equispheres

Collaboration in materials for Additive Manufacturing

Space Tech Expo USA – May 2023

What the future is made of.

equispheres.com

Evan Butler-Jones, P.Eng

VP – Product and Strategy

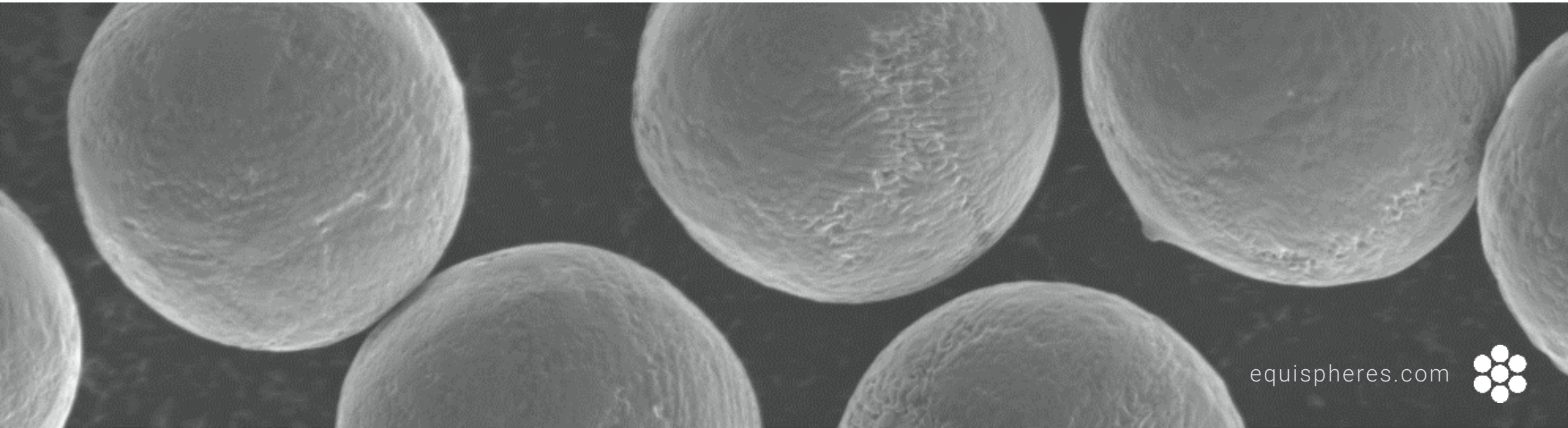
Evan.Butler-Jones@equispheres.com

www.linkedin.com/in/evan-butler-jones

Who We Are

Equispheres mission is to enable mass production with Additive Manufacturing (AM) through advancing materials technologies. We design and produce metal powders tailored to improve performance in AM.

