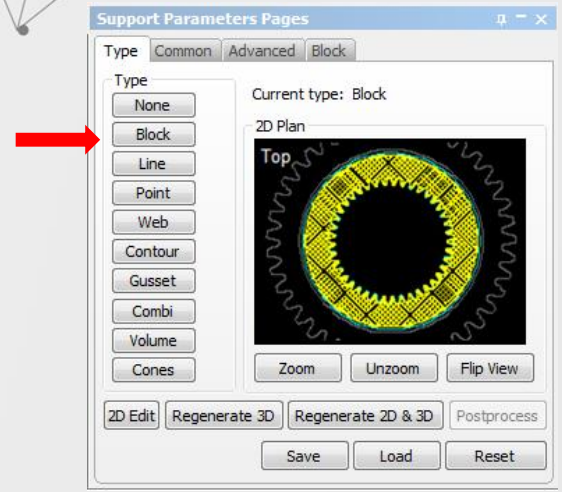
Chessboard hatch pattern
Slow build rate
Lower residual stress
Suitable for large parts

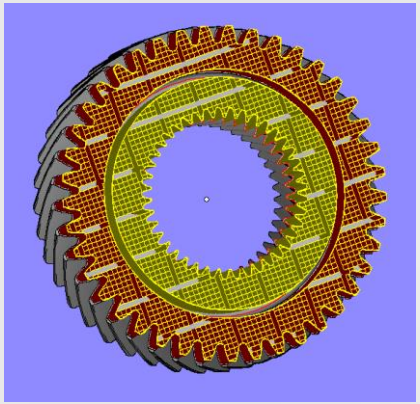
Basic rules on generating supports

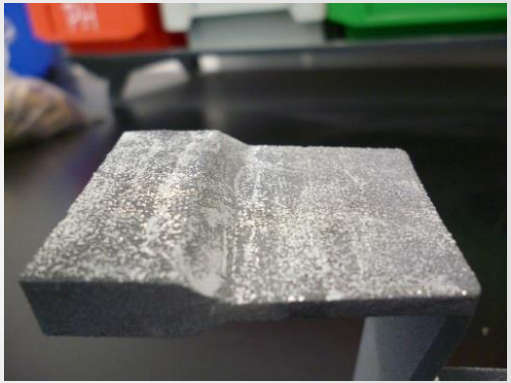
***Type*: Block support**

Is the standard support

- **Suitable for small and large surfaces**
- **Easy to adapt**



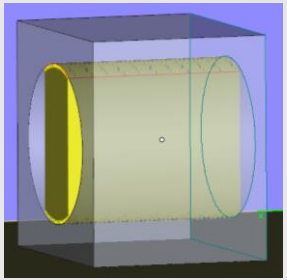


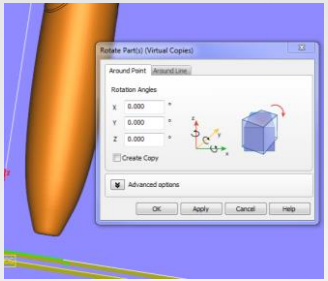


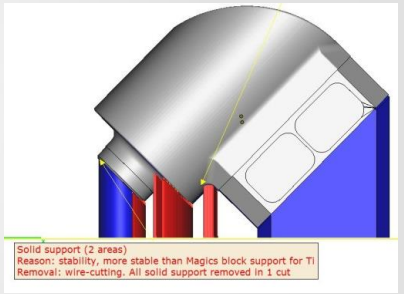
Surface after removal of Block Support

Basic rules on generating supports

Quality: Removability of Support







Any orientation that requires internal Support in a hollow part can not be realized. The Support can not be removed or only with a disproportionate amount of effort.

Sufficient space must be provided between the part and the build platform. The dimension of the gap has to be adequate for the removal process being used

If solid Support is used, orientate in a way that all solid Support can be removed in one cut by wire cutting

Orientate parts in a way that Support Structures can be accessed easily.
Internal Support is considered especially disadvantageous.

