

# METAL ADDITIVE MANUFACTURING CONSULTANCY

Lucideon has been on the cutting edge of this developing technology since its inception. Additive Manufacturing (AM) and specifically, Metal Additive Manufacturing, has been evolving at alarming rates with the development of new equipment, methods, suppliers, powder sources, post-treatment processes and resource centers. Lucideon has maintained a role at all levels of development and has formed networks and relationships with all the manufacturers and most of the users in the industry.

Lucideon provides a unique metallurgical perspective on these issues and can offer solutions to expedite your progress and avoid common mistakes. No matter where you are in the AM world, Lucideon can help you resolve any material issue you might be experiencing. Whether you are in the design, prototype manufacturing, validation and testing, or even market launch stage, we can help resolve issues and formulate solutions.

## DESIGN STAGE

- Should you get involved with AM?
- What are the risks in terms of performance trade-offs compared to conventional manufacturing routes?
- Which AM method should you evaluate?
- Should you buy your own machines or use an outside vendor?

We can evaluate your current components and production methods and help you decide if AM is appropriate and then which AM method is right for your applications. We have extensive experience with all available methods including: laser methods such as DMLS, DMLM, SLM and others, E-Beam methods such as Arcam's EBM, the LENS directed energy methods, and recently Binderjet printing. We understand the advantages and disadvantages and, more importantly, limitations of each of these methods.

## MANUFACTURING STAGE

- How and where to get parts made?
- How to handle the numerous and complex processing issues
- What powder sources to use and what specification should you demand?
- How to clean and post-process components?

We have assisted with the development of procedures and internal standards and specifications. We have assisted through intrinsic knowledge combined with Design of Experiments approaches (DOE's), assessing powder sources, powder recycling issues and the application of post-processing operations. We have extensive experience with the effective application of cleaning methods and have thoroughly assessed the benefits of Hot Isostatic Pressing (HIPing). We have also established a network of global resources to directly address processing issues.

## VALIDATION & TEST STAGE

- What tests should be performed to validate parts and what does “good” look like?
- Where should test specimens be placed on the build?
- What existing standards can be applied and are they really relevant?
- How to correlate test results to processing parameters?
- How to assess the effects of post-processing treatments?
- What to do when things go wrong?

We have the extensive metallurgical experience to deal with all of these issues and more. Every day we experience new problems and run into a new material challenges related to MAM. We formulate and implement appropriate test plans and evaluate the results based on the client’s requirements, and we are also members of the relevant ASTM and FDA committees on AM. As test samples fail to meet specifications, we perform failure analyses and investigations to resolve the issues. Issues from the original powders, to powder recycling, processing issues and the improper application of post-processing methods such as stress relieving, heat treatment and HIPing are all common, and whilst the perfect, reliable solution has not yet been found across the AM industry, we can help you make your way towards it.

## PRODUCT LAUNCH PHASE

- How to design a quality assurance program across builds, machines, locations, etc.?
- How and what to test to ensure your product is performing consistently?
- What to do when things go wrong?

Even as components are being manufactured for sale and use, problems still arise. The implementation and monitoring of effective quality programs with such a new and developing technology continues to be a challenge. Supply chain issues from powder suppliers to post-processing services such as HIPing continue to be a challenge. Maintaining quality is critical and we have assisted clients with setting up the monitoring required to ensure parts have the upmost quality. Again, when things go bad and components fail, Lucideon has the experience to handle the issues and resolve any material problem involved.

All in all, Lucideon’s AM experience and an independent, objective position in the industry offers a unique set of services to anyone involved with AM. We can help with any material problem and can resolve issues in a timely manner to assure success.