



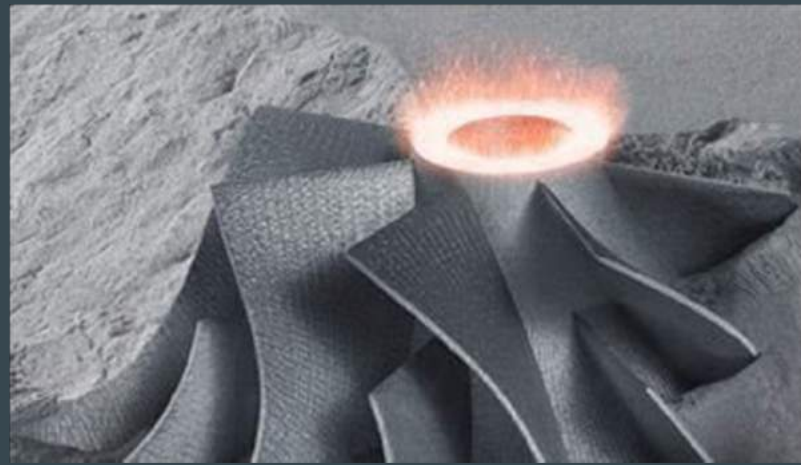
Open Platform Powder Bed Fusion Metals Additive Manufacturing

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Adapt Meeting 12/12/2018

Project Description

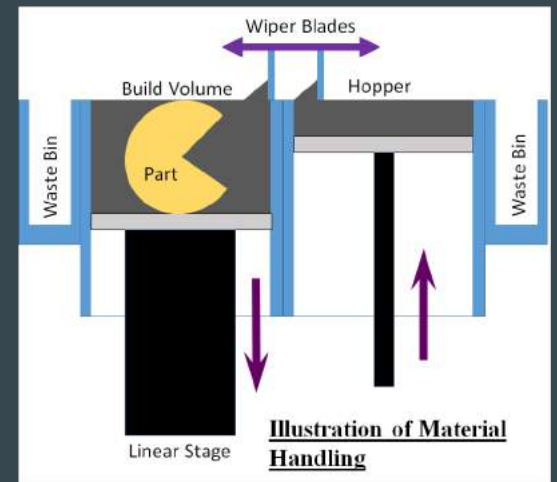
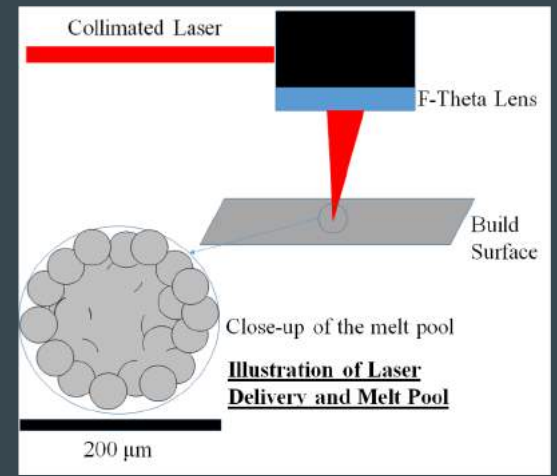
- Design and build an education focused laser powder bed fusion additive manufacturing machine
- Immerse students in the field of additive manufacturing and establish CSM as a hub for research in this field.
- Machine and software to be:
 - Modular
 - Open Source



<https://steemit.com/engineering/@djanky/powder-bed-fusion-pros-and-cons-or-additive-manufacturing-and-3d-printing>

Powder Bed Fusion (PBF)

- An additive manufacturing process that uses a laser to fuse metal powder together layer by layer to form a part.
- Becoming commercial standard for complex metal components.
- An education focused machine is worth building because:
 - Students need to know the detailed functionality of standard manufacturing processes.
 - PBF is not perfect, so we need machines that enable research.

