Advanced Manufacturing Technologies – 3D Printing related services for companies

Big Science & NOMATEN Innovation Day
19.11.2024, NCBJ, Poland

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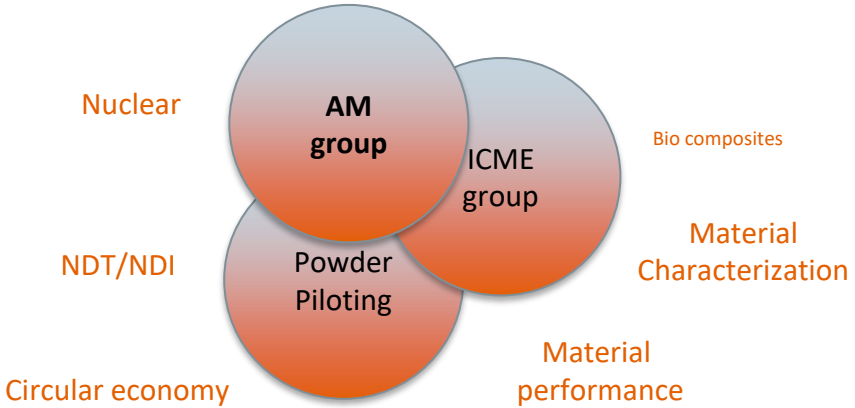
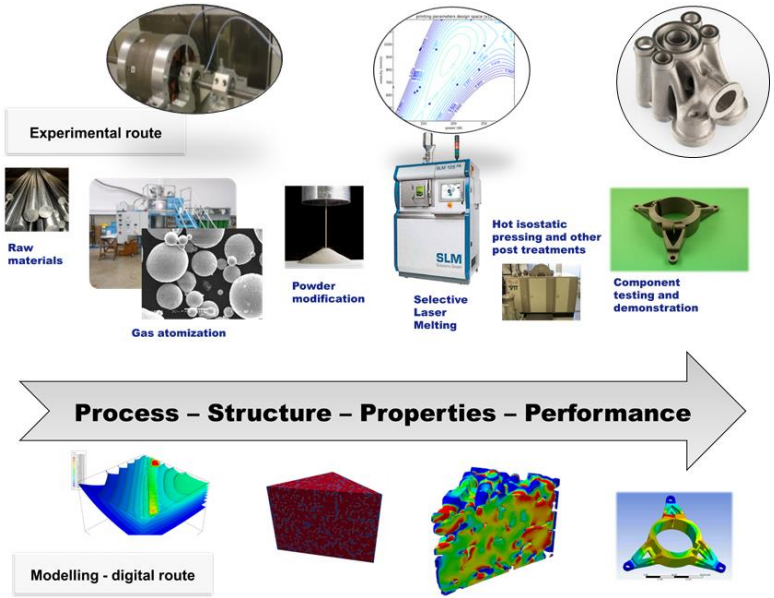
Research on Additive Manufacturing at VTT





https://www.vttresearch.com/en/ourservices/industrial-3d-printing

Additive Manufacturing key competences and priorities at VTT

- Support our customers on industrial use of metal additive manufacturing, by developing new applications, process & production concepts, and AM materials and their performance.

- Proper metal AM process understanding as basis for demanding high quality applications – aerospace, nuclear, e-mobility, machinery.

WHAT are our areas of expertise?

Applications

Competitive products and new business models

- New optimized designs
- Clever management of spare part inventory
- Embedded intelligence and functionality

Production

Commissioning support for the new technology

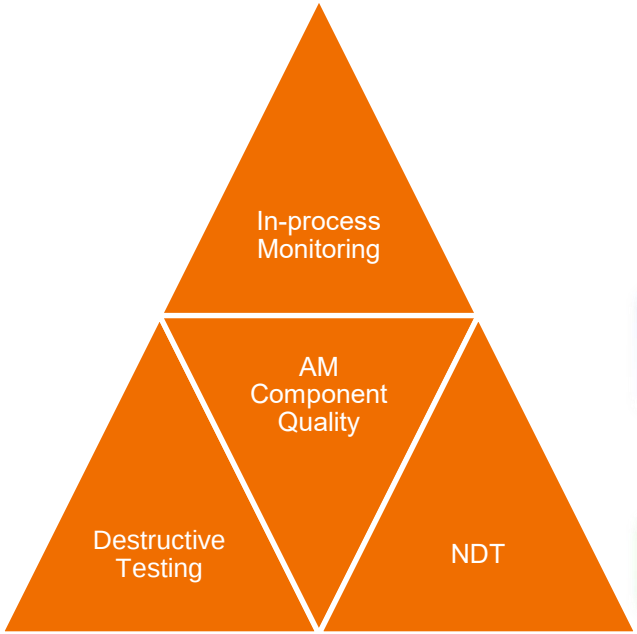
- Quality assurance
- Post-processing strategies
- Additive manufacturing integration into production
- Sustainability

