Electron Beam Processing using NeuBeam Technology- *A Case Study*

WAYLAND ADDITIVE®

Neutral Beam Technology ®

Huddersfield
England

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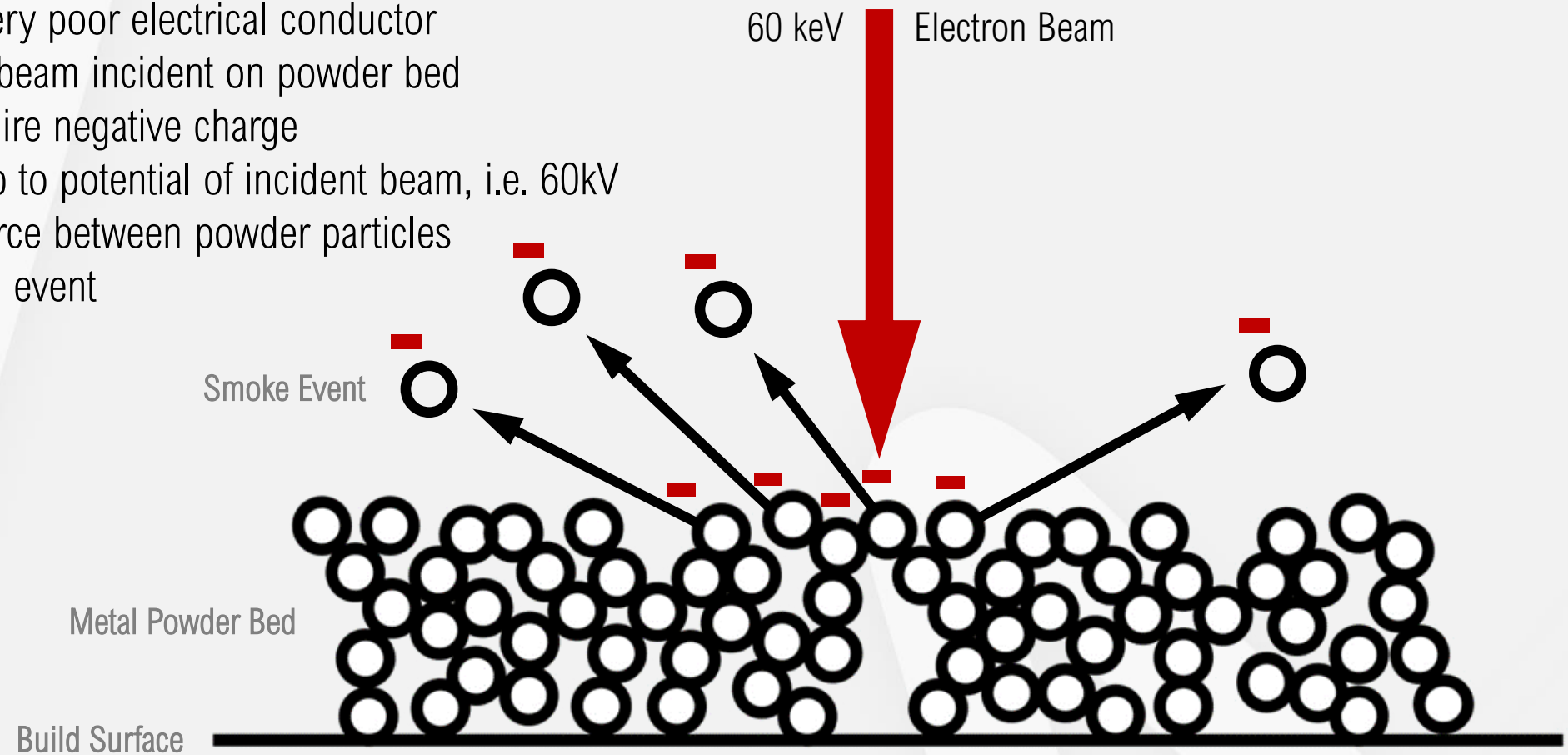
NeuBeam®

Active Charge Neutralisation (ACN)

History: NeuBeam and Wayland Additive Ltd

- Metal powder bed- Very poor electrical conductor
- High energy electron beam incident on powder bed
- Powder particles acquire negative charge
- Powder can charge up to potential of incident beam, i.e. 60kV
- Coulomb repulsive force between powder particles
- Potential build-ending event



