

Additive Manufacturing (3D Printing) in the Oil & Gas Sector

Dr. Lee Djumas

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AOG2019



Casting

Forming &
Shaping

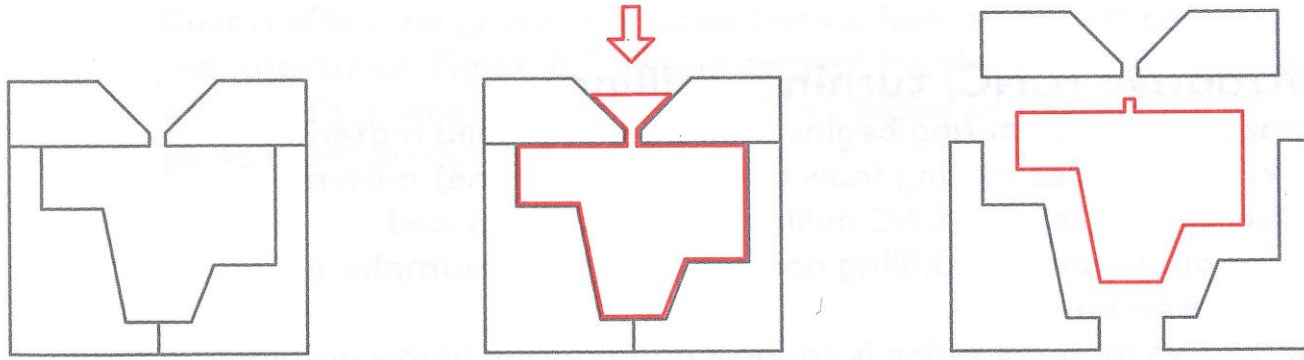
Moulding

Joining

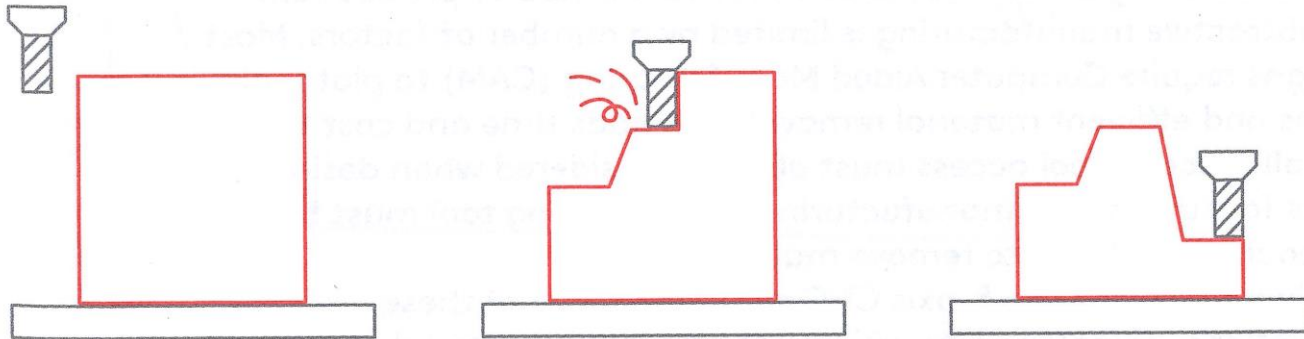
Finishing

Machining

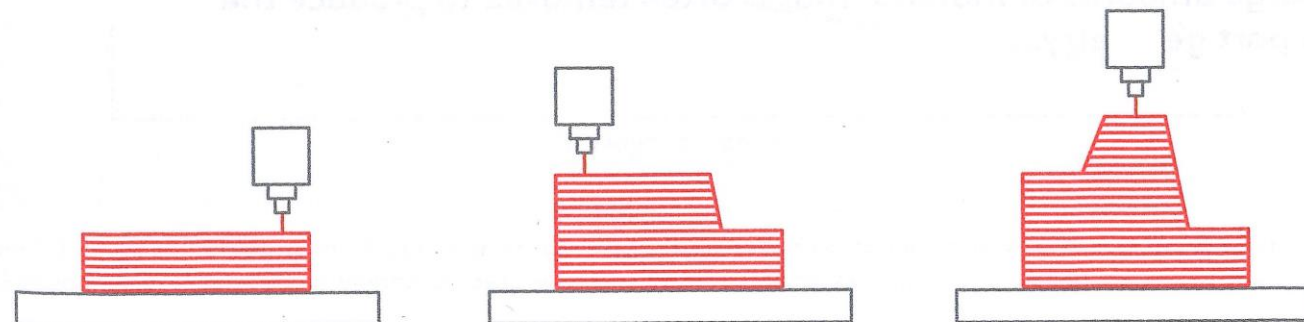
Formative manufacturing



