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MAINTENANCE
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Laser cladding: a turnkey solution to repair
and resurface rotating parts

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Wednesday October 25, 2023
DOW Centennial Centre - Fort Saskatchewan

Outline

- Castolin Eutectic; Who we are
- Castolin Eutectic technologies
- LaserClad solutions
- LaserClad case studies



Who we are



- ✓ Castolin Eutectic is a global provider of wear management solutions through its products and services
- ✓ Castolin Eutectic's brand trusted by millions of industrial users in heavy-duty and wear-intensive industries
- ✓ Over the course of more than 100 years, we have brought innovative products and solutions to our customers challenging ourselves to extend useful life, reduce maintenance cost and increase industrial productivity.



Castolin Eutectic Offering

Castolin Solutions:

- CDP
- CastoTube
- LaserClad
- CastoChrome
- MecaWear
- EuTronic Arc
- CastoDyn-TeroDyn

Castolin Technologies:

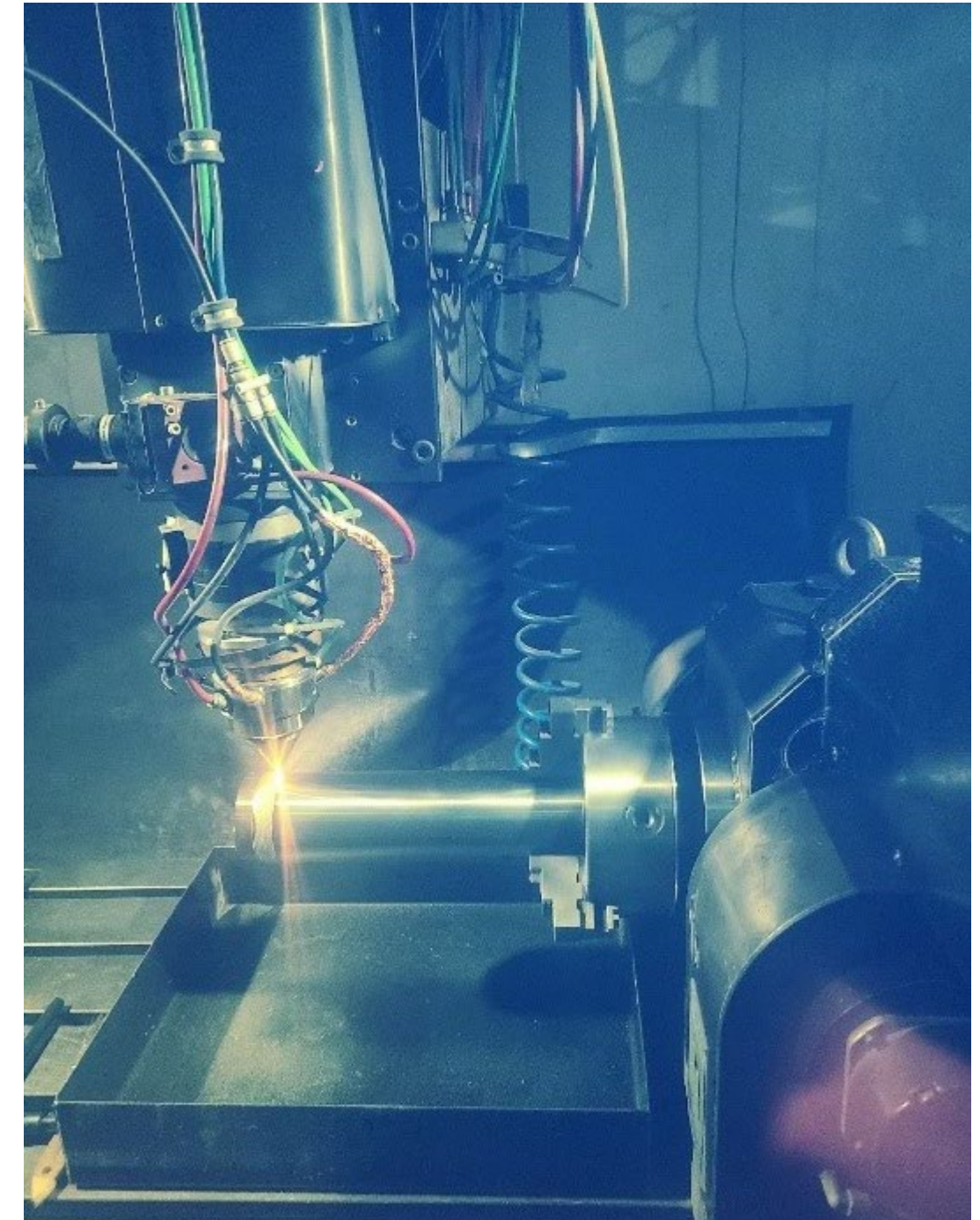
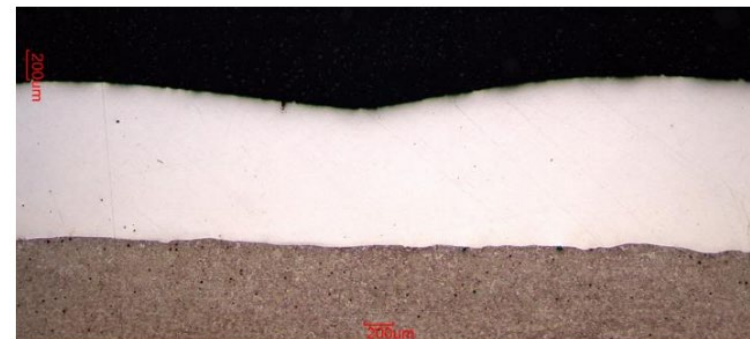
- ✓ Coating
- ✓ Brazing
- ✓ Welding
- ✓ Laser Cladding
 - Powder-Fed Laser Cladding (DED)
 - Wire-Fed Laser Cladding (Hot wire cladding)