History: NeuBeam and Wayland Additive Ltd

Charge-Induced Smoke Events

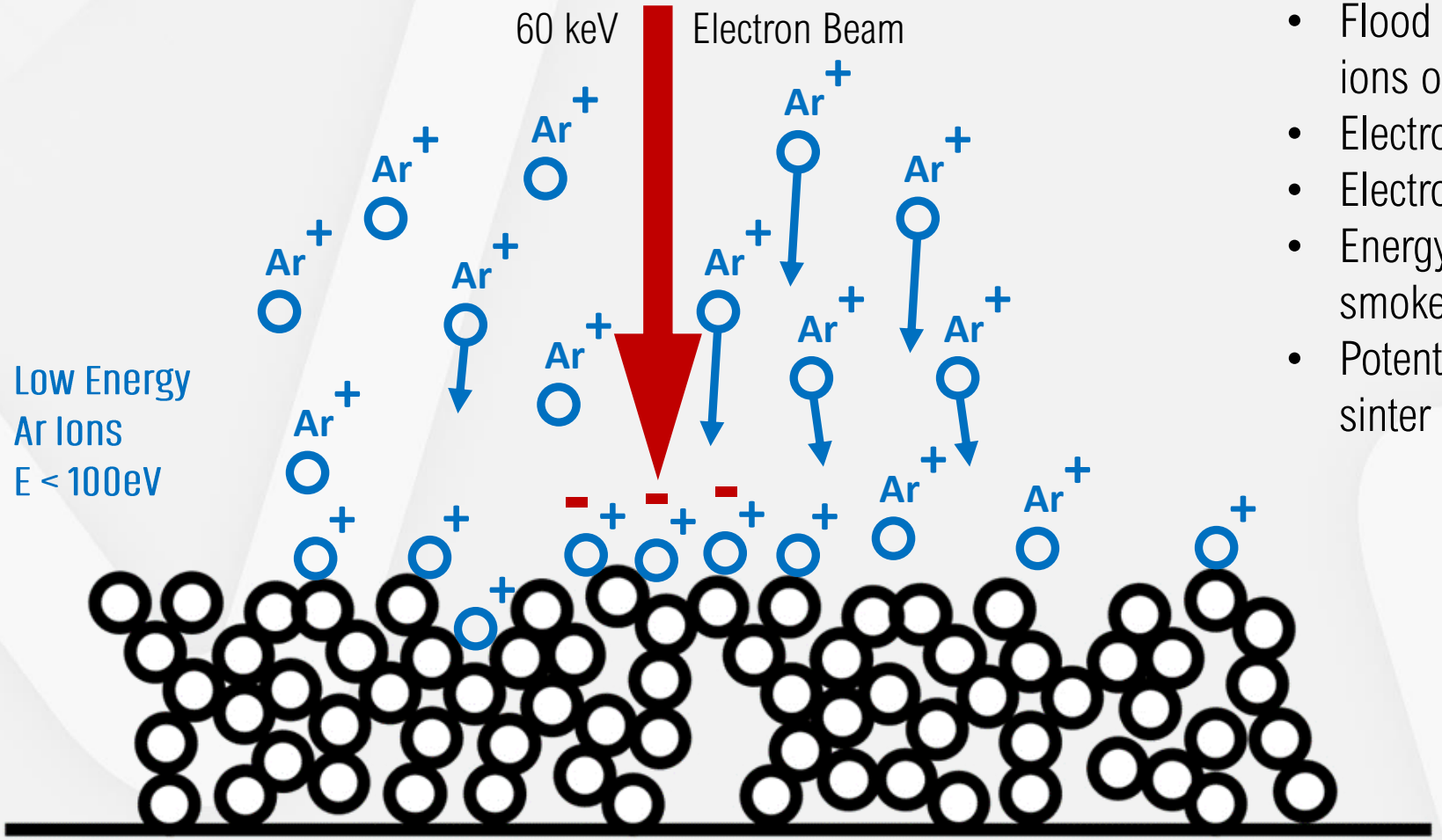
Classic Solution

- Sinter the powder layer prior to melting
- Create a *lightly fused* electrically-conductive layer
- Electron charge has path to ground

