



# Design for AM Metals Turning Design into Reality





## Design for AM Metals Turning Design into Reality

This metals themed online event will explore metals for additive manufacturing in the context of the following calls:

- What challenges do we have in developing powders, what value add do varying processes bring?
- How do we add value across the AM metallic value chain? Does that lower the financial bar to get started with AM?
- MatfAM - making the process work for your material.
- What does industry want? How do we help get them there?





### **Key Research Theme Leader**

**[Robert Higham](#) Head of Centre for Advanced Manufacturing at the University of Bolton**

Robert Higham has worked across motorsport, space and aerospace. Robert was responsible for qualification of materials, processes and parts produced by additive manufacturing most recently for Airbus before creating Additive Manufacturing Solutions Ltd (AMS). AMS was designed to bring aerospace grade qualification, validation and operation capability to all corners of industry and at its core aims to support the industrialisation of additive manufacturing. AMS' most notable clients include The Barnes Global Advisors & MIT. Alongside AMS Robert has worked at the University of Bolton for 5 years where he currently heads up the Centre for Advanced Manufacturing.

Robert is a father, husband, chartered engineer, PhD candidate and is passionate about supporting the growth of metallic AM in the UK and abroad.

### **Live session**

MatfAM reasoning and needs for more development of the processing of metals, Questions & Feedback.

### **Talks**

CfAM process analysis/parameter optimisation

### [Duann Scott 3MF Consortium](#)

Duann is founder of Bits to Atoms, an additive manufacturing consultancy, founding editor of the DfAM Substack, Executive Director of the 3MF Consortium and is also involved in MIT's AM programs both teaching the AMx course and managing partnerships for the Center for Additive and Digital Advanced Production Technologies.

Duann previously held leadership roles at nTopology, Autodesk and Shapeways.

### **Talk - 3MF and its benefits for Metal AM**





### Jimmy Campbell Plastometrex

Jimmy Campbell is the CTO of Plastometrex, who provide novel mechanical testing solutions for metallic materials. Jimmy has a Ph.D. and undergraduate degree in Natural Sciences from the University of Cambridge. His PhD focused on experimental and computational development for the PIP method, which extracts full stress-strain curves (including yield stress and UTS) from a simple indentation test. He has published more than 15 papers in scientific literature, including one identifying a fundamental flaw in an analytical calculation used extensively in the indentation community, is the co-inventor on 3 patents and co-author of a book titled "Testing of the Plastic Deformation of Metals".

#### **Talk title – Anisotropic analysis of PIP**

'Profilometry-based indentation plastometry (PIP) can be used to determine the stress-strain characteristics of metallic materials from indentation testing of a small, localized area. It is currently very well suited for testing on isotropic, fully-dense and homogeneous materials. The procedure uses the residual indent profile and an (accelerated) iterative FEM simulation of the indentation process. The plasticity parameters in a constitutive law (within an indentation finite element model) are repeatedly changed until optimum agreement between measured and predicted residual profile shapes is obtained. The technique characterises the full uniaxial stress-strain relationship, including the yield stress and ultimate tensile strength.

This talk will explain the fundamental science behind the testing technique and explore some of the benefits and issues for it to be applied to additively manufactured materials.'

# Feedstock

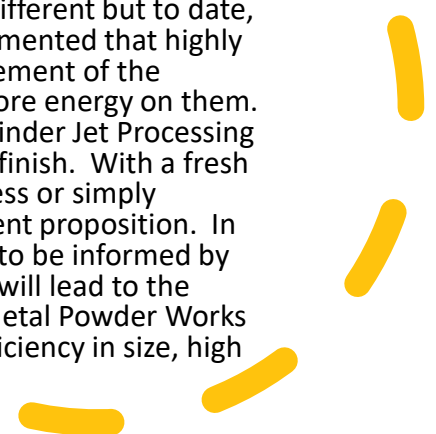


## John Barnes Metal Powder Works

John is the Managing Director of The Barnes Global Advisors and the CEO/Founder of Metal Powder Works. John has a 30+ year career in product development and aerospace with Honeywell, Lockheed Martin Skunk Works™, Australia's CSIRO and Arconic. He's been involved in metal additive manufacturing throughout this career, beginning in the late 1990s when he was part of the Sandia National Labs LENS™ CRADA. Since then, he has been in and around AM, working both technical and business cases for implementation and development efforts in materials, powders, processing and printing to mature the technology for applications. John is recognized internationally for contributions to additive manufacturing, product development and leadership in engineering. His team boasts world firsts in medical, therapeutic and aerospace additive manufacturing. John stood up the AM research group at the CSIRO. John is a Materials Engineer by background but has developed expertise in manufacturing, airframe structures, gas turbines and low observables.