LaserClad - Castolin Eutectic's unique PSO to increase part repeatability & component life cycle



What is LaserClad?

- ✓ Laserclad: A method that uses LASER as heat source to melt material for producing a surface layer
- ✓ Unique ability of laser to deliver very high energy/heat on a small spot
- ✓ Heat input from laser can melt almost any engineering material
- ✓ One-step build up process with metallurgical bonding
- ✓ Protection of melt puddle by shielding gas from oxidation and contamination
- ✓ Cladding material being fed to laser in form of either powder or wire

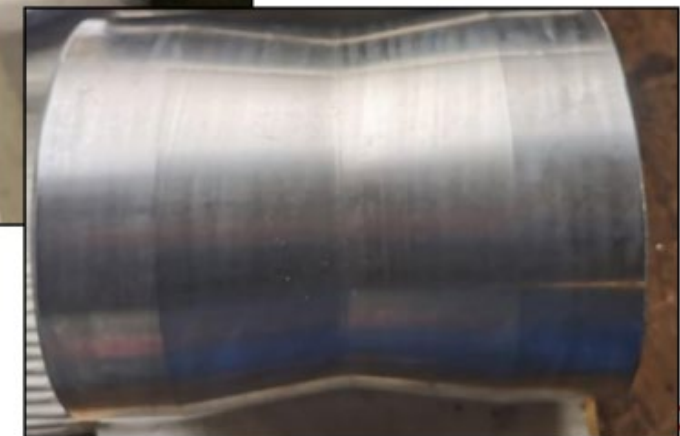


Why LaserClad?

- Metallurgical bonding vs Mechanical Bonding
- Very low heat input and minimum distortion
- Minimized coating/substrate dilution (1 – 10%)
- Higher production rate (DE up to 13 kg/h with MMC coatings)
- Minimized post-weld treatment (finishing) & component stress relieve
- Homogeneous micro-structure through rapid surface solidification
- Part Reproducibility & Performance