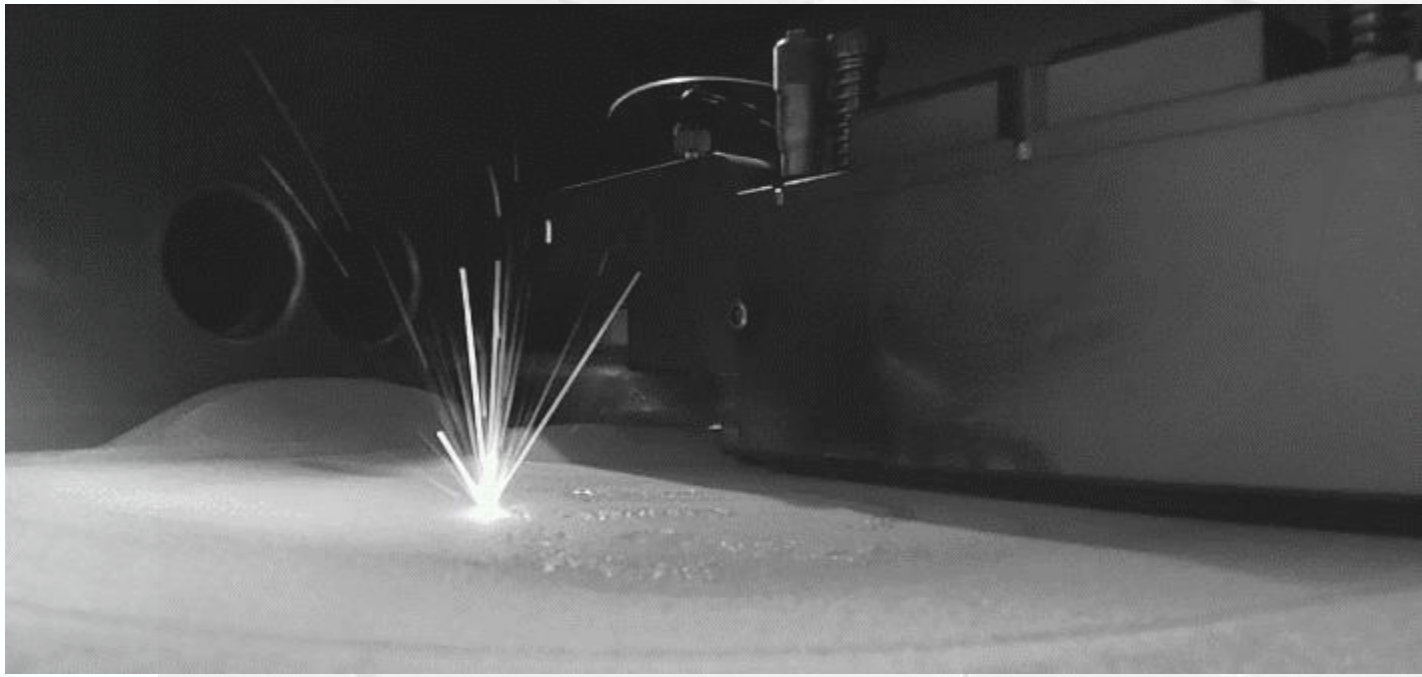
- Focus on aluminum alloys
- Offer powder and applications engineering services



Why Collaboration Is Key For AM Success

Goal:

Achieve design performance targets and complete production qualification with highly repeatable results

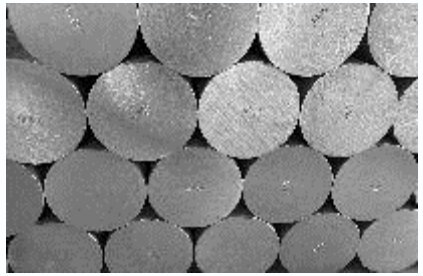


“Making the material with the part”

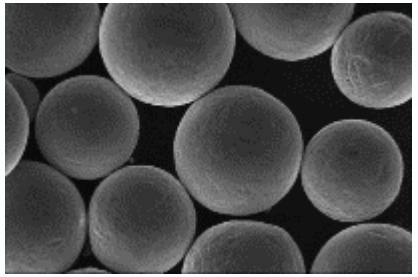
Material/Alloy Selection Is Just The Beginning…