Basic rules on generating supports

Block support: Hatching

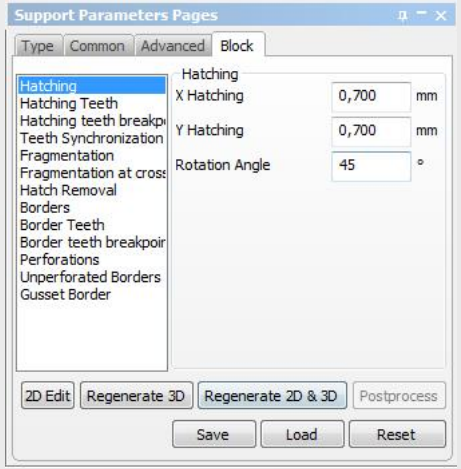
Is the grid pattern of the block support

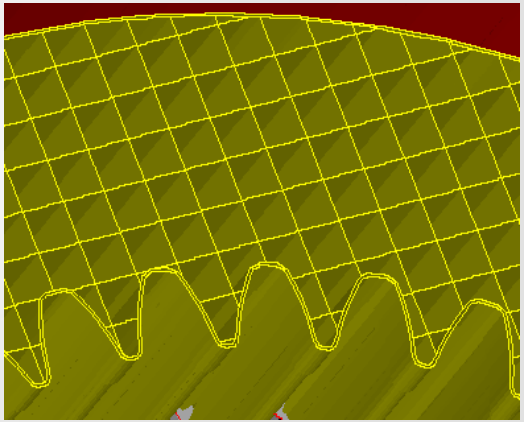
- The values are the dimensions of

the individual boxes (e.g. 0.7 mm x 0.7 mm)

- Recommendation: rotate hatching (rotation angle)

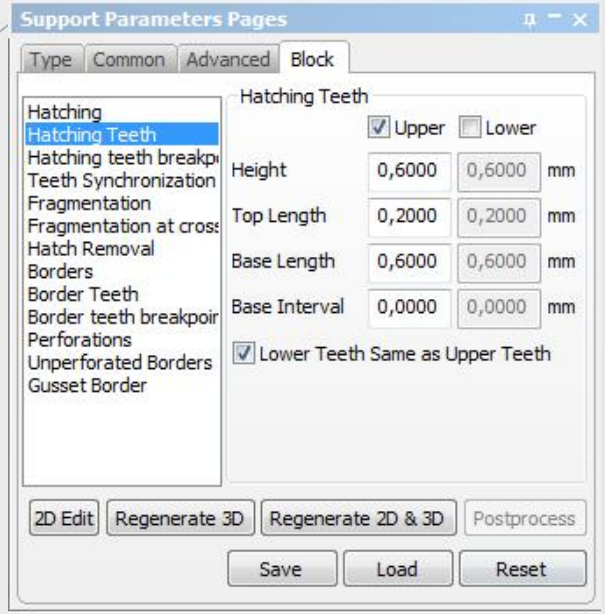
to avoid approach problems with the recoater





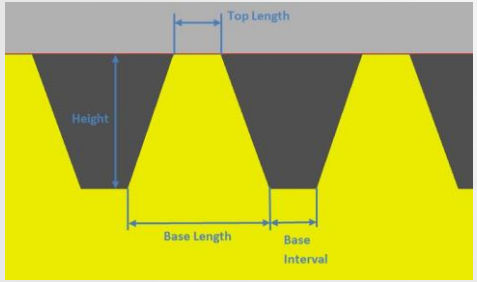
Basic rules on generating supports

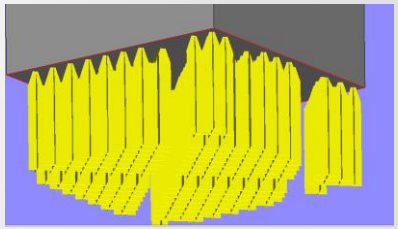
Block support: Hatching Teeth



For easier removal of the support

- The values for the teeth depend on the part and the related surface
- For an improved connection between part and support: use Z offset