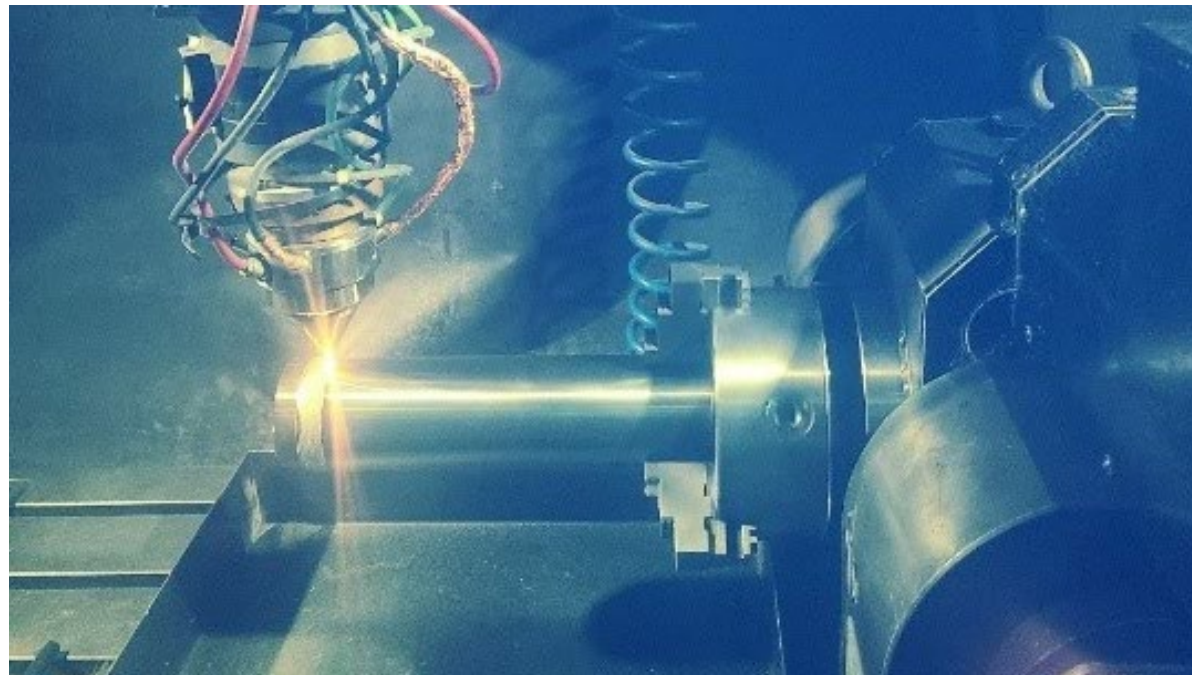


Guiding rollers for the steel industry

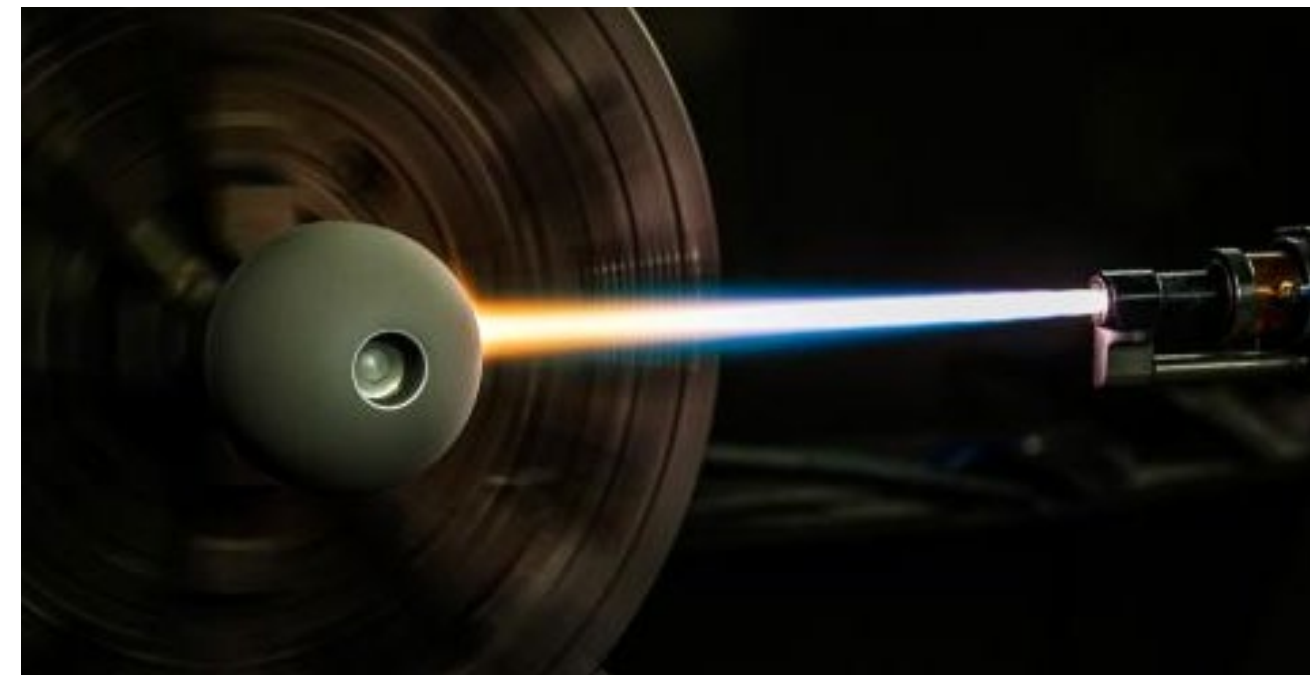


LaserClad in comparison with other repair technologies

	LaserClad	Thermal spray (HVOF)	PTA welding
Operating Temperature (°F)	1000 - 2500	2500 - 3500	50000
Coating thickness (in)	0.01"- 0.15"	0.002"- 0.05"	0.05"- 0.1"
Metallurgical bond	Yes	No	Yes
Finishing required	Minimal	Some	Some