End part properties are defined by interaction of ALL of the below

Alloy selection

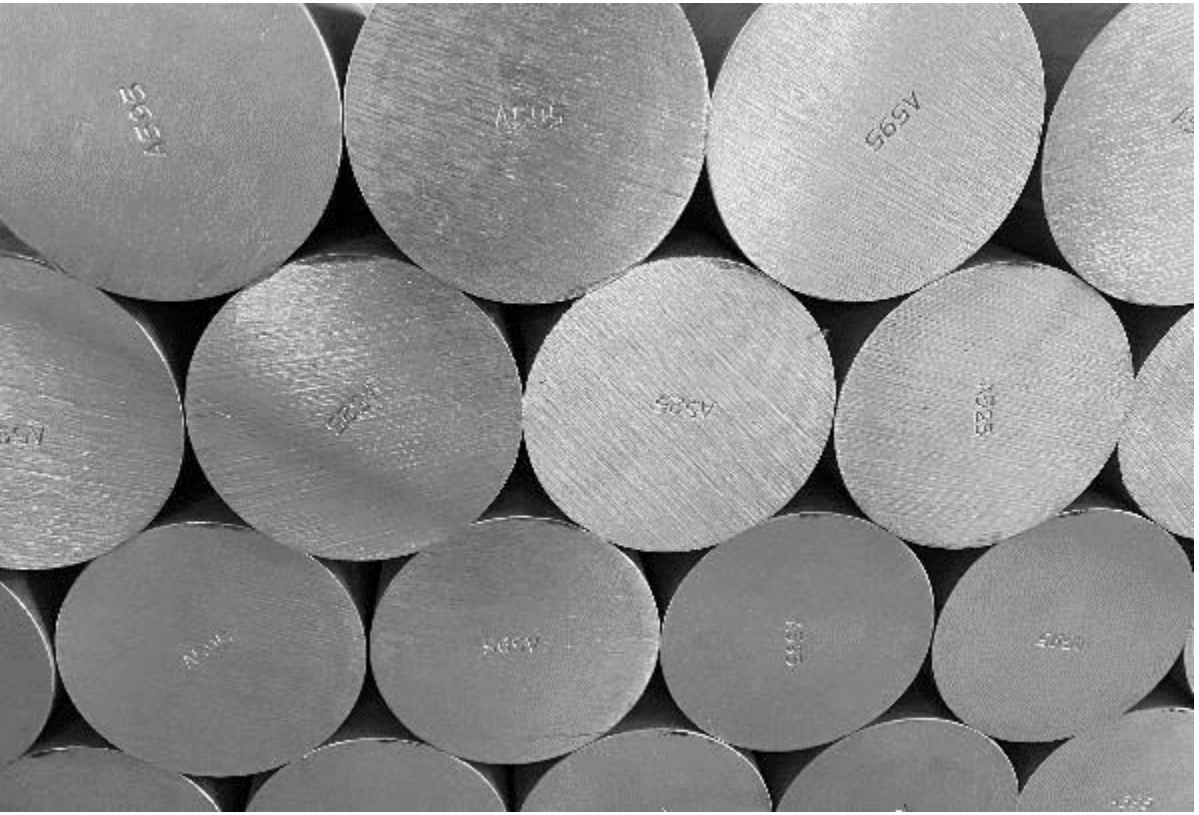


Powder design



Process design

Alloy design & selection



Define the possible part performance

- Mechanical, thermal, corrosion/ surface treatment, & electrical conductivity…
- MMPDS Handbook will include AM properties in volume 2

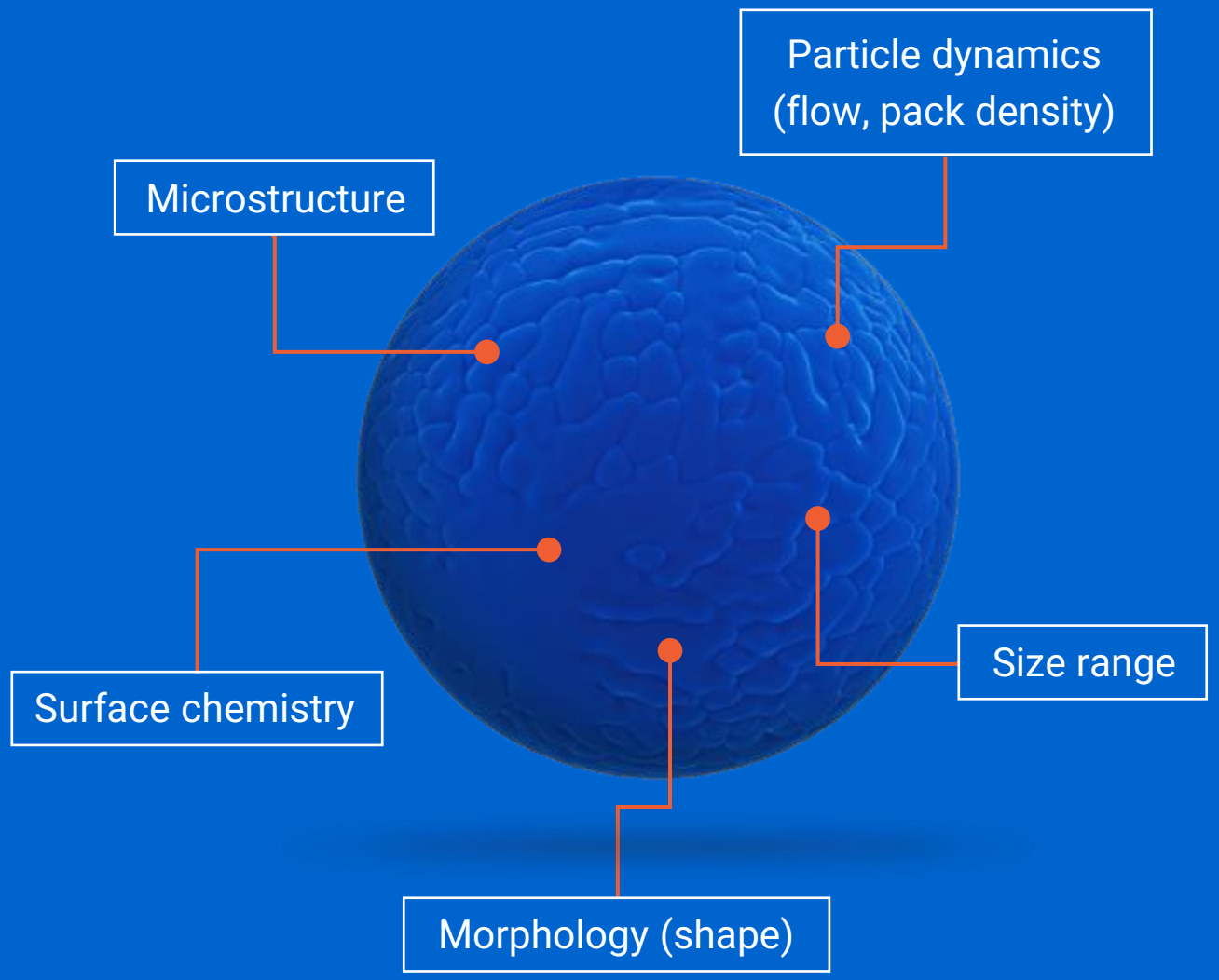
Alloy selection defines the basic requirements for downstream processing

