

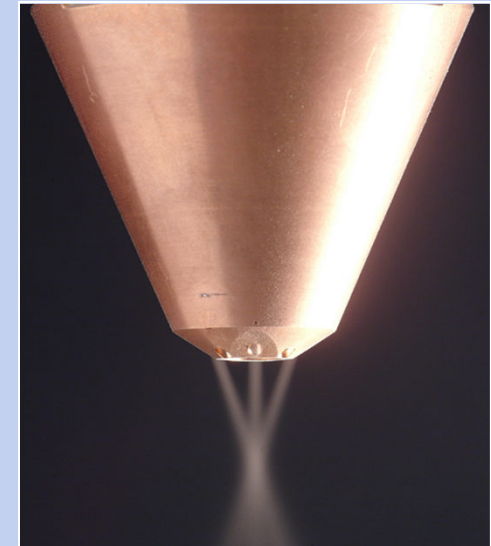
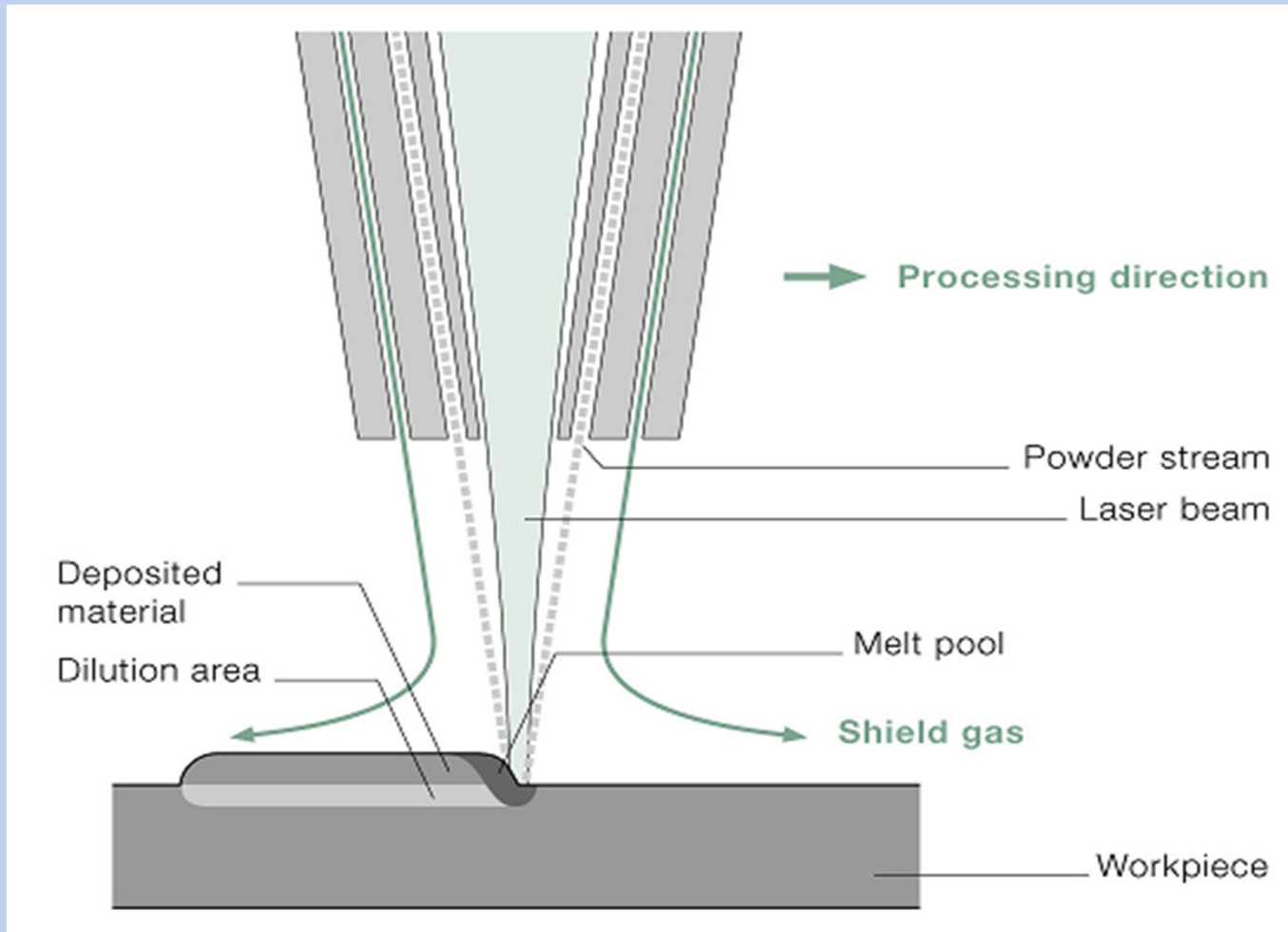


AG TOLERIE

LASER CLADDING



Schematic Process Diagram





Cladding-Process Characteristics

- **Cladding is a production process to refine or refurbish parts**
 - Automated 3-dimensional metal deposition
 - Superior material properties –fully dense and fine microstructures
 - Minimal distortion and narrow heat affected zones
 - Finish of the coated part through milling, grinding, EDM
 - Cladded structures can be heat treated
 - PVD coatings can be applied on to the cladded structures



TLC 5-Axis Laser Machining Center

- 5 Axes
- 4.000 x 1.500 x 750 mm
- 2 powder feeder
- 6th rotative axe
- TRUMPF Disk 4 Kwatt
- 3D-CAD/CAM software