Materials

Increased quality and component performance

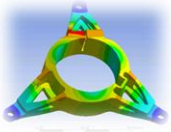
- Powder printability
- Application driven materials
- Computational material development

Approach to Quality Assurance and Qulaity Control in Additive Manufacturing



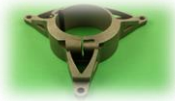
Process Qualification

- We need to ensure that the general process is controlled and repeatable and can produce components within quality requirements
- This includes: Machine, Powder, Operator



Component Qualification

- We need to ensure that a particular part can be printed within quality requirements given a certain design, build preparation, orientation, post-processing, etc.



Individual Part QC

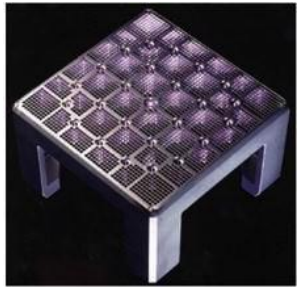
- We need to ensure that every single part is printed within quality requirements. And if it is not, that defects are properly detected and the non-conformity properly recorded.

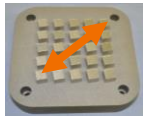
EU NUCOBAM

- NUclear COmponents Based on Additive Manufacturing aims at:
  - developing the **qualification process for laser powder bed fusion (L-PBF manufactured parts)** in NUC applications
  - provide the **evaluation of the in-service behavior** allowing the use of additively manufactured components for nuclear installation
- Thorough test campaign for the material (including NDI, mechanical (tensile, impact toughness, fatigue, irradiation, SCC, etc.)

- Coordinator: CEA, Myriam BOURGEOISE
- Partners: 12 from 6 countries + EU JRC
- Total Project Cost: ~4 M€, Duration: 4 years (10/2020-9/2024)
- 7 Work Packages

Demonstrators (316L):





stability

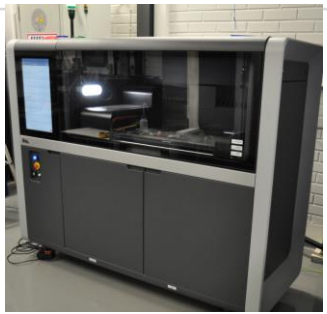
repeatability

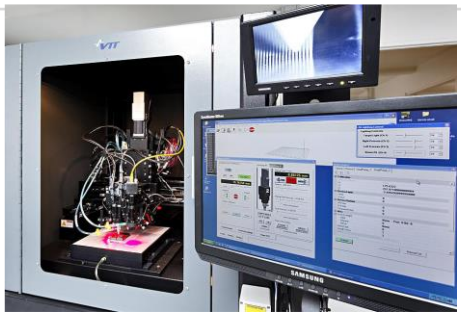
reproducibility

AM equipment

Infrastructure *from the powder manufacturing to the component performance testing*:

- **Powders:** Gas atomizer (Hermiga), plasma spheroidization (Tekna), powder measurements (particle size, flow, chemical composition, oxygen content)
- **Printing:**
  - LB-PBF: SLM125HL / Sigma Labs Print Rite Melt Pool Monitoring / FLIR thermal camera / High Temperature Platform (up to 400°C) / ~40 different alloys
  - M- BJT: Desktop Metal Shop system (355*225*100 mm)
  - DED: InssTek MX-Lab
  - DW: nScrypt Direct Write Paste
  - FGF, FFF: Brinter (with several modules), some desktop FFF machines
- **Thermal treatments and post-processing:** HIP (Qvintus), several furnaces (vacuum, argon, hydrogen etc.), blasting, grinding
- **Testing:** NDI (e.g. micro-CT, ultrasound, eddy current), destructive mechanical (static and dynamic testing, fatigue, creep, small punch etc.), microscopy, dimensional accuracy (e.g. MIKES facilities), chemical, corrosion





One stop shop for metal AM

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