Tradeoffs between well established alloy families and new alloys optimized for AM

Powder Design

Application drives powder requirements

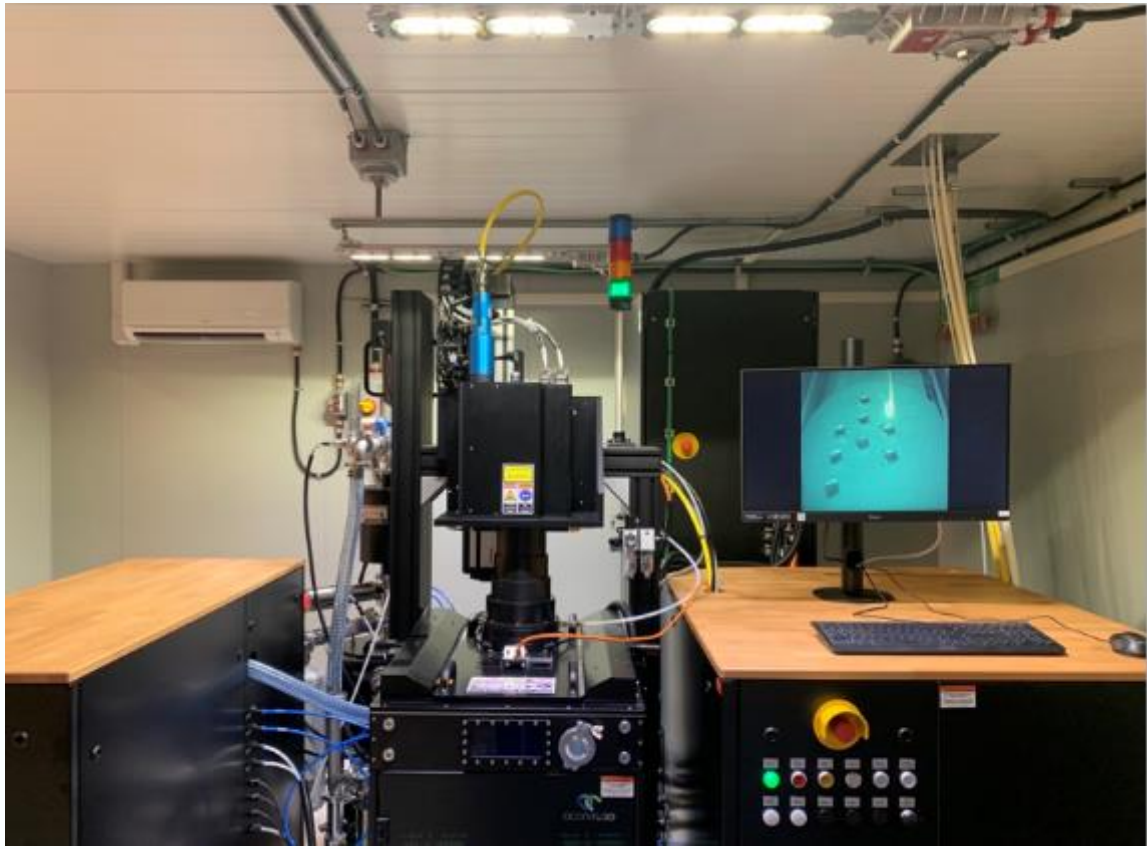
- End-use part (features & geometry)
- Technology (L-PBF, DED, Binderjet…)
- Machine (laser power, spot size, gas flow)
- Alloy (volatiles, reactivity)
- Handling and storage