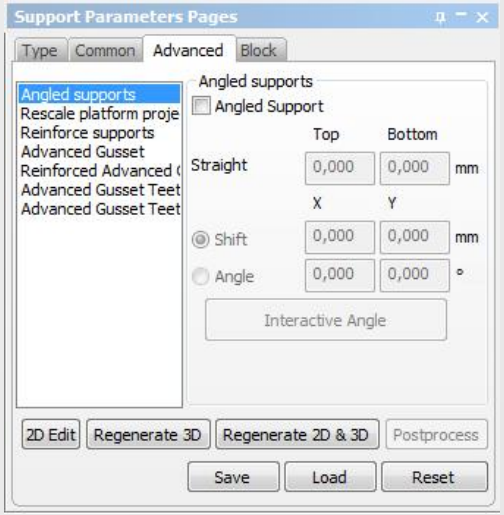


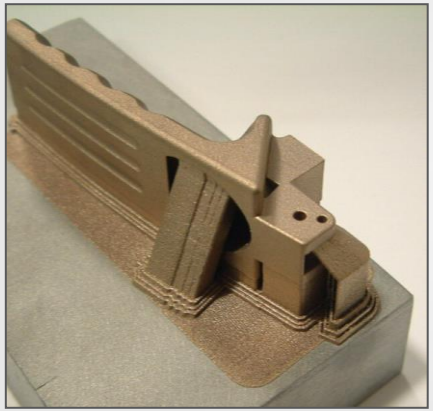


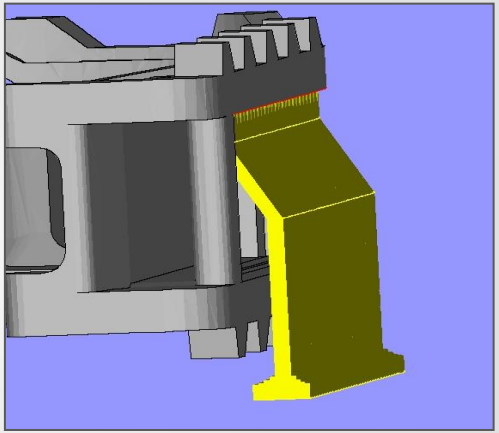
Basic rules on generating supports

Advanced: Angled supports

Overhanging surface can be supported at the side
Supports are easier and quicker to remove
No interface to other surfaces required

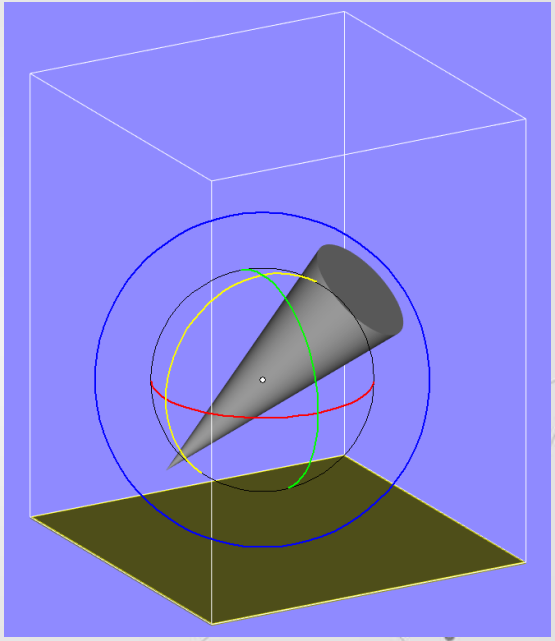






What do you think?

Which orientation of this cone would you prefer to **optimize** the character property **Buildability** of the part as well as further post-processing.



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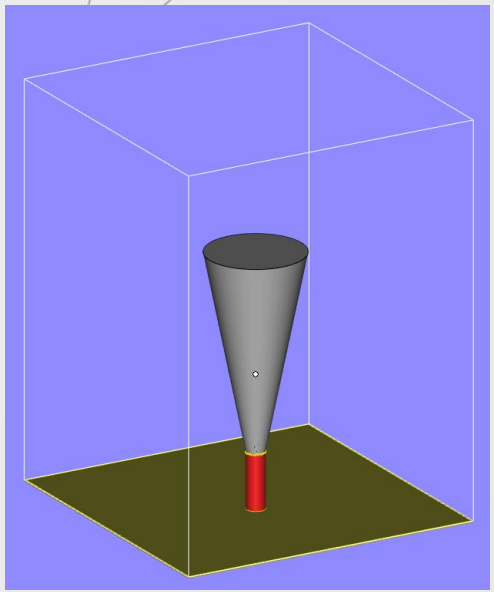