Subtractive manufacturing



Additive manufacturing





PBF¹⁾



DED²⁾



Jetting



Extrusion



**Binder
Jetting**

Build principle

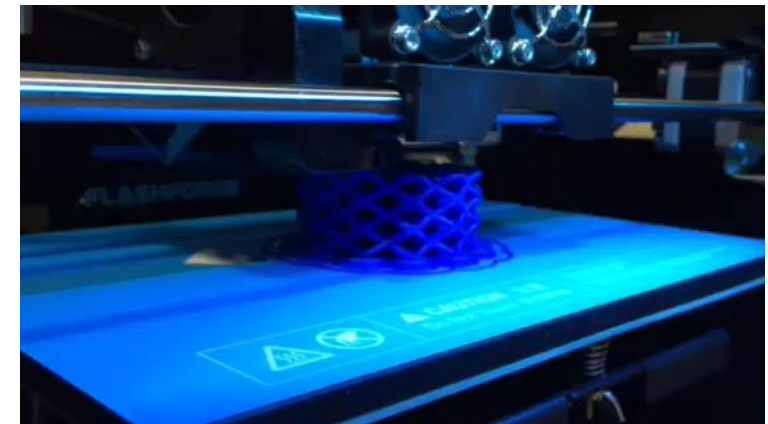
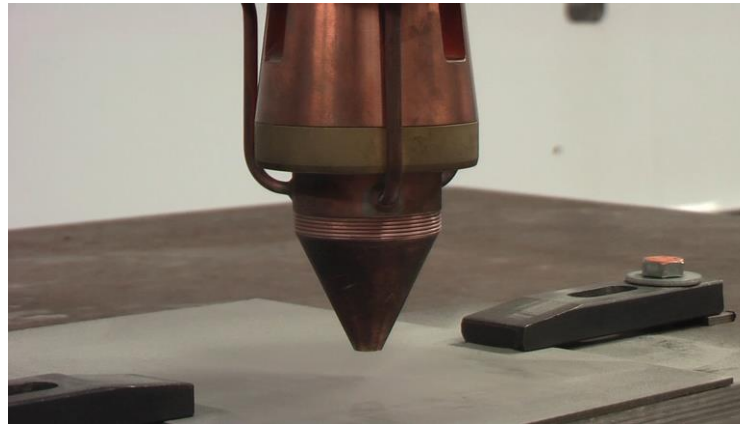
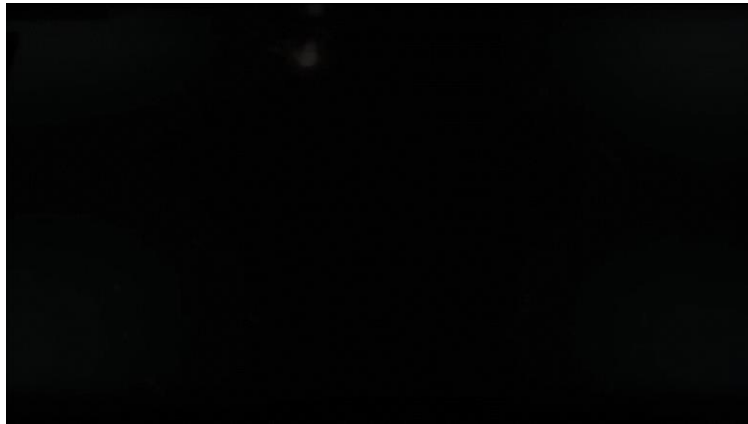
A powerful laser fuses layers of powder on a "powder bed", with incremental fused layers adding depth and detail