Powder, printer and process interaction

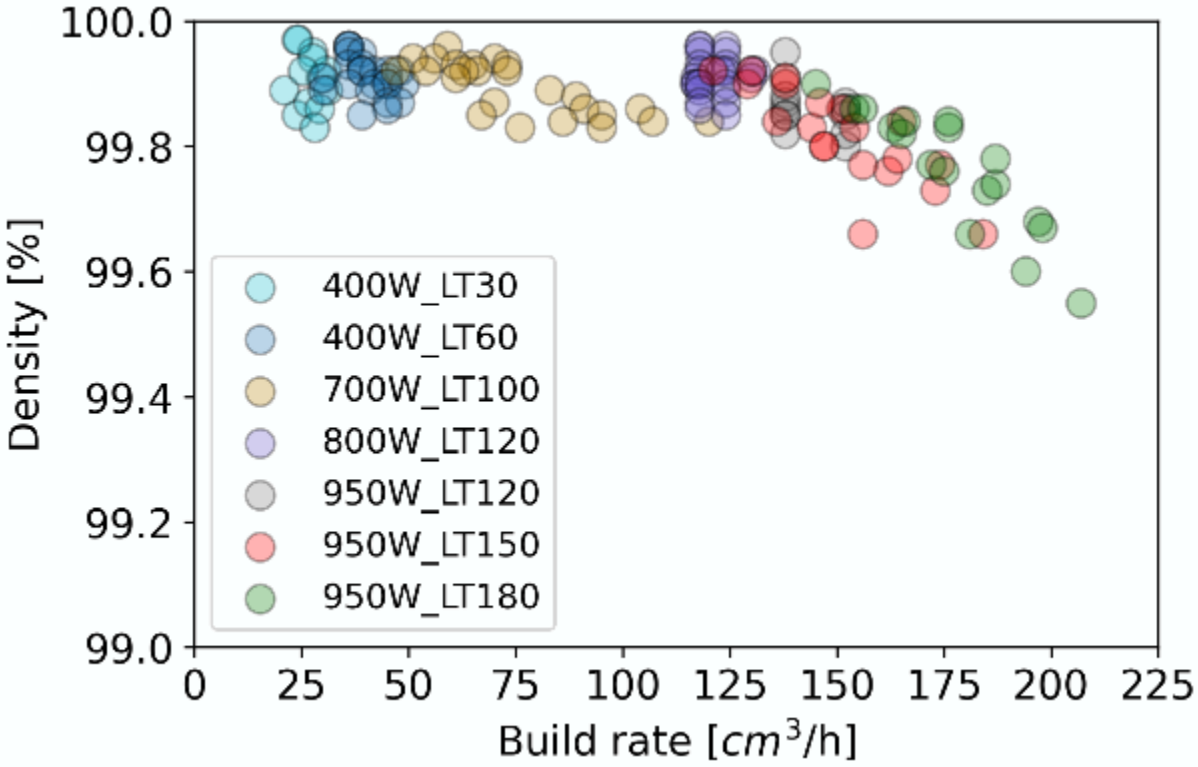
Interaction defines

- Average and statistical mechanical properties
- Dimensional accuracy
- Surface roughness
- Heat treatability