A Different Option

- Neutralise the charge on the powder
- Technique employed in other fields/ instrumentation (XPS; Auger spectroscopy; SIMS, etc)

NeuBeam: Active Charge Neutralisation (ACN)



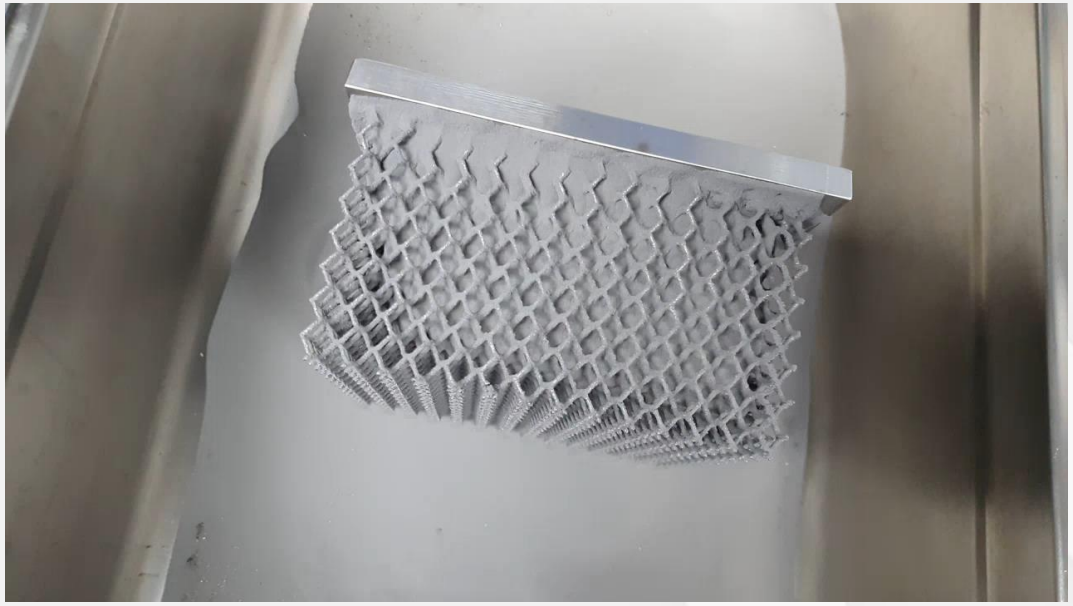
- Flood or shower of positively charged inert ions onto powder bed
- Electron beam incident on powder bed
- Electron charge neutralized by ion
- Energy delivery in absence of charge induced smoke events
- Potential for e-beam AM builds without a hard sinter cake

Benefits of NeuBeam: Active Charge Neutralisation (ACN)

At the heart of NeuBeam is a process that prevents electron charge accumulation of the surface of the metal powder particles, thereby changing the traditional electron beam AM process very significantly.

- The differences ranging from easier powder removal
- Control of the material properties through unconstrained choice of operating temperature
- Reduced powder contamination
- Increased productivity
- Increased energy efficiency
- Larger part size capability