"Depositing" melted powder to create the part directly, with powder material melted during deposition

Deposition of molten metal or metal powder into a carrier liquid

Dispensing of material through nozzle to form a green part³⁾

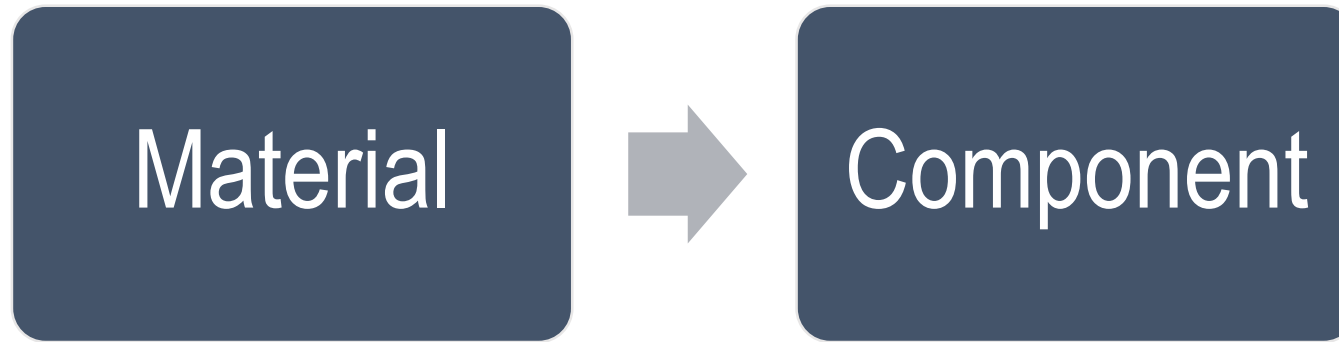
Using a chemical bonding agent to join metallic or other powder to form a green part³⁾



