Diploma Thesis

Design of 3d Printed metal parts using Selective Laser Melting technology (SLM).

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ABSTRACT

The present thesis was oriented towards the understanding of the basic principles of SLM method.This work is focused on the creation of a numerical model of a beam constructed by 3D printing. Macroscale Static and Thermal Analysis was conducted on the beam. Emphasis was given into the field of Topology Optimization due to minimize the mass.
Also, there was a simulation of moving laser source and defining the rest of the boundary conditions of the problem. Finally, in the present study, Modified failure criterion developed at its early stage, based on the of Deformation Theory which was also individualized to the method of SLM.

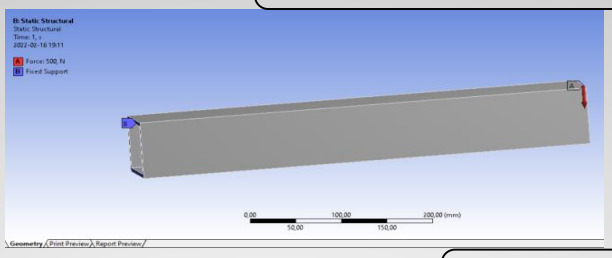
SOFTWARE PACKAGES

Ansys SOLIDWORKS

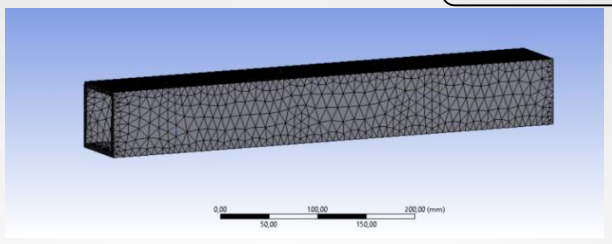
CONCLUSIONS

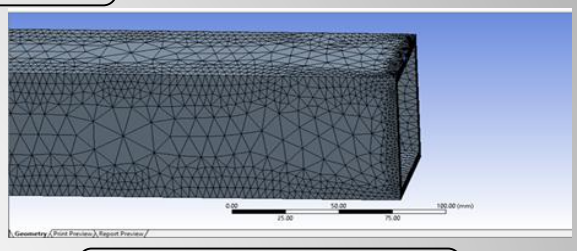
- The choise of unsuitable finite element may lead to extremely long response time and low quality.
- Laser path is affect the temperature distribution on layers and the final mechanical properties of component.
- Topology optimized geometry is affected by the finite elements due to the fact that optimization algorithm based on elements' sensitivity.
- Homogeneous and isotropic material can deliver high reliability.

