Purpose: Laser cladding metal powder alloys to enhance, repair, or free-form material geometry for applications in aerospace, power generation, valve, and OEM supplied components. The LAP® process is delivered by a 6 axis robot, 2 axis tilt/turn table with two powder feed nozzle options. The LAP® process can offer positional accuracy while maintaining material quality and metallurgical bonding. This process is also capable of fabricating free-forming alloyed geometries to minimize final manufacturing steps.

Overview:

1. Higher possible deposition rates than LAW® allow processing of larger surfaces economically
2. Lower minimum power input allows cladding on very thin surfaces and edges
3. Smaller penetrations and heat affected zones allow for repairs that would not be possible with LAW®
4. Powder feeding allows for the repair of surfaces that are not physically accessible by LAW® system

Hardware and Mechanical Limits

- KUKA KR30-HA is an 8 integrated axis robot complimented by a 400kg (880lb) capacity tilt turn table
- Two powder feed nozzle options
  - Multijet- Three discrete jets of powder
  - Coaxial- Continuous cone of powder with <0.4mm powder focus
- Two hopper precision powder feed
  - Allows easy transition between two different powdered alloys
  - Alloys powder blending for functional grading or transition layers
- Programmable collimator
  - Laser spot size can be varied by software
  - Cladding varied surfaces on a part with independent parameters
  - Transition layers with independent parameters
  - Creating tapered edge buildups, such as vane leading and trailing edge
- Fully integrated turnkey system with training and installation
- 2000watt max, 20watt min
- Capable of a minimum powder groove of 3mm x 0.3mm
- Practical powder groove diameter of ¼", capable of achieving 2/10" with special attention to rotary speed
- Laser sources can be both continuous wave and pulse delivery

Accuracy

- Positional accuracy: 0.03-0.04" or 1% of largest linear movement
- Laser power accuracy guaranteed to 5% with stability under 1%
- Rule of thumb: Use as large a spot size as possible for best efficiencies (but dimensional accuracy will decrease and the microstructure will coarsen)

Material Capabilities

- Preferred powder deposition rate of 43mm^3/min
- Able to achieve varying surface finishes through adjustments to powder particle size and carrier gas
- Surface finish varies with powder size and carrier gas
  - Reduced particle size improves finish, but carrier gas spreads fine particles more widely than coarser particles
    - Leads to a decrease in collection efficiency
- Experienced with Inconels, Stellite, Stainless Steels, Carbides, etc.
- Successful hardness up to 63HRc