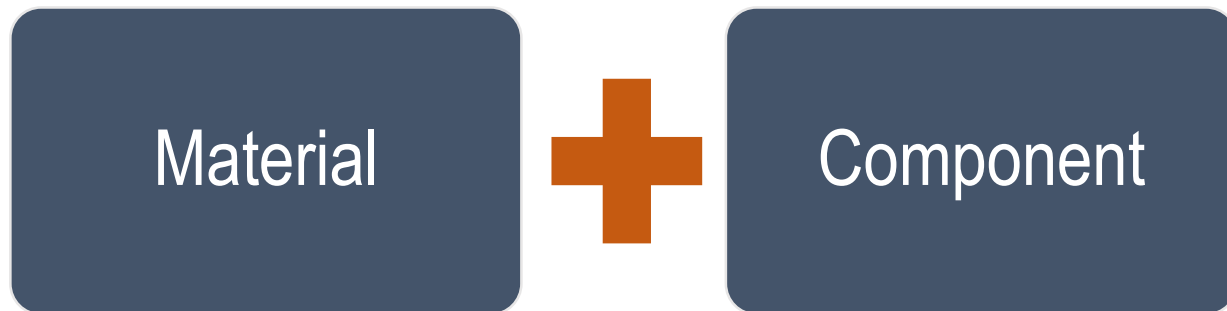
Roland Berger - 2017

AM: Why

Traditional



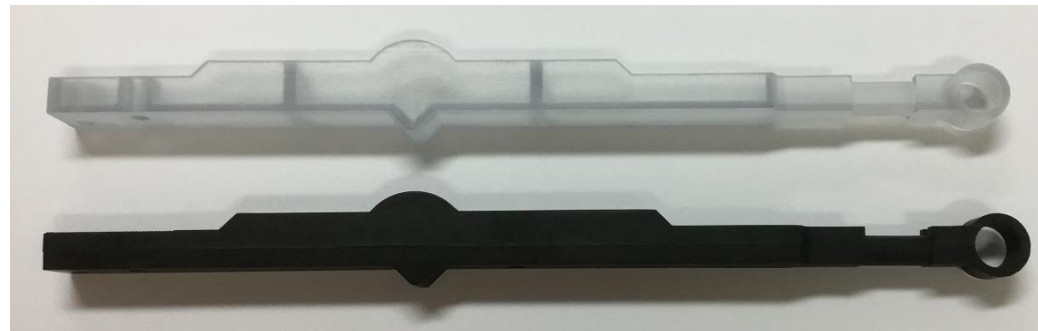
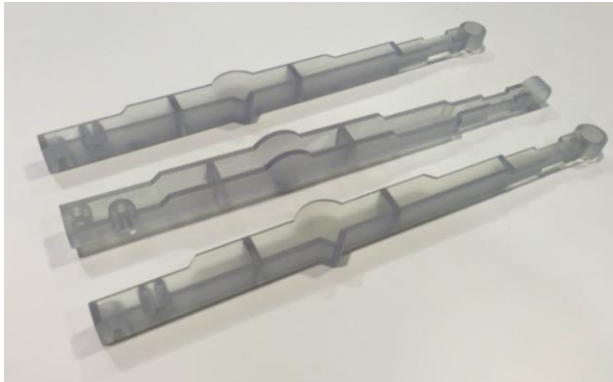
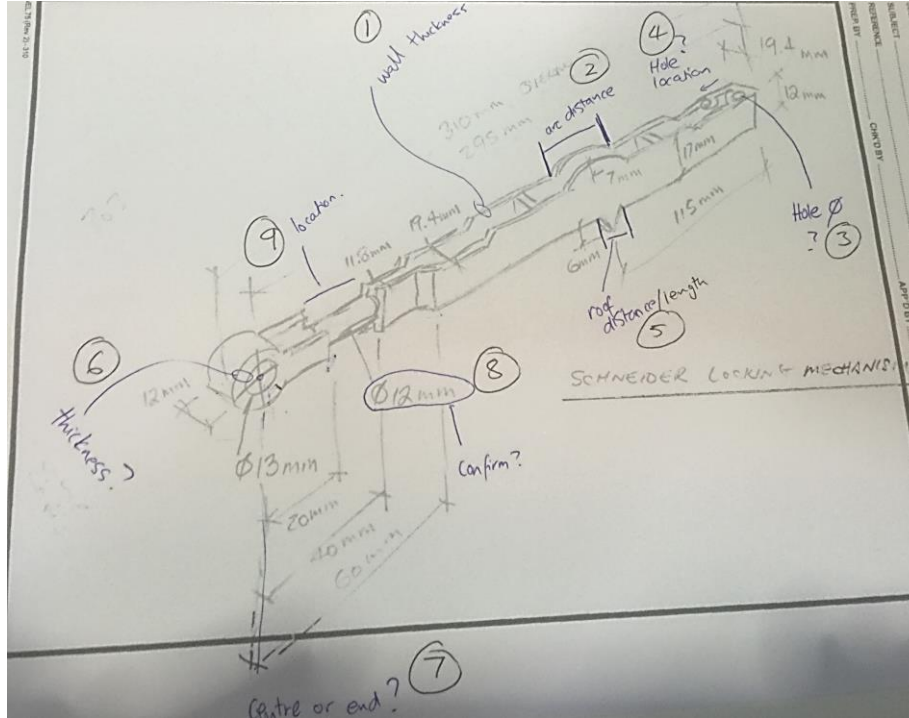
Additive



