Comparison of Thermal Spray Technology vs. Laser Cladding
Hayden Corporation Background

- Founded in 1919
- Experts in industrial wear and corrosion control
- Providing commercial application of:
  - Thermal spray coatings since 1951
  - Hardface weld overlays since 1974
  - PTA weld overlays since 1988
  - Laser cladding since 2007
Conventional Thermal Spray Processes

HVOF – High Velocity Oxy Fuel

Premium mechanical bond (exceeds 10,000 psi) least amount of porosity and hardest values in the Tungsten Carbide option. Usually used for WC's and Cobalt (Stellite) options.

Arc Wire and Flame spray

Arc-Wire and Flame spray enable for cost effective repair or substantial coating coverage due to thick deposit. Frequently used for Stainless Steel's, Aluminum, Zinc or NiCrB self fluxing alloys.

Plasma

Slightly lower adhesion and more porosity, but is the only process capable of spraying the oxide (ceramic) family due to the heat zone of equipment.

Fused coating

is a post process heating after Thermal Spray processing on self-fluxing powders that can change mechanical bond to alloyed adhesion. Parts must be engineered to tolerate fusing temperatures of up to 2000 degree F.
Process Comparison at Hayden Corp.

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Hayden Laser Services

cost comparison…

- **Manual Welding**
  - Least costly….based same thickness
  - Unmatched portability

- **TS, Fused Overlays**
  - Moderately priced
  - Low cost for performance

- **Laser Applied Overlays**
  - Higher cost
  - High performance usually justifies expense
heat input...

- **Manual welding**
  - Heat is locally high, but contained
  - Heavy bead = large thermal mass

- **Fused Overlays**
  - Extreme heat input, most areas > 1950°F
  - High likelihood of dimensional distortion

- **Laser Overlays / TS Coating**
  - TS-like heat input... bulk heat < 400°F
Hayden Laser Services

minimal net heat...

- Net heat comparable to Thermal Spray
- Max bulk heat < 400°F
Hayden Laser Services

dimensional accuracy...

- **Thermal Spray**
  - Highly accurate, line-of-sight
  - Thickness controlled within 0.002”

- **Manual welding**
  - Least accurate
  - Bead control typically +/- 0.125”

- **Laser Applied Overlays**
  - Comparable to Fused Overlays
  - Thicknesses 0.010” and up
  - Accuracy +/- 0.020” is typical
Laser Applied

Metallurgical bond

Tungsten Carbide

Mechanical bond

Stellite 6

HVOF
Laser or not case study?

400 series SS Medical part

Clad a knife edge with pure copper .025” thick

Present method copper plating

Buyer – We were asked to do this. We have never tried it before. Can you please quote 100 pieces?
Bottom Line

It may be about customer preference. Price may override technical advantages/disadvantages.

It may just be the wrong application of a good technology.

“Latest technology” may override a common cents $$$ decision.

Comfort level may override changing to something new/better/different.
When do you choose thermal spray?

- Thin layer (<.020in)
- High volume – multi fixtured
- Cost sensitive
- Field work (coat onsite)
- Crack sensitive material
- Sliding Abrasion Wear
- Wide variety of material choices
When do you choose laser?

- Thick build up (>0.100in.)
- When metallurgical bond is crucial with low heat input
- Accurate, selective cladding w/o masking
- Near net shape cladding (not rapid prototyping)
- Repair with post process machining
Thank you for your time

Questions or Comments?