Super lattice de-powdering- **Virtually sinter free**

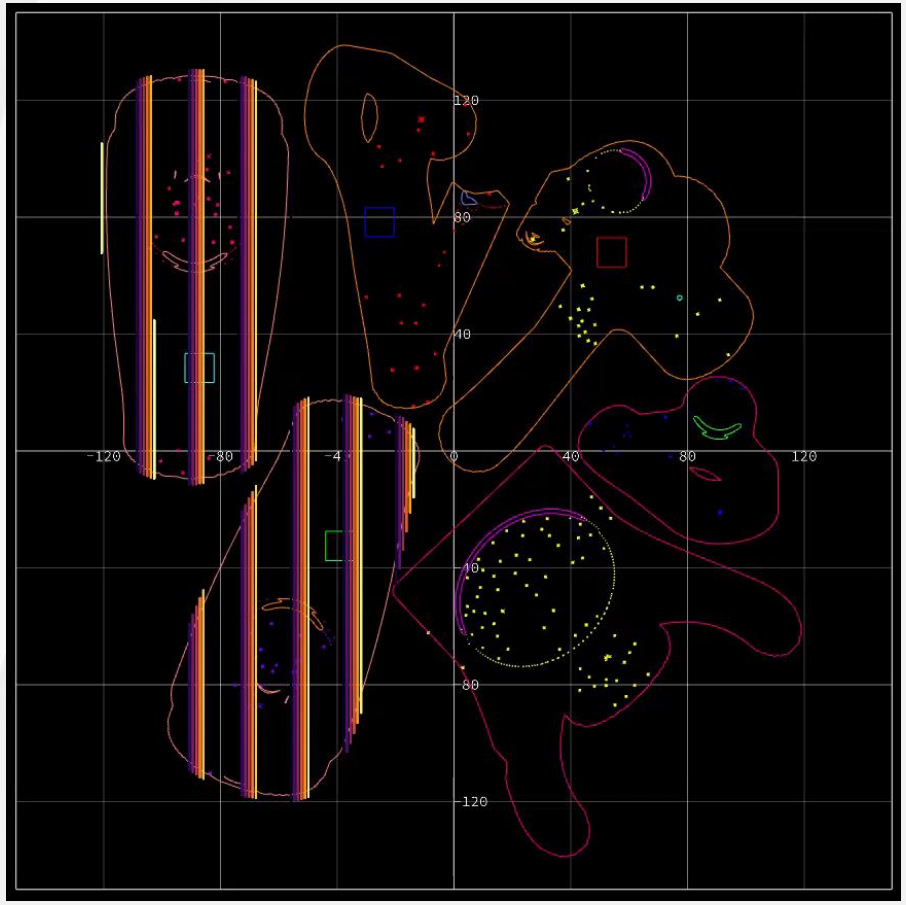


Wayland Build: Tool path and In Process Monitoring

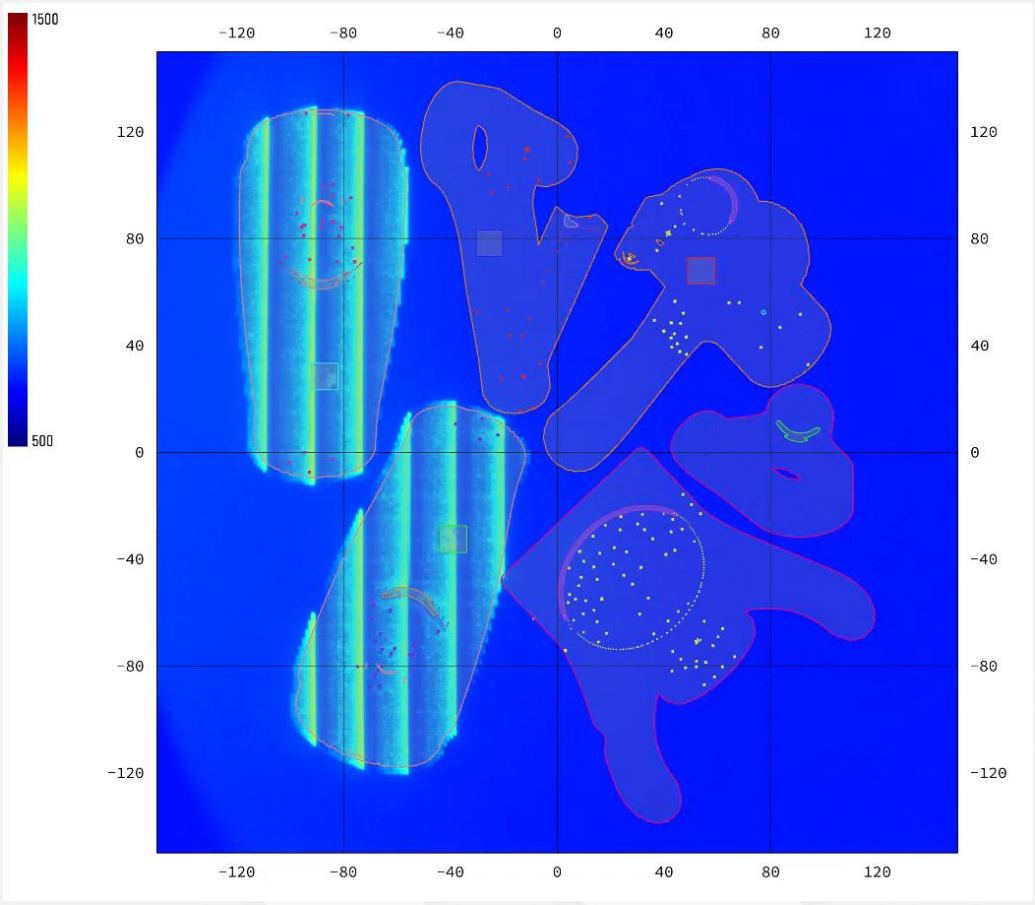
Build data

Build name: Bike parts
No. of layers: 2497
Total build time: 52 hrs
Preheat: Variable area