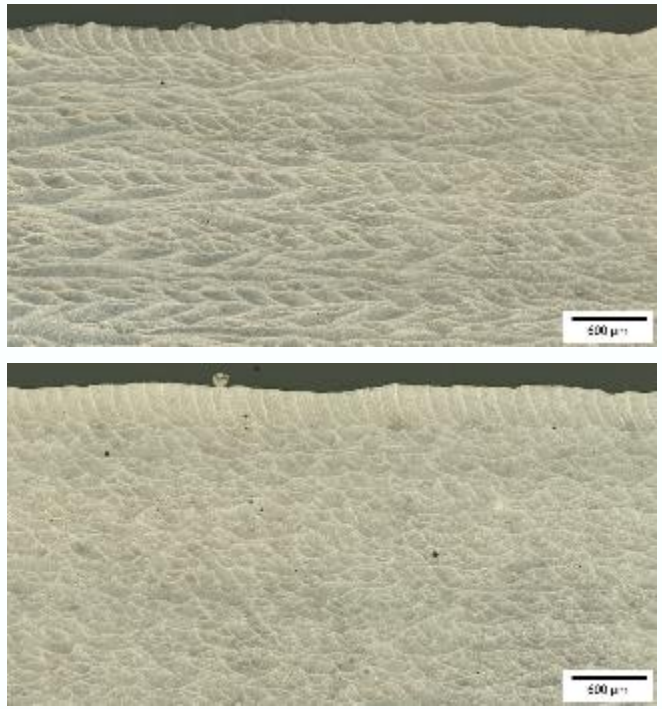


Build process defines “as-built” part properties

Build process impacts part density



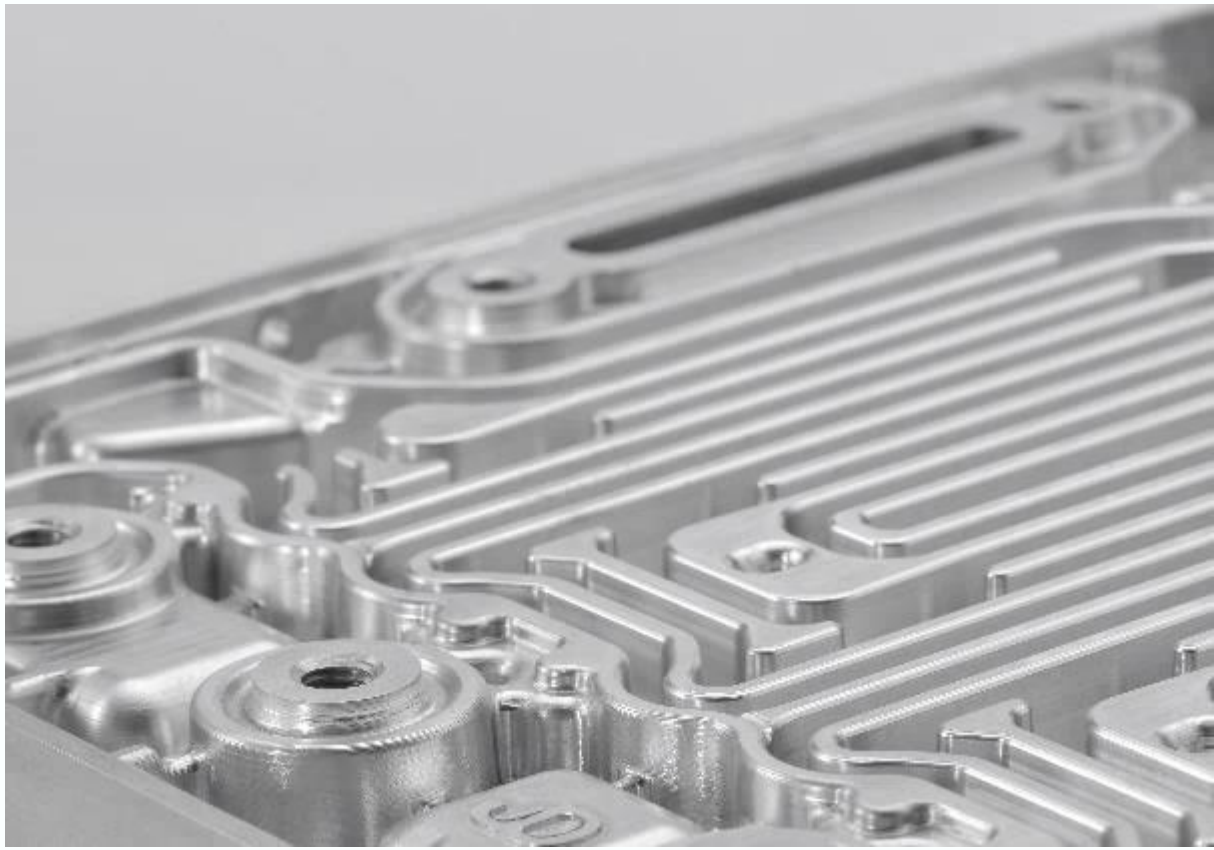
Build process impacts microstructure



“Post” process – heat & surface treatments + machining

How does material respond to…

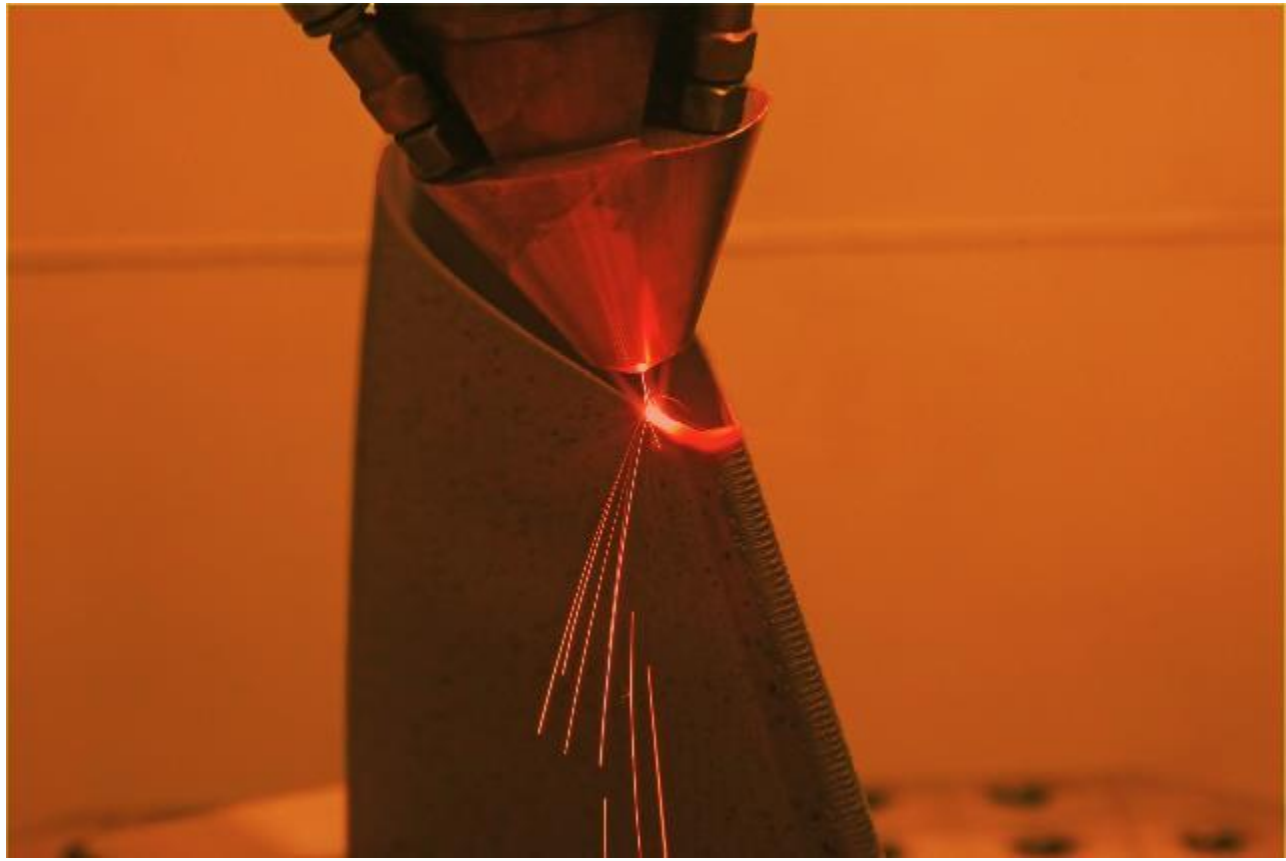
- Heat treatment
- Polishing and machining
- Surface treatments
  (corrosion coatings, anodization, etc.)



Where does collaboration come in?

From initial conditions to continued delivery

- Reduce initial development time through existing datasets and shared expertise
- Establish the process controls for continued production
  - Alignment of testing & QA methodologies
  - Testing standards
  - Statistical variations



NExP-1 Advanced Powder Design at Work

Non-Explosible, Non-Combustible printing media for AM

Manufacturers are challenged with storage limitations, handling restrictions for large quantities of aluminum alloy powder.

