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Large Format Applications for Cold Spray Additive Manufacturing

Speaker: Jeremy Schreiber

Organization: HAMR

The low-cost, high build rate, near-net-shape capabilities of cold spray additive manufacturing (CSAM) make this an attractive technique for large format components. This presentation covers experience in design, manufacturing, and testing of CSAM components for sea and land-based large format applications. Emphasis will be placed on the roles of design for additive manufacturing on printability, as well as integration of process monitoring and predictive modeling for qualification pathways. The talk will finish with extension of these concepts to future components and broader maritime, air, and space applications for CSAM.

Unveiling Weld Bead Dynamics: Imaging of Wire Arc DED Process

Speaker: Tyler Dolmetsch

Organization: Florida International University (FIU)

Understanding the intricate dynamics of weld bead deposition and evolution in the Wire Arc Direct Energy Deposition (Wire Arc DED) process is crucial for enhancing process efficiency and product quality. In this presentation, we explore the utilization of advanced imaging techniques, high-speed and thermal cameras, to record the Wire Arc DED process in real-time. By synchronously capturing both high-speed and thermal data, we aim to unravel the fundamental mechanisms governing the deposition and evolution of weld beads over time. Through comprehensive analysis of the recorded data, we seek to elucidate the interplay between heat transfer, material deposition, and morphological changes occurring during the welding process. Insights gleaned from this study hold significant promise for optimizing process parameters, mitigating defects through feedback control, and advancing the capabilities of Wire Arc DED technology for diverse applications.

Challenges in Scalability of Additive Friction Surfacing of Steel

Speaker: David Garcia

Organization: Pacific Northwest National Laboratory (PNNL)

Friction stir-based additive technologies provide a direct pathway to manufacture large-scale components with wrought materials properties. The refined grain and refined secondary phase microstructure provides many benefits which have been readily demonstrated at the research scale. Beyond the engineering and equipment challenges, an understanding of the scientific principles in scalability must be developed to achieve commercial success. This work investigates the challenges in additive friction surfacing of a navy-grade steel alloy with a focus on increasing deposition rates. By systematically studying process inputs (traverse velocity, rod diameter, and tilt angle) and measuring the processing history response (forces, torques, and material flow) a substantial increase in deposition rate and quality is achieved.

ES3 Advanced Manufacturing for DOD Development and Sustainment

Speaker: Shawn Huff & Kelly Smith

Organization: ES3

ES3 is advancing both metal and composite additive manufacturing processes targeted to sustain current aging DoD weapons systems while enabling game changing design and manufacturing possibilities. ES3 is driving AFSD development with the goal to enable rapid forging and casting replacement. As the sole landing gear parts supplier for USAF organically sustained aircraft ES3 can see the seismic change AFSD without graphite will bring to high value low rate production. AM composite manufacturing for DoD structures can only be achieved with proven processes, known material properties, and analysis tools that can predict design success. ES3 is making this reality today.

Implementing Large Scale AM to Resolve Modern Mfg Challenges

Speaker: Alex Michelson

Organization: Solvus Global

The erosion of domestic supply for large metal castings and forgings poses a significant risk to both defense readiness and industry growth. Additive manufacturing presents a critical capability to keep the future supply of large components available. To be a successful alternative to centuries old castings and forgings, additive manufacturing methods need to demonstrate robustness, measurable quality and flexibility to meet the needs component designers. Mammoth Metalworks exists to change the way large metal parts are manufactured. Through implementing large scale additive manufacturing methods, Solvus Global and Mammoth Metalworks have demonstrated the solution for extensible, qualified additive manufacturing capabilities.

A Flexible & Adaptable Additive Manufacturing: Solidstir®-AM

Speaker: *Kumar Kandasamy*

Organization: *Enabled Engineering*

SolidStir®-AM is a novel approach to solving most of the process complication associated with current solid-phase deposition technologies. In SolidStir®-AM, feedstock size is independent of track width, feedstock plasticization is decoupled from deposition. These inherent technical advantages allow the SolidStir-AM to offer better deposition efficiency, low axial force on the substrate and narrower track width to improve feature definition on the deposited components. Because of which the process is adaptable on the conventional machine tools and flexible with feedstocks while requiring no specialized spindle design. This wrought metal deposition technology has potential for widening the application range and commercial viability.

Leveraging Big Data for Closed Loop Control in DED

Speaker: *Zachary Gray*

Organization: *Siemens Industry Inc., USA*

The integration of novel sensor systems and edge-based data-gathering strategies in Laser Metal Deposition (LMD) enhances process stability and enables smart production by collecting and processing data from various sensors. Especially, the monitoring of the distance between the nozzle and the part with an OCT-sensor has been proven to be promising for data-based, real-time process control of the LMD process while producing complex structures.

Titanium Wire Arc AM – Near Miss Lessons Learned

Speaker: *Jeremy Lebowitz & Patrick Grace*

Organization: *Jensen Hughes & Solvus Global*

Novel technologies have the potential to introduce novel hazards. This presentation highlights the WAAM process, and how Solvus Global built upon near miss incidents to improve process safety and reduce fire/explosion hazards by implementing a dust hazard analysis.