LaserClad

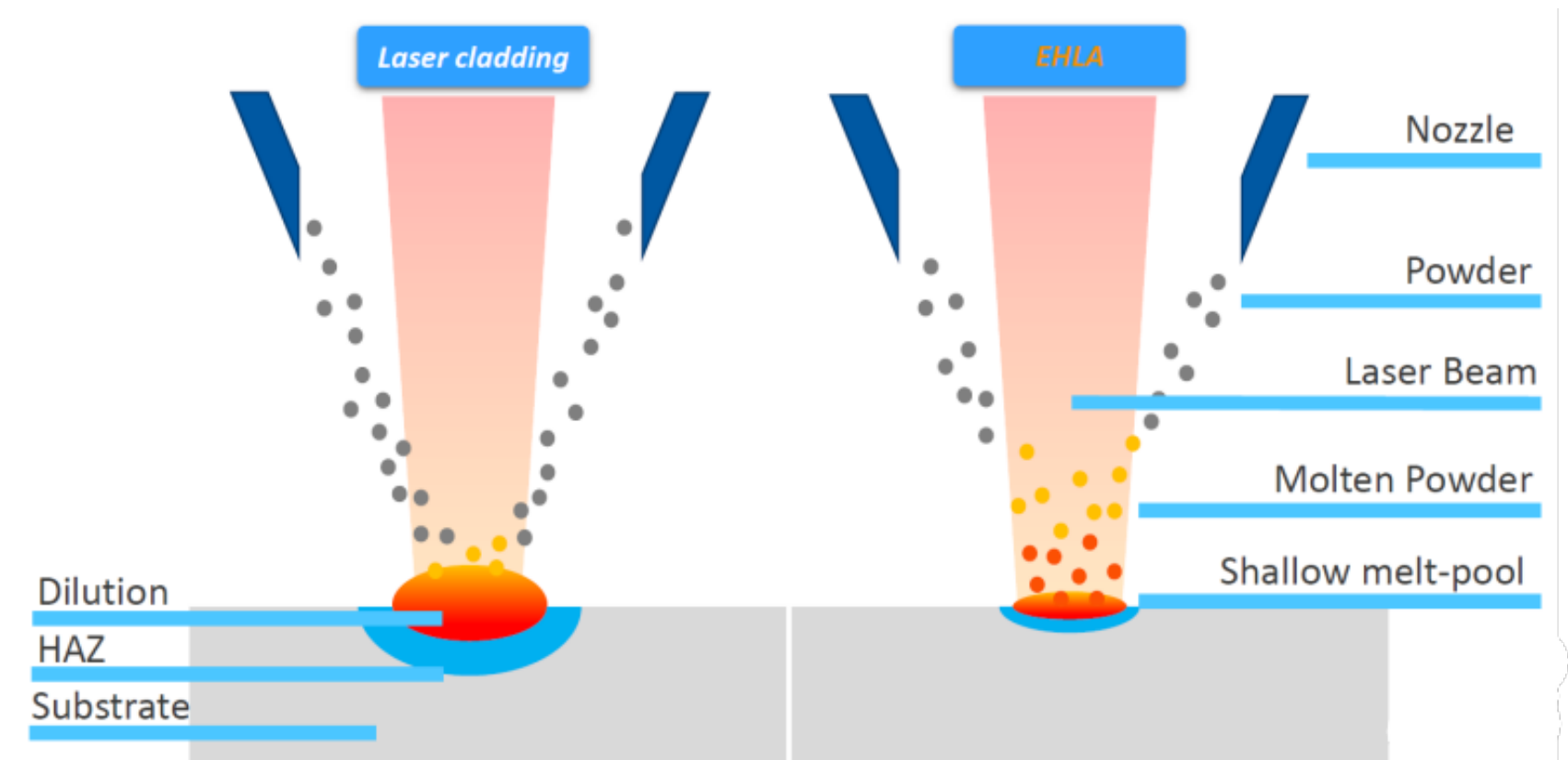
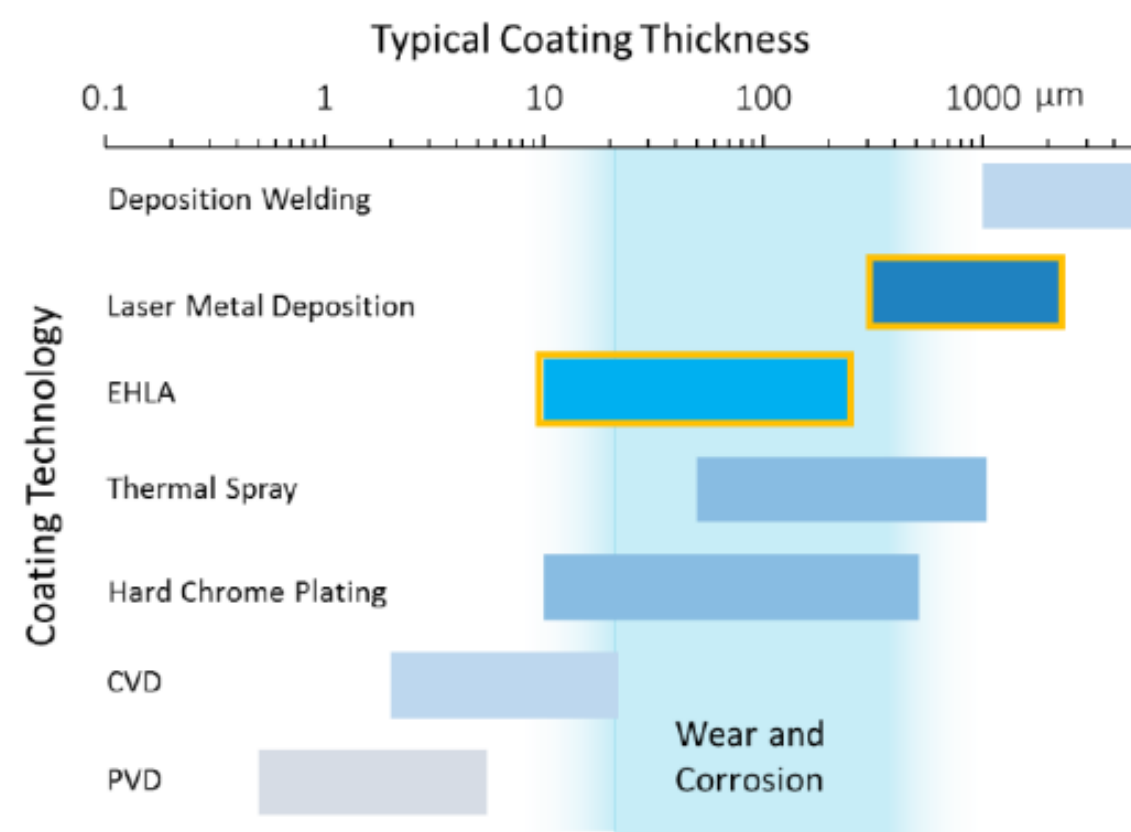


HVOF thermal spray



Laser Metal Deposition & EHLA

- Laser metal deposition with powder feedstock for high value components
- Production speed and thickness limits for conventional laser cladding
- Extreme high speed cladding (EHLA), as direct competitor to thermal spray, use smaller spot size and fine powder
- EHLA can produce thin coatings relatively fast with DE of 2kg/h
- Typical application for EHLA is hydraulic rods when the part being rotated relatively fast (25...500m/min)