AM + Woodside

Woodside FutureLab Journey with AM

Locking Mechanism



Woodside FutureLab Journey with AM

Prototyping

Deluge line bracket



Manifold key



Machined



Printed

Prototype Packing Structures

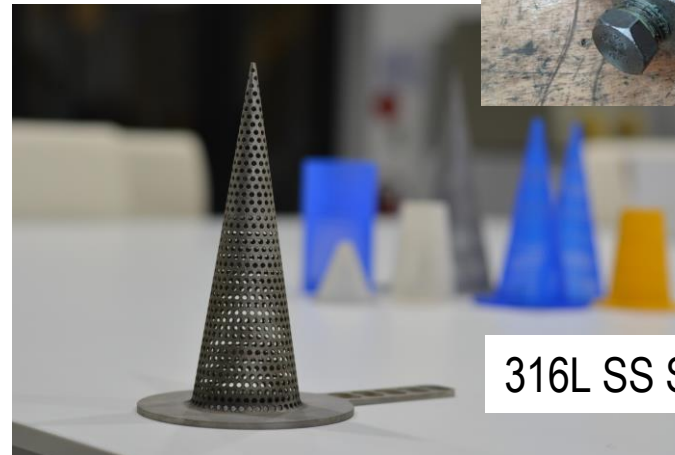
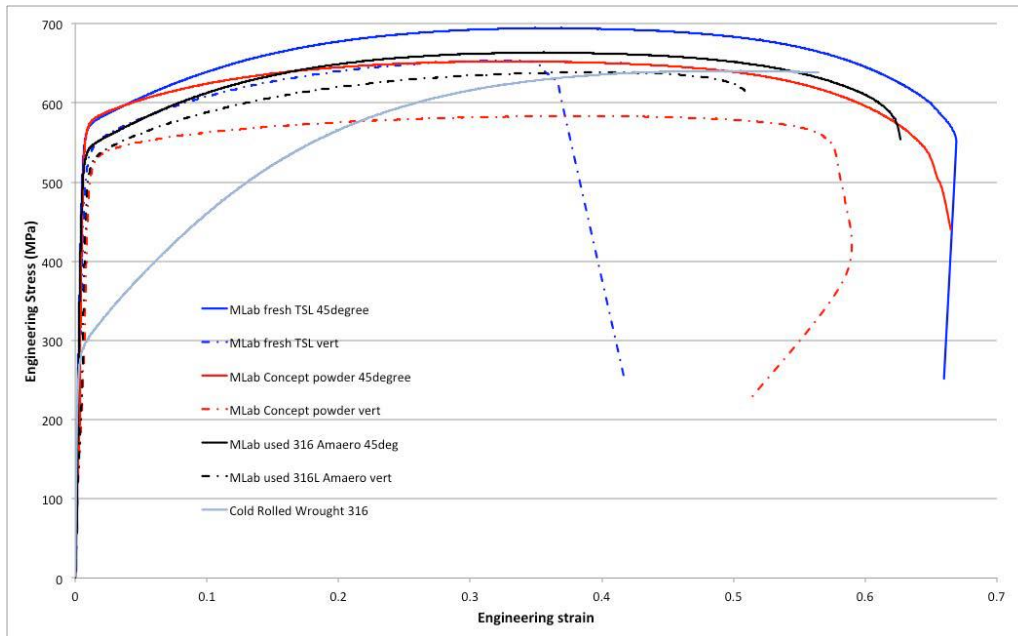
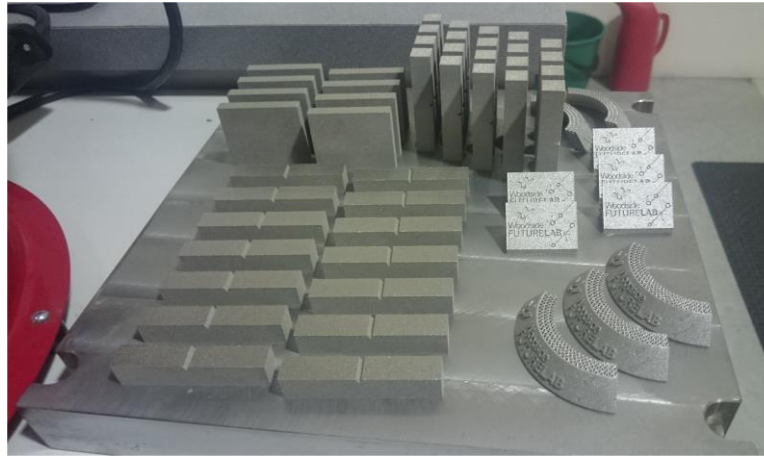