Wayland Prep: Tool path optimisation

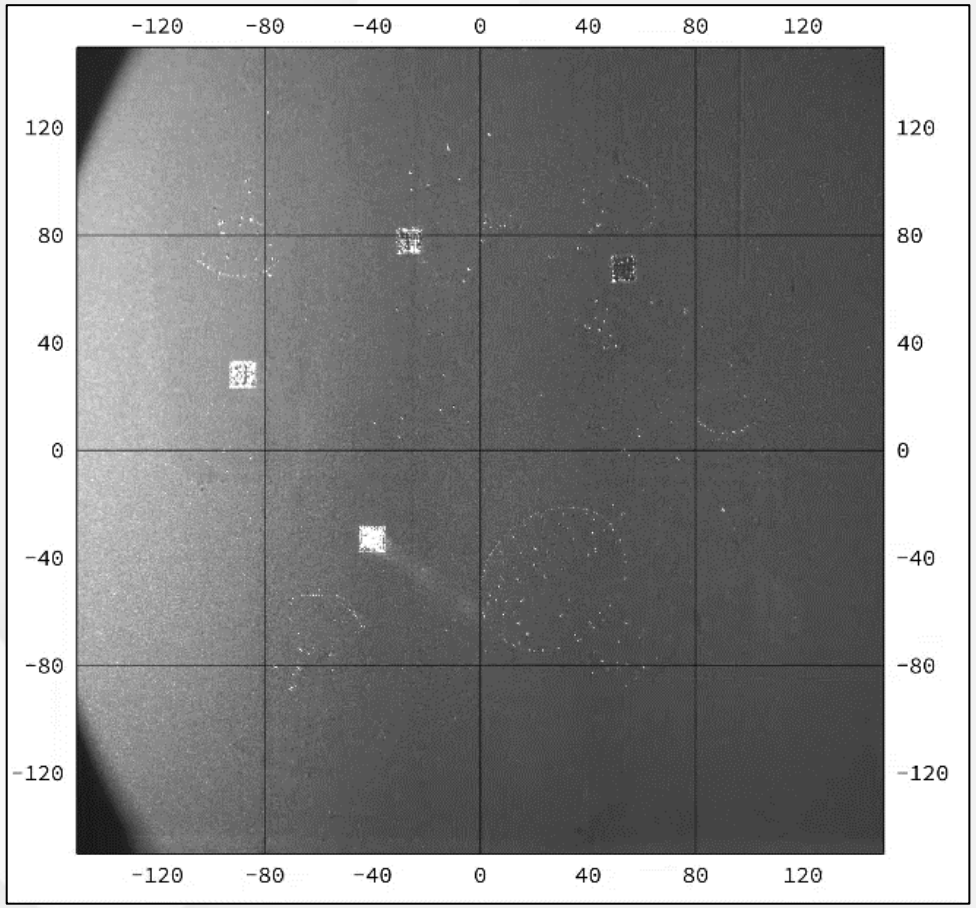


Wayland View: In process monitoring by IR camera

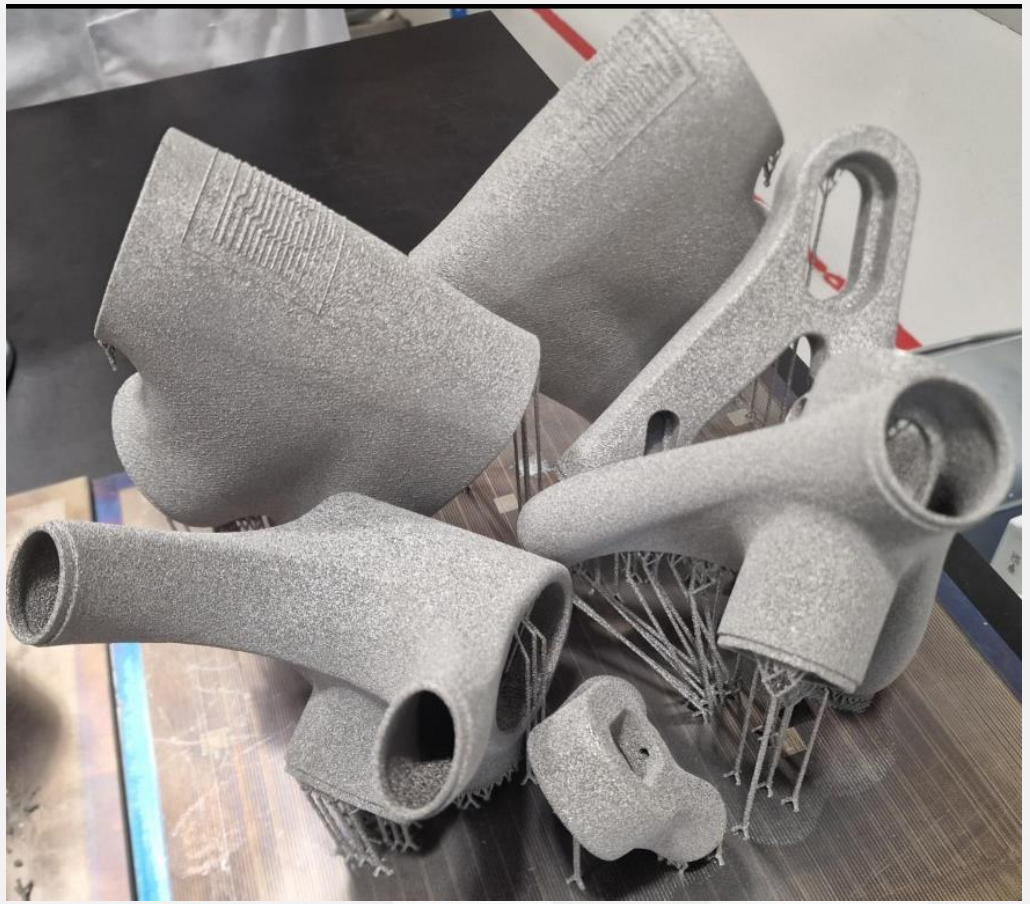


Wayland Build: Tool path and In Process Monitoring

Wayland View: In process monitoring by SLS camera

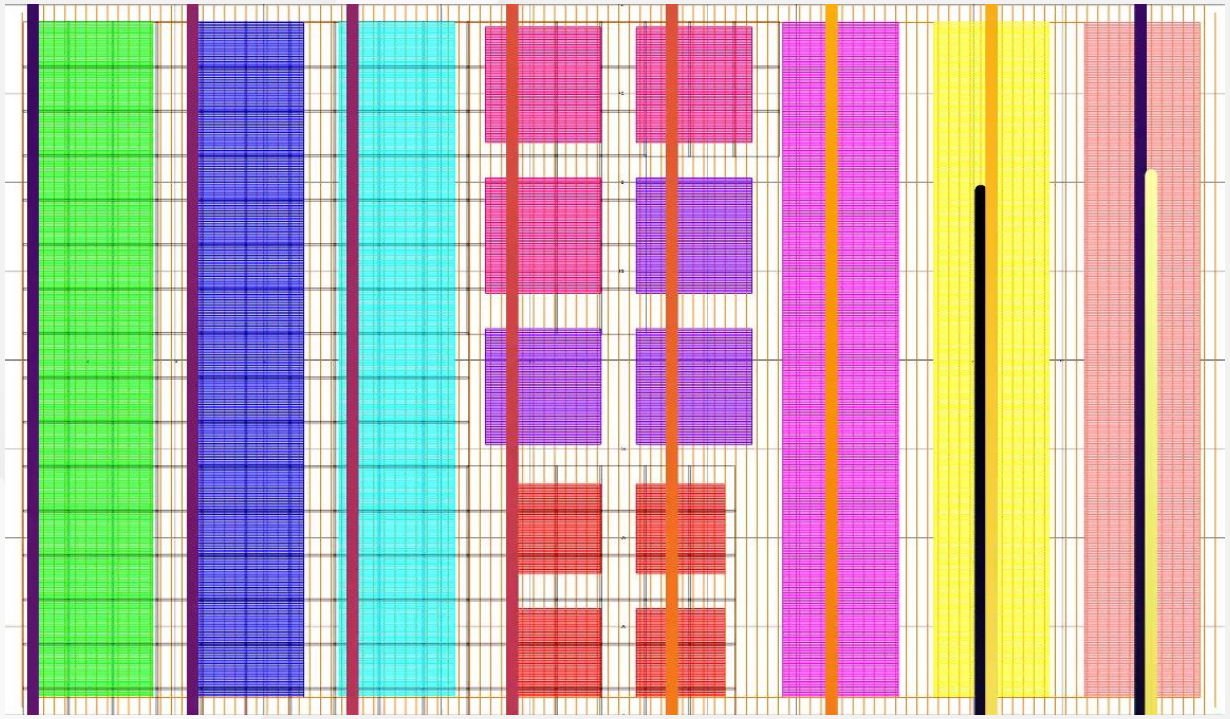


Final build parts



