



Development of a powdered metal alloy for high recycling rates after use in Additive Manufacturing

The background is a collage of industrial machinery, including a lathe and a drill press, with a semi-transparent green overlay. The logo consists of a green Greek letter sigma symbol followed by the word 'smart' in white lowercase letters, and 'advanced manufacturing' in smaller white lowercase letters below it.

Σ smart
advanced manufacturing

ORGANISATION PROFILE

ISQ HAS A STRONG REPUTATION IN THE
DOMESTIC AND INTERNATIONAL MARKET

50
YEARS OF
EXPERIENCE

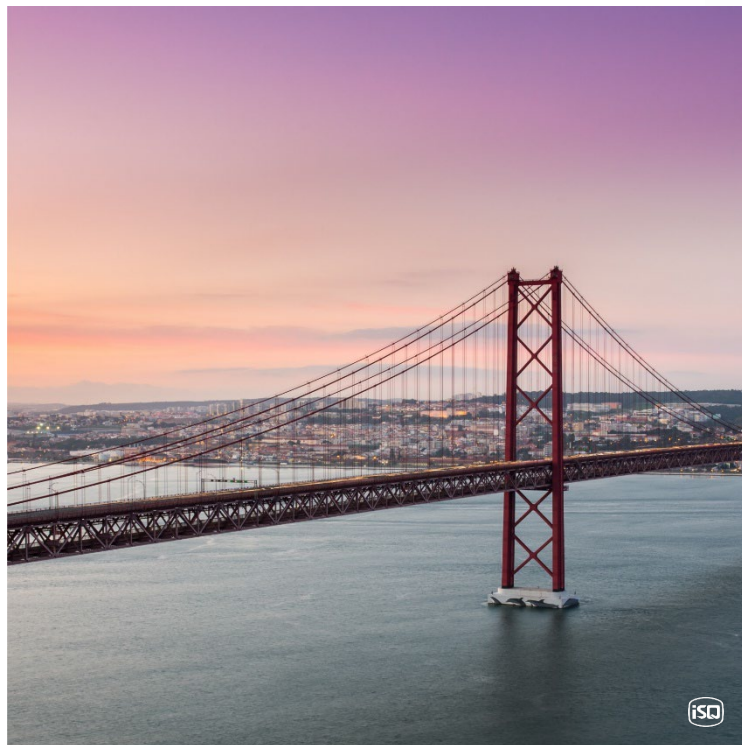
16 
ACCREDITED
LABORATORIES

 **6**
CONTACT
POINTS IN
PORTUGAL

MORE THAN
250
SPECIALISED
SERVICES

34
AFFILIATES

1,600
EMPLOYEES

ORGANISATION PROFILE



ORGANISATION PROFILE

LOW-CARBON AND
RESOURCE EFFICIENCY



MATERIALS AND
TECHNOLOGIES



INTELLIGENT AND
DIGITAL SYSTEMS



TRAINING AND
QUALIFICATIONS



R&Di Units



Energy



Industry



Transports



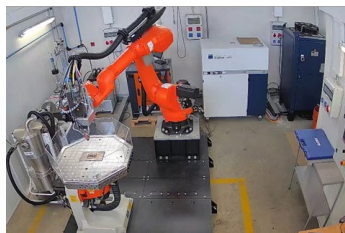
Environment and
natural resources



Agri-food

R&Di Programmes

ORGANISATION PROFILE – ADDITIVE MANUFACTURING AT ISQ



Powder Bed Fusion – Laser Beam (PBF-LB)

- Power source: 500 W laser, 1070 nm
- Build volume size: 250 mm x 250 mm x 350 mm (as well as reduced build volume size of 78x78x50 mm³)
- Layer thickness as low as 10 - 20 microns and spot size of 80 microns

Directed Energy Deposition – Arc (DED-Arc)

- Power sources: MIG/MAG, TIG/Plasma
- Several wire-arc transfer modes (MIG Pulse, CMT, CMT Pulse, PMC, PMC Mix)
- Build volume size: medium to large (only limited by the robot arm maximum reach)

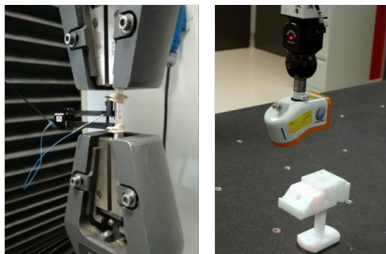
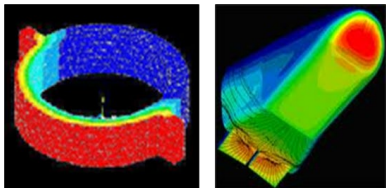
Directed Energy Deposition – Laser Beam (DED-LB)

- Power source: 5 kW laser
- Build volume size: medium to large (only limited by the robot arm maximum reach)
- Two independent hoppers for powder feed (multi-material)

MATERIALS

- Stainless steels
- Aluminium
- Titanium
- Inconel
- Cobalt Chrome
- ...

ORGANISATION PROFILE – ADDITIVE MANUFACTURING AT ISQ



DfAM AND SIMULATION

- Design for AM
- Thermo-mechanical simulation
- Modelling and topological optimization

AM POST-PROCESSING

- Heat treatment
- Bead blasting
- Powder sieving
- Sawing
- Ultrasound cleaning
- Polishing
- Machining

TESTING AND CHARACTERIZATION

- Microstructural characterization and surface analysis (X-ray diffraction, infrared spectroscopy, scanning electron microscopy)
- Mechanical tests (uniaxial compression and tensile, Charpy, bending, low/high cycle fatigue, hardness)
- Non-destructive testing (computed radiography, ultrasonic, thermography, Eddy currents, tomography)
- Chemical, electrochemical and corrosion evaluation (salt spray, moisture, thermal shock, pitting, crevice, intergranular corrosion)
- Dimensional quality control

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Vision: The main project goal is to develop a powdered metal alloy that allows for easier recycling after use in additive manufacturing processes such as Powder Bed Fusion – Laser Based (PBF-LB) and Directed Energy Deposition – Laser Based (DED-LB).

Motivation: While DED-LB and PBF-LB have proven to be technologies with a multitude of uses (manufacturing, repair and coating) and great value-added potential, they still result in high rates of powder waste.

Identify existing recycling methods used in AM for unused powder

Identify main challenges in recycling metal powder used in AM

Identify existing alloys that can be replaced by the novel "recyclable" alloys

Develop novel alloy(s) composition(s)

Parameterize novel alloy(s) for use in PBF-LB and DED-LB

Compare recyclability of novel alloy(s) and existing alloy(s)

Validate novel alloy(s) through mechanical testing and use-cases

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Expected outcome: Development of at least 1 novel metal alloy composition that allows for easier powder recycling after use in DED-LB and PBF-LB. For each new alloy composition, an optimized recycling process must also be developed to ensure maximum efficiency.

Schedule: Duration: 2 or 2,5 years
Start: at earliest convenience

Current Consortium: ISQ

Partner search:

- 1 Industry Partner from Portugal
- 2+ Partners from outside of Portugal with experience in:
 - Metal powder production
 - Recycling metal powders
 - DED-LB and PBF-LB

CONTACT INFO



Paulo Morais – pjmorais@isq.pt
Head of the Additive Manufacturing Lab



Philip Carvalho – pscarvalho@isq.pt
Additive Manufacturing Researcher



THANK YOU