Carbon Fibre Composite Bicycle



Woodside FutureLab Journey with AM

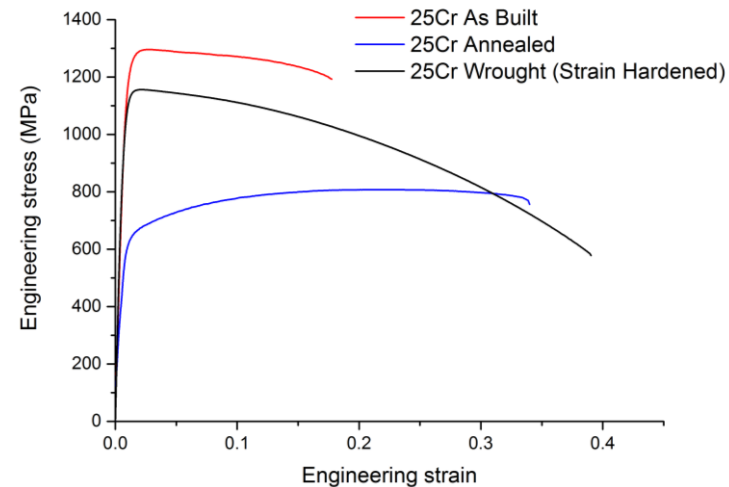
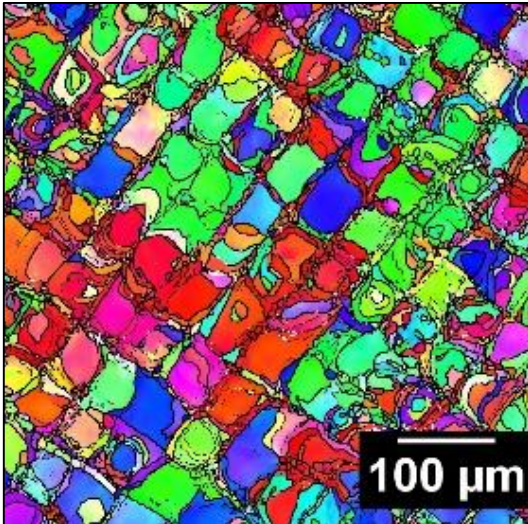
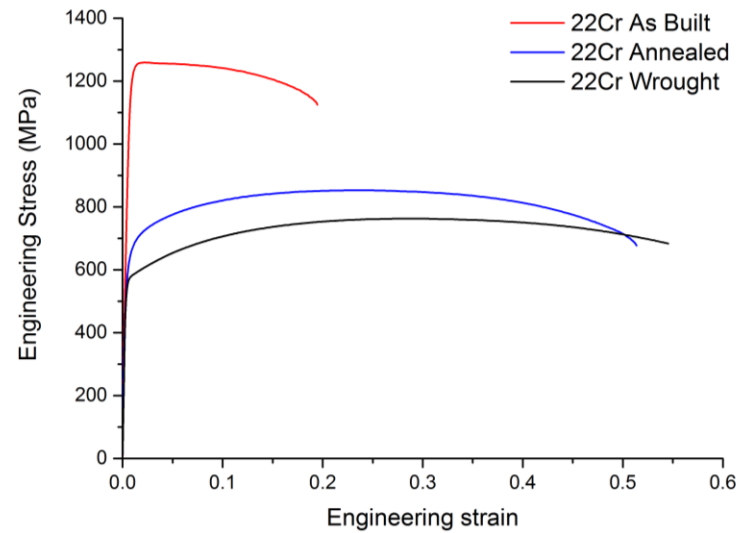
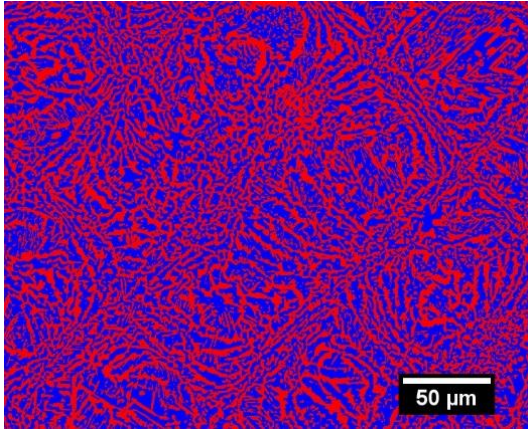
Metal: 316L Stainless Steel