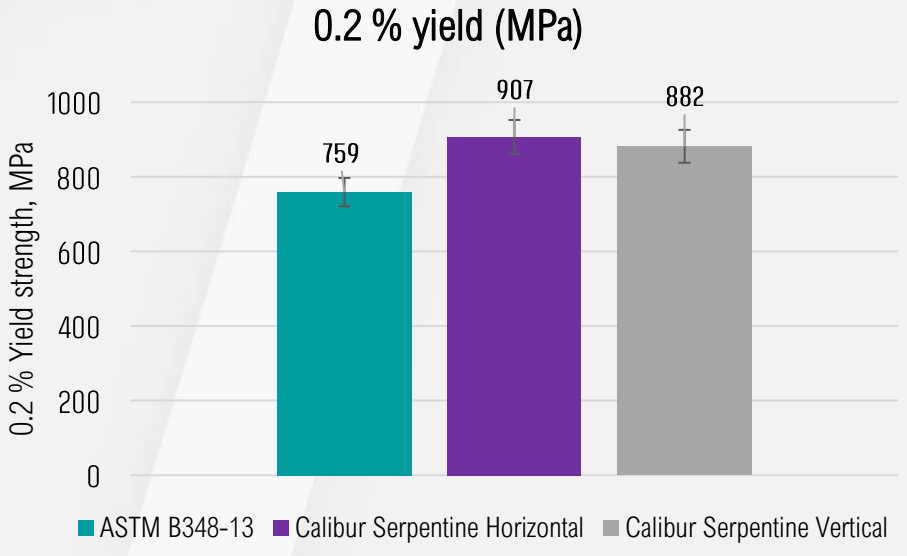
Material properties: Ti 6Al 4V

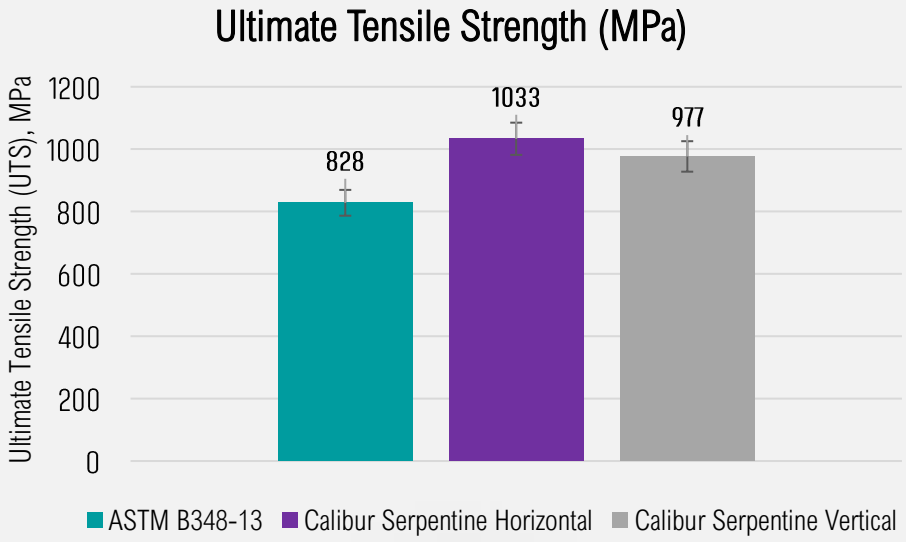
Tool path

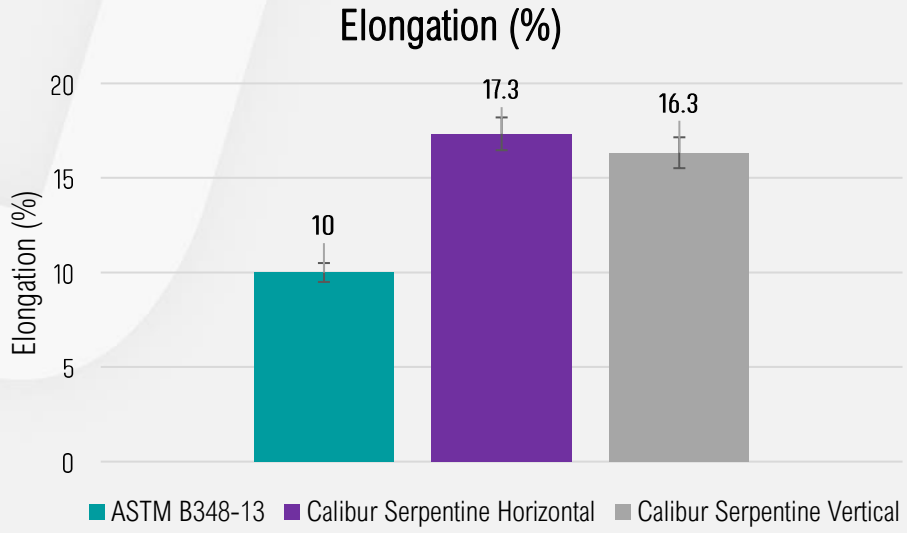


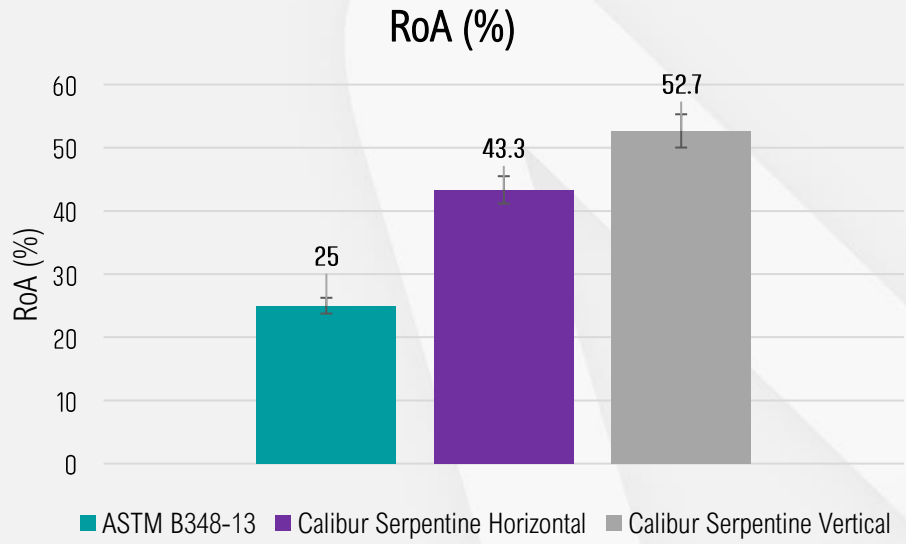
End of build layer

Material properties: Ti 6Al 4V









Advanced Manufacturing Process

- Our advanced manufacturing process is to involve integrated machine learning (ML) into the in-process monitoring system (both Infrared Camera and the Structured Light System) in order to enhance real-time process control to detect the defect and optimise the process.

- These ML models can identify the build patterns and anomalies, reducing downtime and improving efficiency.

Future Material Innovation: Expansion of material options

- Tungsten
- Molybdenum
- Vanadium
- CPM420V
- Duplex Steels
- High Carbon Steels
- Copper
- CM247
- Ceramics

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Thank you for listening!

Questions or comments are welcome

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