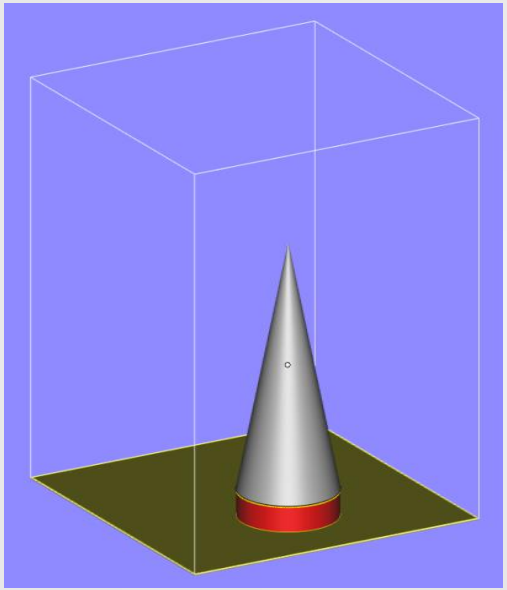

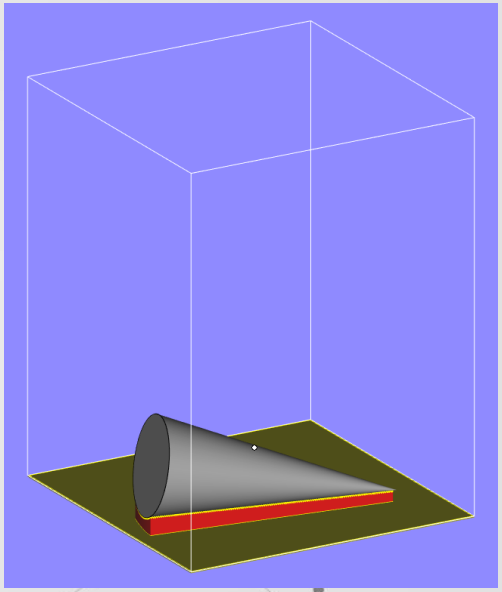

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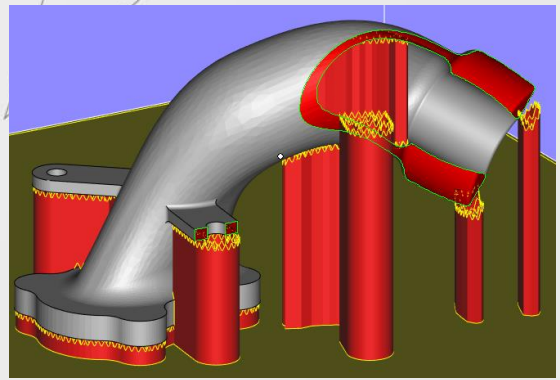
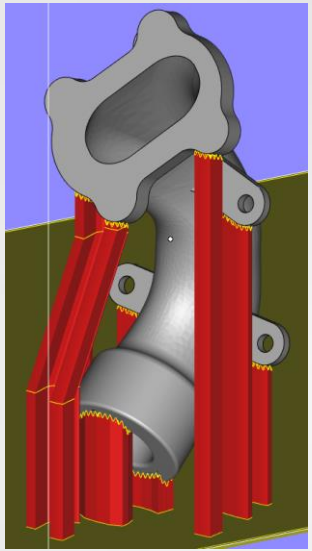