### **Talk - Metal Powder Works Overview of a new Efficient, Consistent and Sustainable Powder Production Method**

Requirements for powders for Additive Manufacturing (AM) are not well understood or documented. Typically, most people only mean Powder Bed Fusion (PBF) and leave out sintering based methods, deformation based methods like cold spray or large fusion processes like Directed Energy Deposition (DED). The characteristics of the powder for each process is different but to date, only atomized product has been available which is a compromise. It is well documented that highly flowing powders flow highly, meaning that little energy is required to cause movement of the powders. This is well and good if you move the material and then never exert more energy on them. Of course, in AM, energy is then exerted via a laser in PBF and via the binder in Binder Jet Processing (BJP) causing denudation to occur and contributes to spatter and overall surface finish. With a fresh look at whether requirements are truly requirements of the manufacturing process or simply characteristics of controlling the atomization process, we might arrive at a different proposition. In this presentation, we will examine how our view of powder requirements needs to be informed by the downstream manufacturing process and how global atomization installation will lead to the growth limitations in AM unless new methods and requirements are adapted. Metal Powder Works has launched a new method for manufacture of powders which has very high efficiency in size, high consistency in shape and almost no CO2 emissions.





## Feedstock



### Nick Weeks Carpenter Additive

Nick Weeks is the Plant Manager at Carpenter Additive. In his role, Nick oversees the daily operations of Carpenter Additive's state-of-the-art metal powder manufacturing facility in Liverpool, UK. The Liverpool site runs two atomisation units and is responsible for the European and Asian sales market. Nick ensures operational excellence and inspires the team to action, driving the future of additive manufacturing.

Nick is a Chartered Engineer with the IET and read Engineering with Business Management at Birmingham University. Formerly the Technical Director of Carpenter Additive, Nick has worked in many different roles, building on his experience in aerospace materials and manufacturing from Rolls-Royce PLC in his early career. In recent years, Nick won the IET Sir Henry Royce Young Engineer of the Year Award for outstanding influence in the workplace over the last three years. He has been involved in a variety of technical committees in Singapore and supports the global movement Engineers without Borders.

Nick's love of engineering is rooted in his desire to be involved in complex problem solving and see his projects move successfully from concept to production. Nick is helping Carpenter Additive to shape today's world and transform tomorrow with each new industry breakthrough.

### **Talk - Materials for Additive, a powder producers view**

Challenges in yield, economic value of AM powders and overview of GrCop. Discuss wire?

## Processing Options



### Ian Brooks Additure

Ian Brooks is technical director at Additure. Additure are supporting the technical growth of a variety of AM equipment in the UK and are subject matter specialists in AM equipment manufactured by SLM Solutions & Gefertec.

Ian has worked in AM for over 10 years at machine OEM's, catapults and now at Additure and brings a wealth of experience across AM needs by industry and how to match the needs with product.

**Talk - Overview of applications today and the future trends for wire-based products.**

WAAM applications, future, reasoning and expectations.



## Processing Options

### [Richard Mincher](#) FORG3D

Richard Mincher leads FORG3D as they develop large format exotic metal 3D printing. Currently focused on how they can qualify an AM process to replace traditional forgings. FORG3D is replacing the traditional forging process for Titanium and other exotic metals with an additive manufacturing (AM) solution. Reducing carbon footprint and waste whilst allowing for new designs, we are changing manufacturing for the Aerospace, Space, and Defence sectors.

**Talk - Overview of opportunities and recent developments.**

WAAM applications, future, reasoning and expectations.



## Processing Options

### Jason Gilmore Airbus Defence & Space

I am the nominated AM Expert for Airbus Defence and Space. I worked on the first ever ESA funded AM study in 2007. Since then I have designed many flying parts, qualified new materials and processes and presented at numerous conferences over the last 16 years.

An innovative and highly technical leader, who's most recent achievements include winning the Astrium 'Great Innovator' award in 2013, a finalist for the Airbus 'Hall of Fame' awards in 2014, and nominated for an Airbus 'Award for Excellence' in both 2015 and 2017. In the 2022 innovation campaign my submission was in the top 3 ideas from 199 entries.

I have significant mechanical design, stress and thermal design experience whilst maintaining astute commercial awareness to generate cost efficient designs.

**Talk - What does industry need?**





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