316L SS Strainer

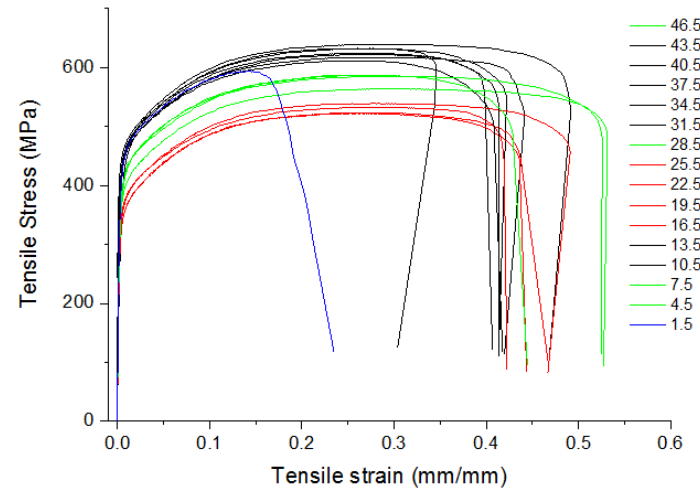
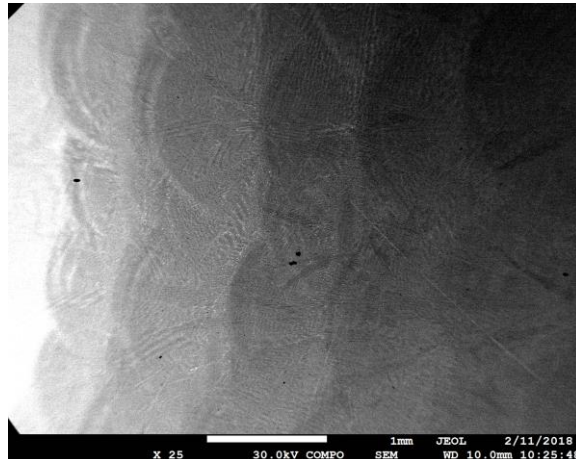
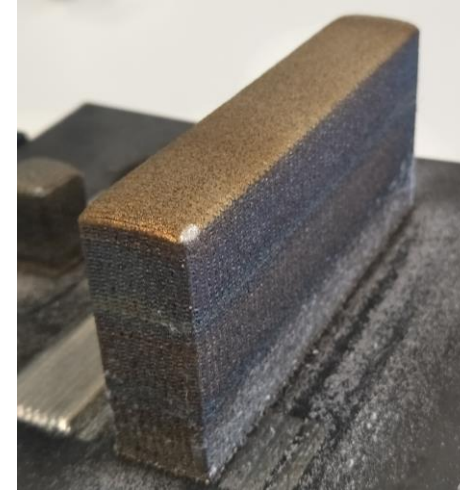
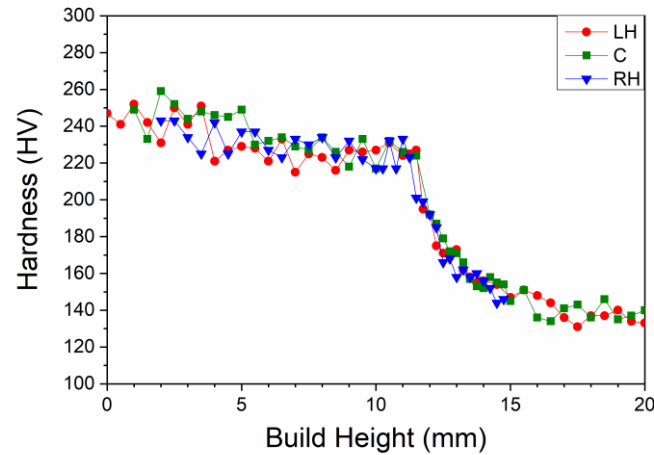
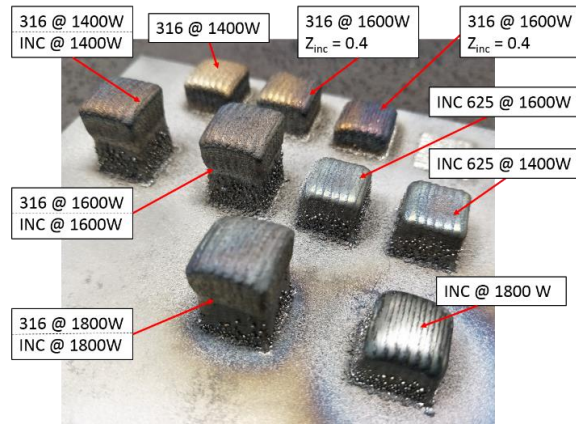
Woodside FutureLab Journey with AM

