Electron Beam Additive Manufacturing

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www.sciaky.com
Introducing Sciaky, Inc

- Located in Chicago, IL USA
- 146,000 Square Foot Manufacturing Facility
- History in Design and Manufacture of Precision Welding Systems
- Contract Service company – Growing in EBW, PAW, and EBAM
Our Experience – EBW Systems

- Custom engineered flexible moving gun designs
- Fully integrated process and CNC motion controls
- Low distortion “keyhole” – high Depth to Width ratio
- Vacuum processing – high purity environment
The Sciaky EBAM Process

- An Electron Beam (EB) serves as the energy source
- The EB is used to create the melt pool using wire feedstock
- Add layers until the desired geometry is complete
- Build new components, add features, or repair parts
EB Additive Manufacturing Process

NC Path Planning

Deposition

Finished Part

NC Machining
Why EB Additive Manufacturing?

- Material savings, 20-75%
- Reduced machining, 20-75%
- Lead time reduction, over 80% possible
- Large system designs + High deposition rates target LARGE parts
- Very efficient, high power (up to 42 KW)
- EBAM uses basic inputs, wire and substrate – plate or round stock
- Engineering designs can be easily modified – tooling is software.
- Vacuum processing is ideal for reactive alloys
- “Off the shelf” part fixturing
Sciaky EBAM Process Controls

Adaptive Thermal Control by way of real time molten pool measurements

Process Benefits that the EBAM process with Closed Loop Controls:
• Bead Geometry Uniformity
• Consistent Microstructure
• Consistent Mechanical Properties
• Chemistry
• Automated and adaptive Real-Time Process Controls
• Automatic Process Variable Acquisition and Recording
Target EBAM Materials

- The best candidates for the EBAM process are weldable, available in wire form, difficult to machine, high value metals.
- Business case for EBAM is currently driven by raw material waste and lead time reductions for high cost, difficult to machine materials such as Titanium and Nickel base super alloys.

Nickel alloys

Titanium alloys

Refractory Alloys

Nickel base alloys
EBAM Wire Feedstock

EBAM metal or alloy candidates:

- Titanium 6Al-4V and ELI grade
- Nickel alloys 718, 625
- Stainless Steel (300 series)
- 70-30 Copper Nickel
- 2319, 4043 Aluminum
- 4130, 4340, P20 Steel
- Molybdenum
- Tantalum
- Zircalloy
- Niobium
- Copper
- Tungsten

Common wire feedstock sizes:
0.045” (1.1 mm)
0.063” (1.6 mm)
0.093” (2.4 mm)
0.125” (3.2 mm)
0.156” (4.0 mm)

Two spool formats available: Nominal 12” O.D. Spool has capacity of 15-35 Lbs, Large spool capacity up to 150 Lbs.
New EBAM Advancements

- Qualification – Shared parameters and mechanical properties databases
- Multi-Wire Feed
  - New Alloy Development
  - Graded Structures
  - Can have two identical or different diameters in chamber to support both small and large bead deposition within single pump down
- Feature Resolution Improvements
- Closed Loop Control Enhancements
- New Geometries
Sciaky EBAM Systems and Services

Our Electron Beam Additive Manufacturing (EBAM) systems bring value throughout the entire product life cycle.

- **Pre-Production:** Prototypes, Initial Production Articles.
- **Production:** Manufacture metal parts with significantly reduced machining time, material costs, and lead time.
- **Post-Production:** Repair or remanufacture damaged and obsolete parts.
- **Equipment Sales:** EBAM-68, EBAM-88, EBAM-110, EBAM 150.
Six Months of Progress with EBAM
Thank You!

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