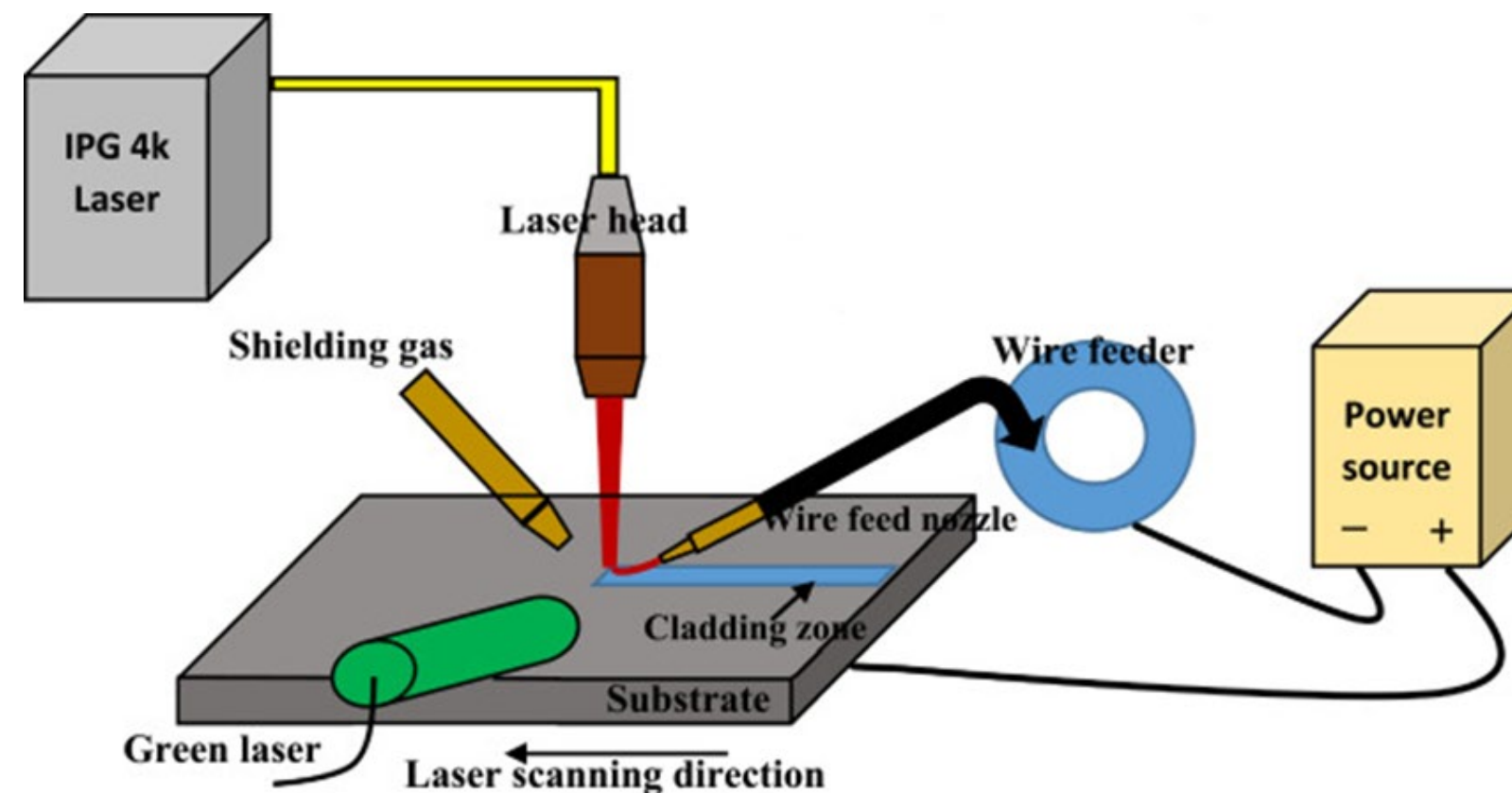


<https://www.twi-global.com/technical-knowledge/faqs/what-is-laser-cladding>



Laser Hot Wire Cladding

- Laser hot wire cladding is a process that combines a preheated wire contacting a workpiece in a puddle created by a laser beam
- High volume deposition rates and very low material lost (overspray) to deposit the desired chemistry
- High travel speed with minimal heat input leading to lower dilution rate compared to other arc welding processes
- Ideal for applications when detailed part or exact chemistry specifications need to be met



<https://www.sciencedirect.com/science/article/abs/pii/S0143816619309352>



LaserClad Case Studies



Armature Motor Shaft | LaserClad™



The Challenge

A 3750 HP DC motor armature for power generation looking for a turnkey solution to wear and damage. The shaft had heavy extension gouging and seal journal scoring due to friction wear.