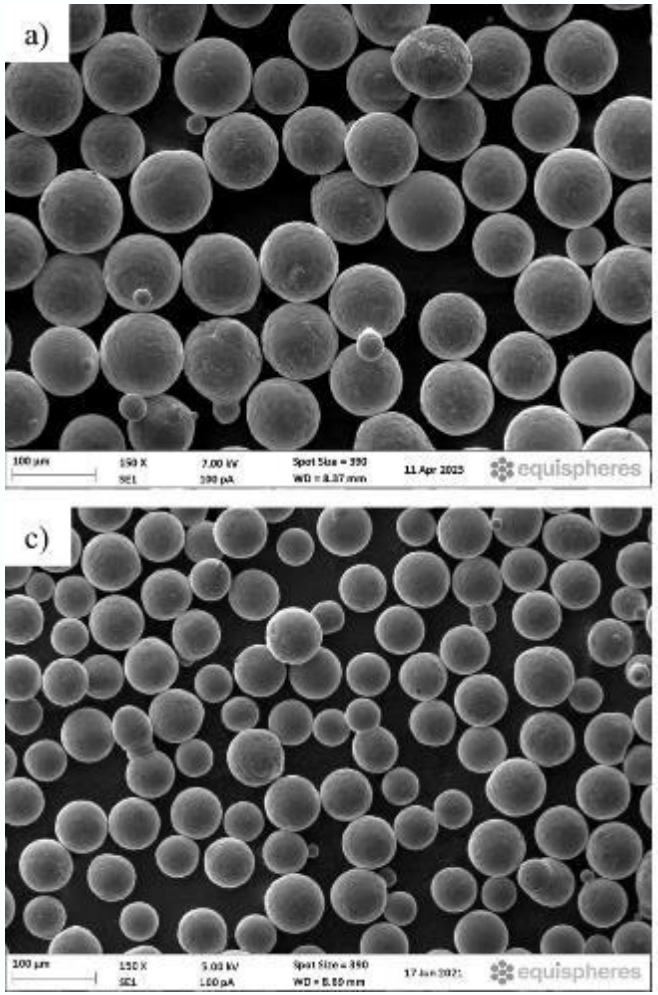
Eliminate Major Barriers in Metal AM

- ✓ Reduce infrastructure costs
- ✓ Reduce operational hazards
- ✓ Reduce material contamination

NExP-1 Powder Design

- Applications requiring medium-to-high productivity, with moderate surface finish requirements
  - Eliminate fine particles
  - Avoid use of coatings or change in overall chemistry
  - Engineered surface properties - particles cannot propagate an explosion

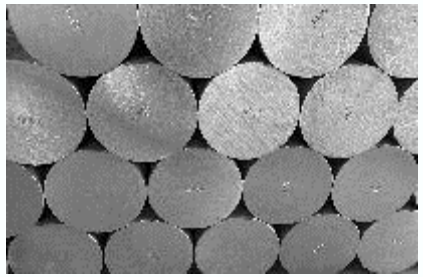
Achieved a non-explosible powder that provides excellent print results under a wide range of conditions



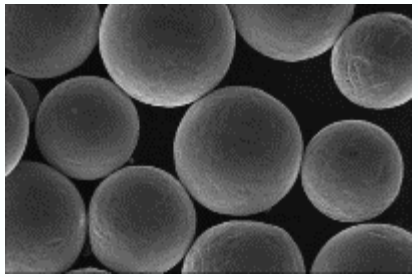
Collaborating for improved materials knowledge

- Qualification requires deep understanding of material behavior from start to finish
- Customer-supplier relationship is critical to ensuring both initial material selection and ongoing process controls

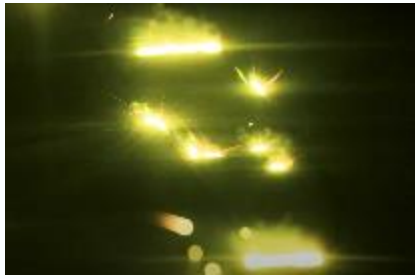
Alloy selection



Powder design



Process design



Thank You

equispheres

© 2023 Equispheres. All rights reserved.

What the future is made of.

equispheres.com