- Removability of Support
- Surface Roughness
- Dimensional Accuracy



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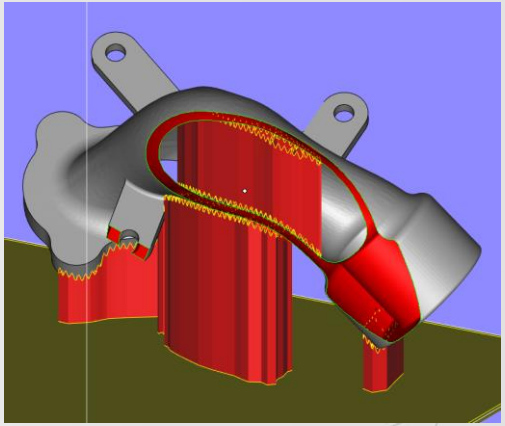
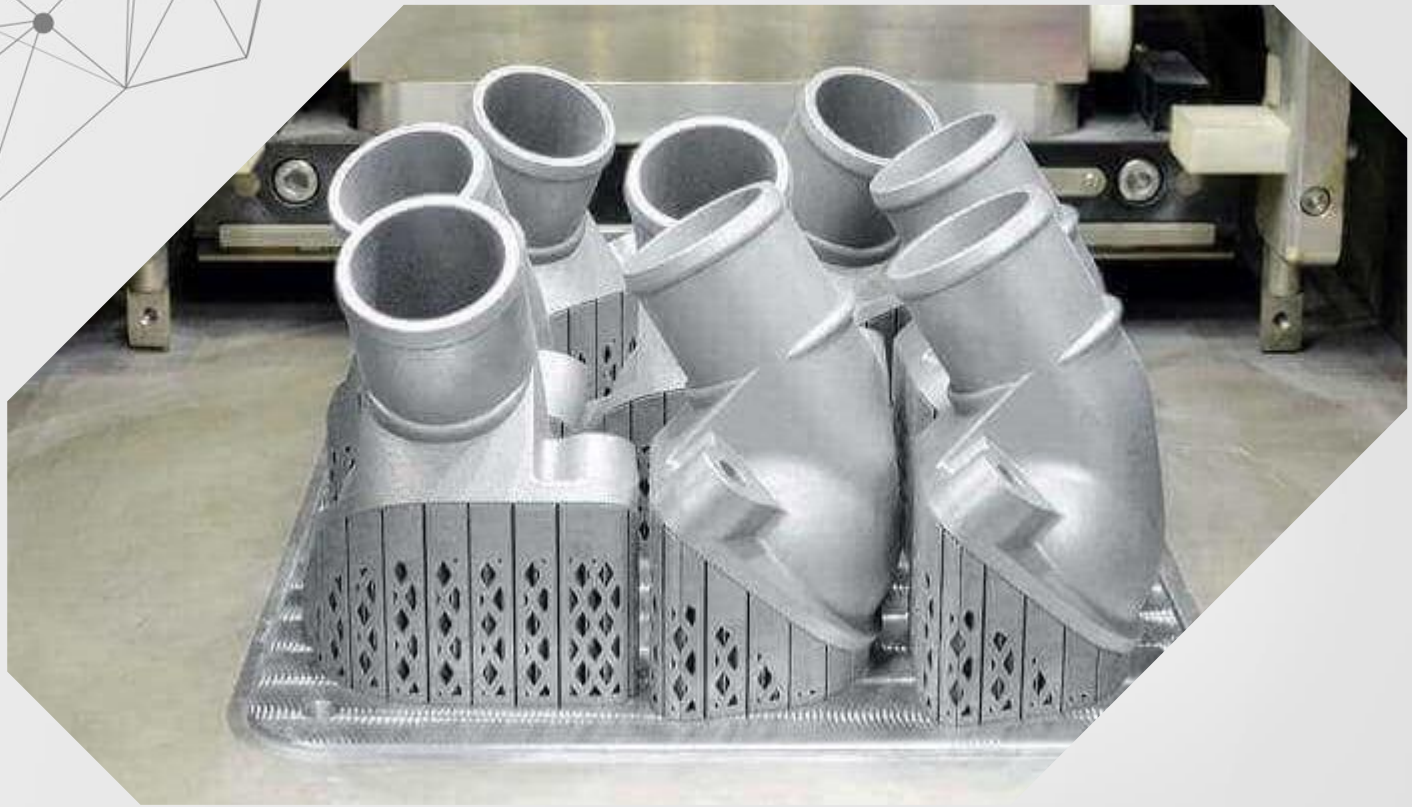


- Removability of Support
- Surface Roughness
- Dimensional Accuracy

THANKS



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