Geometry lattice and initial conditions



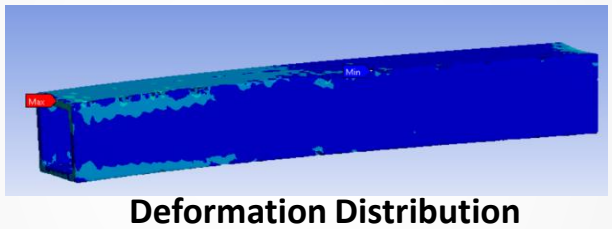
Mesh Refinement



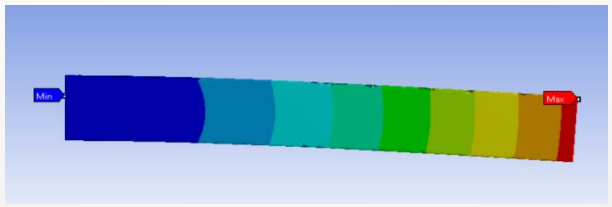


Static Analysis

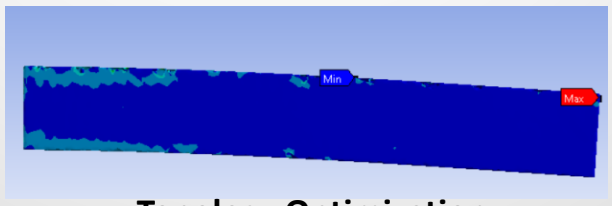
Stress Distribution



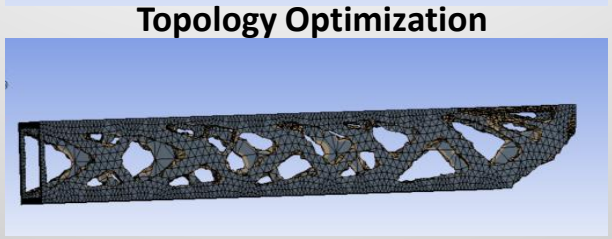
Deformation Distribution



Elastic Strain Distribution

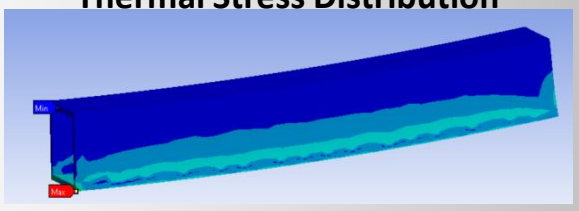


Topology Optimization

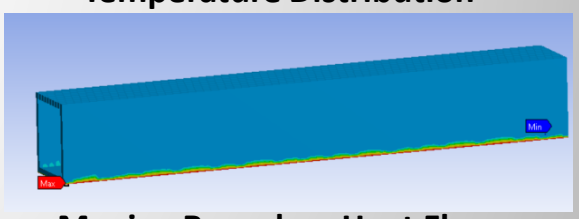


Thermal Analysis

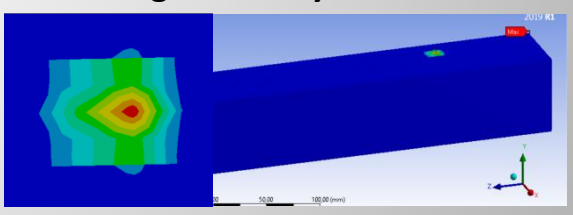
Thermal Stress Distribution



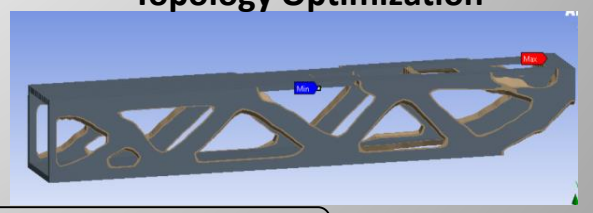
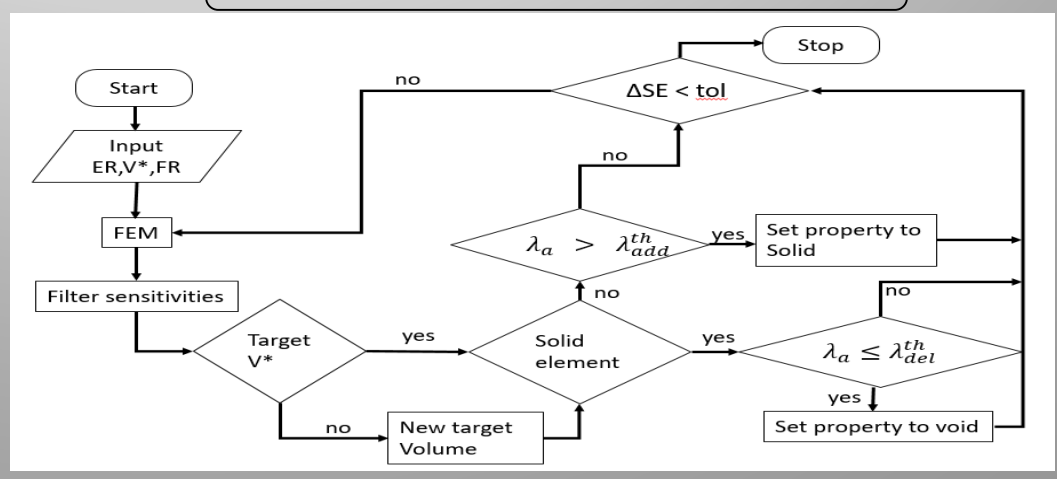
Temperature Distribution



Moving Boundary Heat Flux



Topology Optimization



Topology Optimization Algorithm- BESO