Metal: Duplex + Super Duplex



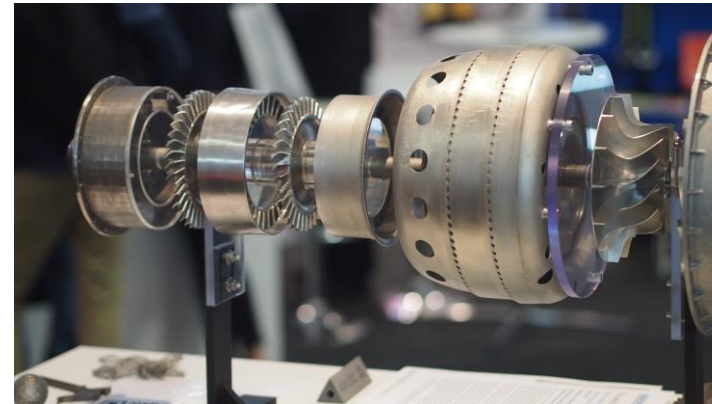
Woodside FutureLab Journey with AM

Multi-Metal Printing



AM at Monash

Impact



AM + Woodside

Opportunities + Threats

Standards, Qualification, Certification

Post-processing

Education, knowledge, know-how (eg. scale etc.)

Business cases

What next?

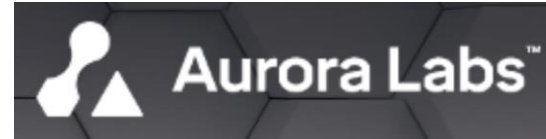
Hybrid Manufacturing

Repair and re-manufacture

Smart manufacturing and automation

New materials

Local Industry + Research



It is happening now, right here

It is not easy, but it is accessible

We have only just started to scratch the surface

Building strong business cases is the key for O&G

Thank you

lee.djumas@monash.edu