The Solution

A precision rebuild was required to avoid damaging the motor winding as well as distorting the shaft. Windings cannot be exposed to sources of heat, such as standard cladding and welding; otherwise, they will be permanently damaged. Shaft alignment is critical - LaserClad minimizes distortion with a concentrated heat zone to reduce post weld finishing.



The Outcome

Our hot wire LaserClad process was used to mitigate the risks of heat, distortion and dilution. The job was completed with minimal downtime to meet client's expectation. Our 24/7 shop capacity and advanced technology allowed for a fast turnaround, while increasing product integrity.

- Unique technology with highly precise deposition
- Best-in-class laser cladding materials and services
- Global service network | Local support throughout North America



Eco-friendly Solution



Turnkey Offerings



Global Support

LaserClad Case Studies



Pump Plungers | LaserClad®



The Challenge

The Oil & Gas industry makes extensive use of reciprocating pumps and compressors for chemical processing and pipeline transportation. The plungers in pumps and compressors exhibit rapid surface wear caused by a corrosive environment, wet and dry particle abrasion, and high friction. These components had previously been coated using HVOF process. Due to high friction and erosion, delamination occurred, decreasing the service life of the plungers.

The Solution

Based on the application requirements, CE wear management team selected a tungsten carbide containing alloy to be overlaid with LaserClad to ensure a metallurgical bond with the base metal (316SS). Laser cladding helped maintain the dimensional accuracy of the plungers and enabled a porosity-free surface finish of 10 Ra or less.



The Outcome

Based on extensive research on this matter, the tungsten carbide containing alloy applied with laser cladding is expected to provide a higher wear resistance and at least double the service life when compared to HVOF coatings. The customer has been very satisfied with the LaserClad solution and Castolin Eutectic has become the go-to supplier, with over 20 processed parts already.

- Extended service life and enhanced performance
- Costs savings through outstanding operational efficiency
- Global service network | Local support throughout North America



Sustainable Solution



Turnkey Offerings



Global Support

Pioneering Industrial Sustainability



LaserClad Case Studies



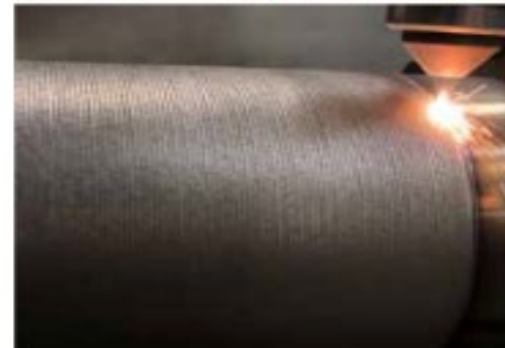
The Challenge

Conveyor rollers used in the transportation of iron ore are subject to severe abrasion. The worn out rollers used to be protected with a 6mm spray & fuse coating that would expose the parts to some heat deformation. The customer was looking for a reliable solution and a better process for the protection of 30 rollers that would preserve the integrity of the substrate as much as possible.



The Solution

Based on the customer expectations and application requirements, the CE wear management team decided to use LaserClad. The low heat input inherent in this process results in minimal distortion of the substrate and reduces post-cladding machining. A 4mm layer of XHD powder was applied to the parts. This reduced not only the weight of each roller but enhanced the performance thanks to our proprietary XHD alloy that ensures hard, dense, wear resistant coatings along with uniform carbide distribution.



The Outcome

The conveyor rollers were shipped on time. The dimensional tolerances have been successfully respected. LaserClad allowed for a better process control and stability than the previous solution. In the long run, the reduced weight of the rollers will positively impact on the overall performance of the conveying system.

- Higher resistance than thermal spray coatings
- Costs savings through outstanding operational efficiency
- Global service network | Local support throughout North America



Sustainable Solution



Turnkey Offerings



Global Support

Pioneering Industrial Sustainability

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Applications: boiler tubes

Boiler tubes are clad with wire and powder:

- Materials are Inconel alloys 625, 622 or 686.
- Water wall panels
- Super heater tubes
- All have to be according to PED or ASME (pressure vessels).



Applications: more...

