

In-situ quality control for Additive Manufacturing May, 15, 2023

EPIC Online Technology Meeting on Additive Manufacturing



Bernard Revaz, CEO May 15, 2023

info@amiquam.ch AMiquam SA 2, route Cité Ouest CH-1196 Gland, Switzerland <u>www.amiquam.ch</u> Mob. +41 77 401 17 48

in https://www.linkedin.com/company/amiquam

AM: you think it is digital, but it is not!



Problems:

1. Failed productions: millions of value scraped

2. Post processing = 60% of the costs, nondigital activities: traditional workflow and logistics

3. "First time wrong" technology: generates a lot of waste (metals), energy, costs

Major hurdles for the growth of metal AM

Solution:

- In process compliant QC and NDT
- Machine + process agnostic
- Digital interfaces with AM ecosystem (machine, MES, QC)
- Generate Cpk for SPC

AMiquam breakthrough in QC for AM

Smart recoater instrumented using our proprietary electromagnetic sensors measuring the **critical sublayer quality** (not the surface as our competitors do)SS

Additional advantages:

- In process monitoring
- Layerwise measurement enabling a full 3D reconstruction of the quality of the part
- Normalised technique: ISO 15548, ASMT E1004-17 among other norms (Eddy current)
- Approved for AM in situ inspection ASTM 3166
- Compatible with AM QC standards ASTM 52930
- Plug-and-Play measurement device
- Agnostic to the machine
- No penalty on the system performance.

We do QC using compliant NDT sensors



Principles of the technique Eddy currents for quality control

- Normalised technique (ASNT, ISO15548, ASTM E1004-17, ASTM 3166:20, BS EN)
- Technique of choice for surface breaking crack detection in metallic components
- Useful for other applications (material properties, sub surface defects, etc...)
- Local
- Simple surface preparation, no couplant





Key tech differentiator Proprietary EC instrument on-a-chip



- Each chip contains a 2-channel EC NDT instrument
- Miniaturization Parallelisation Reconfigurability
- Chip is industrialized (results of other projects)
- Fully parallel 16-channel array
- Mastering this technology is necessary for in-machine integration
- Fabless model (semiconductor process compatible)



Compatible with most of LPBF machine types EOS, Renishaw, GE, SLM Sol., Prima, AI, Trumpf, etc..



Product roadmap From AMiquam W1 to a CaaS platform

AMiquam W1



Process monitoring providing unique information on material properties AMiquam W2 NDT



Full-volume 3D NDT enabling part certification

2024

CaaS

Certification as a Service Platform

Digital marketplace enabling certified inspectors to certify parts remotely

2021

2025





Fabrication details

General Build Job Details

- Material: 316L
- ECT equipment: 2 coils
- ECT scan strategy 3 lines each, 4mm pitch
- Build plate: 200mm OD

Eddy current testing:

- 500µm lift-off at the start
- 200 kHz excitation frequency
- 380 Hz sampling rate (point spacing in recoating ~ 0.25mm)
- 100mm/s recoater speed, i.e. point spacing of 0.25 mm

Parameters:

- 30µm layer thickness 1333 layers (40mm)
- Nominal parameter > 99.5% everywhere except where there are designed defects
- Dimension 150x38x40 (height) mm
- 20% of build plate fully inspected during fabrication with compliant NDT ET technique

Process and Design Artifacts



























Thanks!

AMiquam SA 2, route Cité Ouest 1196 Gland, Switzerland