UNIVERSITÀ DI PARMA
Dipartimento di
Ingegneria e Architettura

1st Winter School on

Trends on Additive Manufacturing for Engineering Applications

Polytechnical University of Timișoara (UPT)
Timisoara, Romania, 24-28 January 2021

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DESIGN AND DEVELOPMENT OF STRUCTURAL COMPONENTS PRODUCED IN METAL ADDITIVE MANUFACTURING

Overview

- Exploit potential and benefit of AM technology for product innovation
- Understand material-process-properties relation
- Quantify fatigue performance of metal AM components

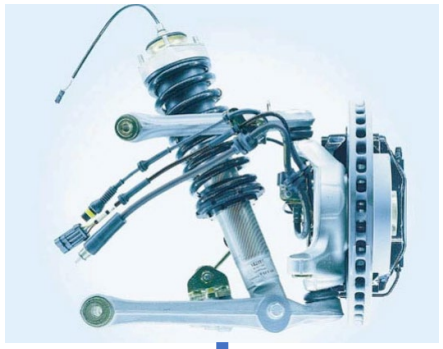
Materials of Interest

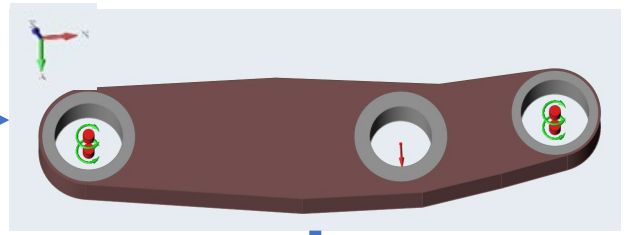
Inconel718 – Aerospace and energy

AlSi10Mg – Automotive

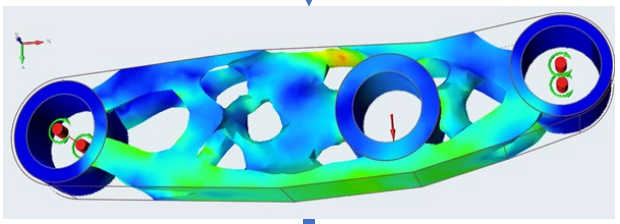
Ti-6Al-4V – Biomedical application

Finite element analysis and Topology Optimization



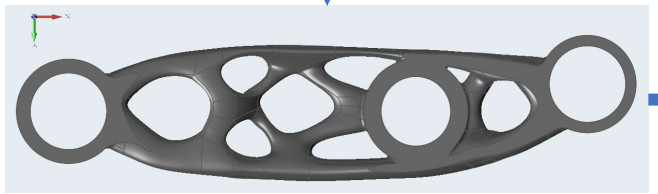


Design space definition



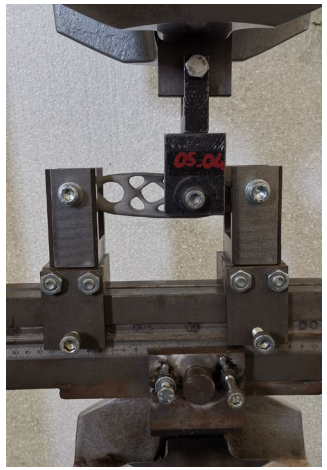
Optimization

Redesign



- Lightweight re-design
- Best stiffness/weight ratio
- Material consuption reduction