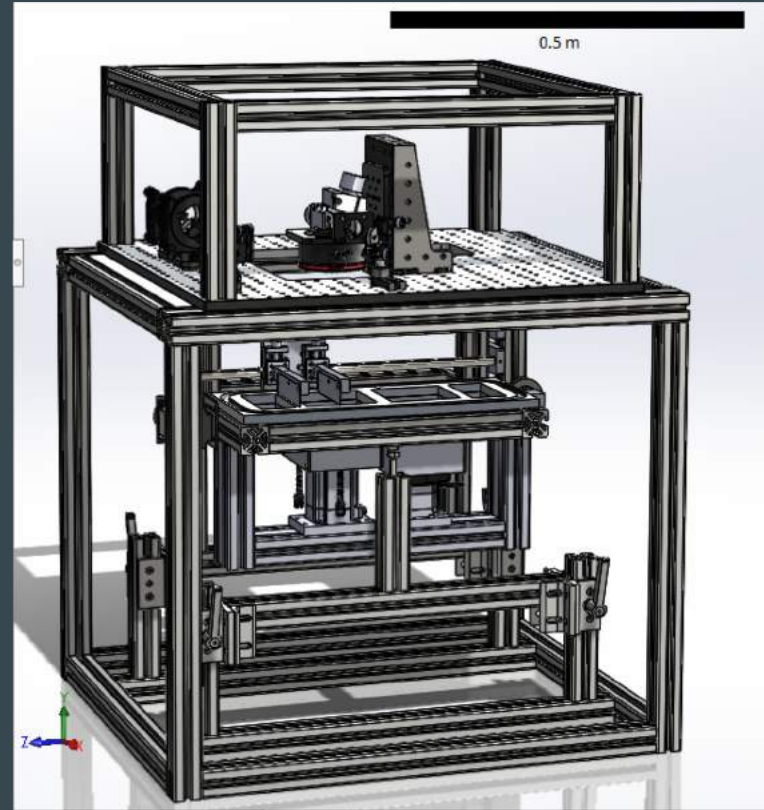


Open Platform Machine

A desktop version of a powder bed fusion machine that enables:

- High level experimentation
- Open environment provides good visibility for students
- 4.5mW Class 3R eye-safe laser will not melt powder but also does not hurt the user
- A way to test various parameters in “ghost” prints before moving on to real additive manufacturing with metal powder

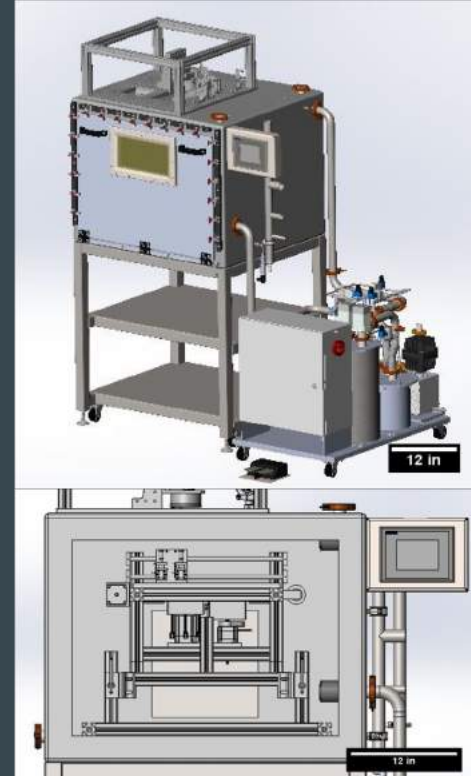
This version is not capable of creating physical parts, but it serves as an open source test bed for proof-of-concept level experiments



Fully Enclosed Powder Bed Fusion Machine

A fully enclosed powder bed fusion machine that enables:

- Students to perform research experiments on real PBF parts
- Easy to convert from the desktop model to the fully enclosed model
- Inert environment for optimal and safe printing conditions
- 400W laser enables printing for many types of metals



Machine Specifications

- Build volume: 100mm x 60mm x 40mm
- Laser Power: 40W - 400W
- Particle size: 7-70 μm
- Spot size: 26 μm - 150 μm
- Minimum feature size: 3x spot size
- Minimum Layer Thickness: 30 μm
- Nominal scan velocity: 0.8 m/s
- Compatible Materials: Stainless Steel, Inconel Alloys, Aluminum, and Titanium Alloys
- Cost: Approximately \$95,000



Key Advantages

- Studies can be performed much more easily, at 1/5 the cost of conventional machines
- Modular aspects of the machine:
 - Scan Strategies
 - Laser Power
 - Spot size
 - Material Spreading
 - Software and programming
 - Frame and Setup



<https://www.ilt.fraunhofer.de/en/technology-focus/laser-material-processing/rapid-manufacturing.html>

