

Assuring Added Manufacture Parts

Product, Process Assurance and Governance

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Who are SDA-NAG-MT

Submarine Development Agency - Naval Authority Group - Materials Technology

- Supports both DE&S and SDA – Ships and Submarines
 - Owns 70 + of the material standards for Ships & Submarine Engineering
 - Provide SQEP Support ranging from NDE, Welding, Ferrous, Non-Ferrous, etc.
 - Support material technology development for safe marine engineering.
 - Undertake process approval and process audits

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Common barriers using developing technology

- Technical Failure
 - Over stretch of technology (often used before understood or ready)
 - Inappropriate use of technology
 - Lack of relative information
- Personnel issues
 - Technical bias (financial, historic, understanding)
 - Fear or alternate motive (requires management)
- Lack of appropriate records
 - Relative development records not kept for proof of assurance
 - It may not be the technology that failed, but no record to analyze or dispute
 - Technology failure that with full records could have been re-evaluated and modified
- Lack of qualified approval

Governance & Process Approval Considerations

- What is the **RISK LEVEL** & What level of approval/assurance is needed?
- Documented with supporting evidence (signed for as correct)
 - Process controls
 - Material
 - Process boundaries
- Proven training and competency qualified
- Proven repeatability
- Appropriate reassurance checks

Question yourself

Can you if required? Stand in Court and be able to show Due Diligence

Start with a proven reliable foundation and build on it

Rapid deployment of technology

Goal: **Available for use at end of Technical Development**

- Proven records for technical acceptance
- Technical justification based on:
 - Proof of **Fit for Purpose** and, or limits of use
 - Comparison to current manufacturing process or better
 - Relative to any standards

Typical Requirements

- Proving trials performed (repeatability, mechanical properties, destructive and none destructive examination, etc)
- Stipulated documents requirement
- Proven equipment and check plan in place
- Auditable training and assessment procedure are in place
- Any initial additional records/process required
 - Fall back assurance checks
 - Any batch testing % check
 - Review requirement and period in place
- **Approval to proceed in place**

UCL-NAG MT Potential Cooperation (Supporting The Approved Process)

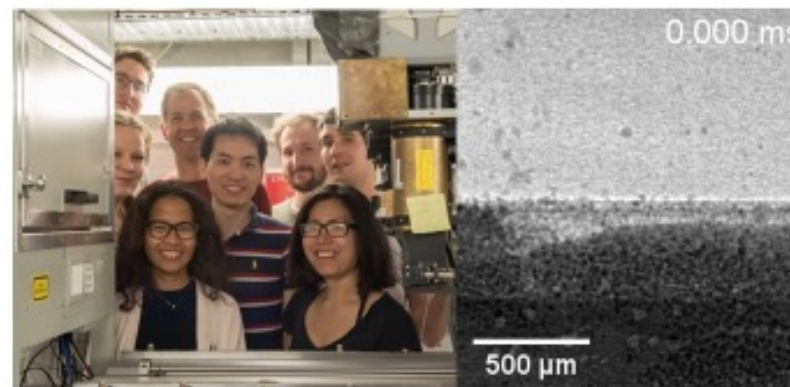
In 2019 The Royal Academy of Engineering announced ten years of support for UCL Mechanical Engineering as a world leader in applying synchrotron imaging to help develop more efficient, environmentally friendly and cost effective additive manufacturing technologies.



Taking Additive Manufacturing's Heartbeat using X-rays



AM enables manufacture of complex, high value added components like these AM built Ti-alloy aerofoils in a Trent XWB-97k test bed engine and knee replacements. However, the process is poorly understood, and the models limited.

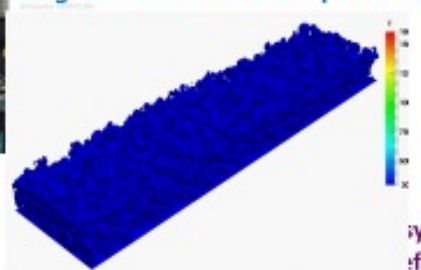


Melt pool level

In situ AM rig + kHz/MHz imaging of AM process



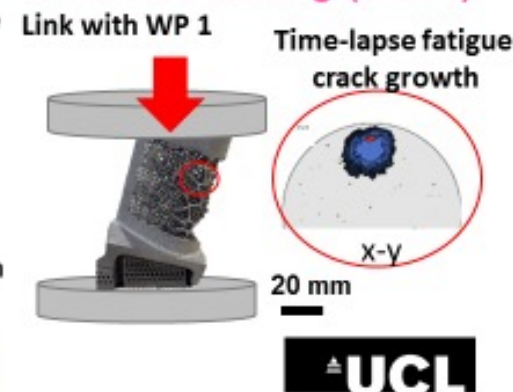
Digital twin of the AM process



NDE at Component level



In-service testing (BM18)



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Considerations going forward

- What do you want to achieve
- What can you prove
- How is it record
- Can it be repeatedly & proven as required
- How does it compare to technology already in use
- How will it be managed, by who and what are there incentive
- Who are part of the whole process and are they on side

Don't Stifle Blue Sky Development