Production and testing



AlSi10Mg

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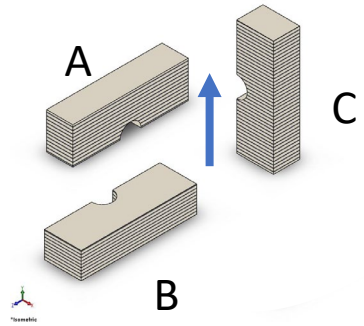
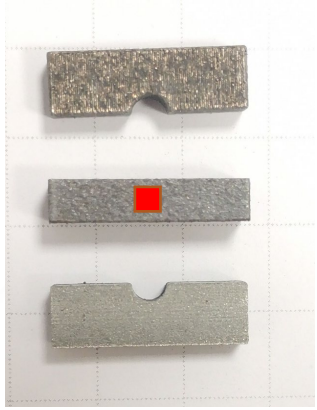
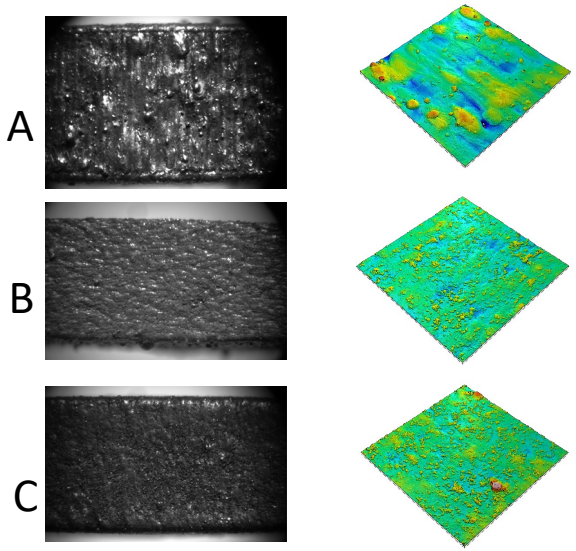
Role of Surface Morphology on Fatigue Behavior

Part orientation and surface morphology

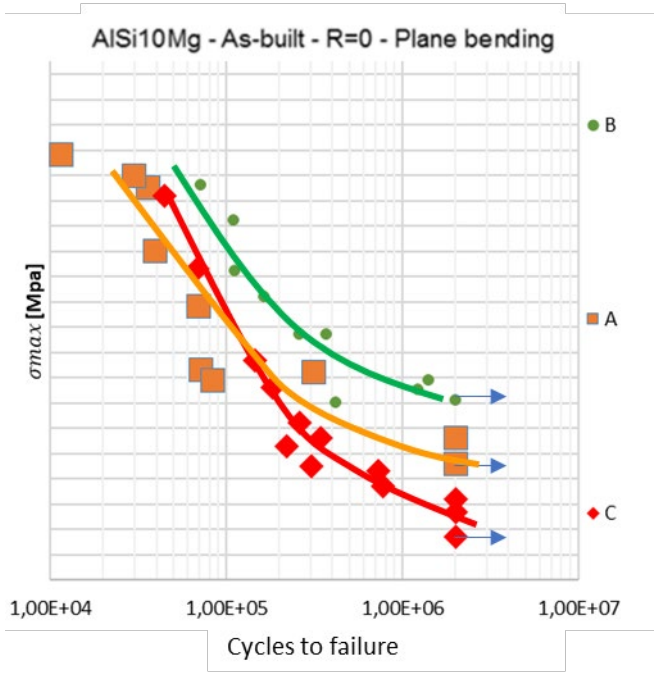




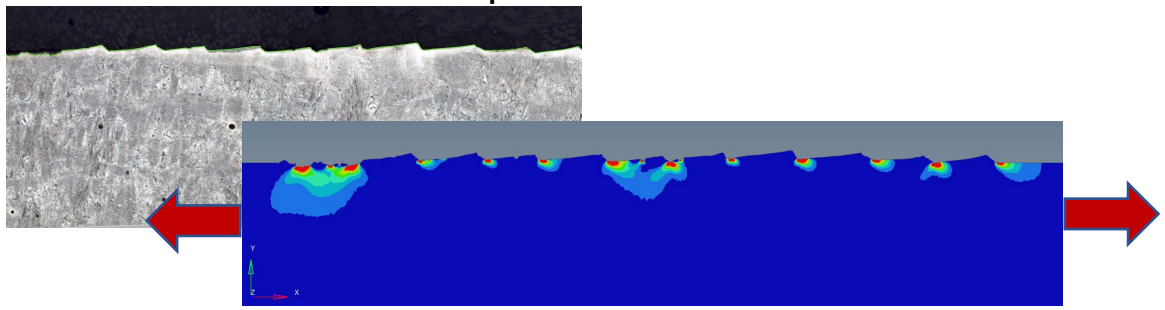
Investigation of the as- build state



Fatigue performance



FEA of reconstructed profile



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Relation between part orientation, surface roughness and mechanical properties

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