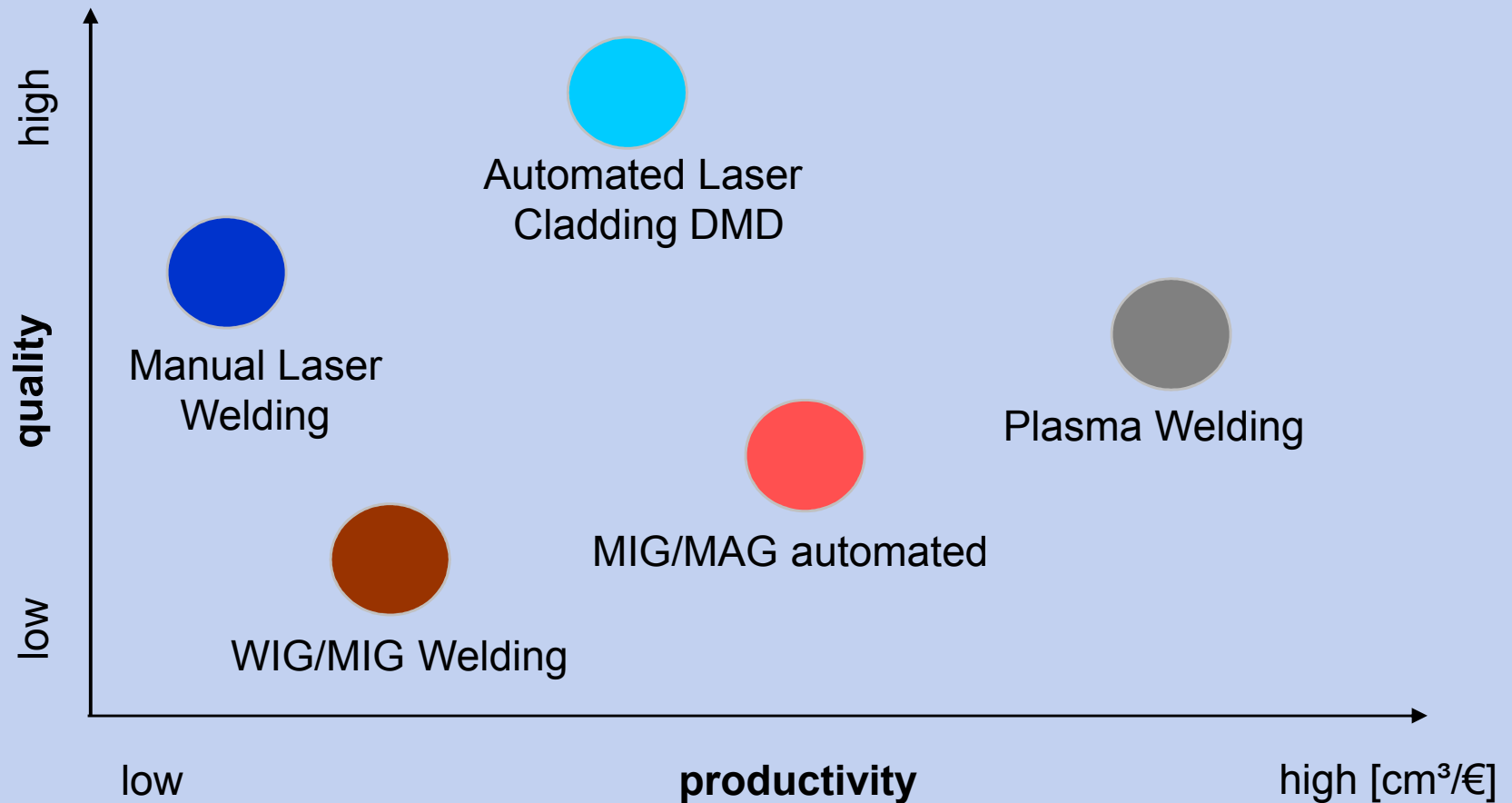


Process Parameters

- Building speed: 10 - 150 cm³/h (0,5 - 9 inch³/h)
- Layer thickness: 0,1 - 1,2 mm
- Typical machining allowance: 0,5 - 1 mm
- Powder material (size fraction): +45 -90 μm (+20 -180 μm)
- Approved materials:
 - Iron, Nickel- and Cobalt Alloys
 - Tungsten Carbide Compounds
 - Titanium Carbide Compounds



Competing Cladding Processes



Quality = f (microstructure ↑, bonding ↑, dilution ↓, distortion ↓, repeatability ↑)



Laser vs TIG – Inconel 625



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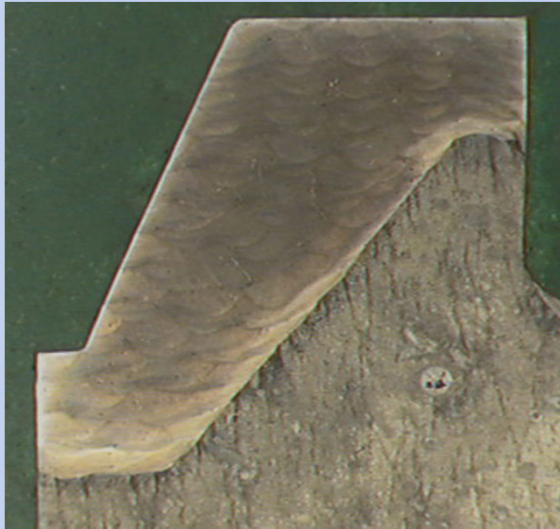


TIG





Laser vs TIG – Inconel 625



Low dilution

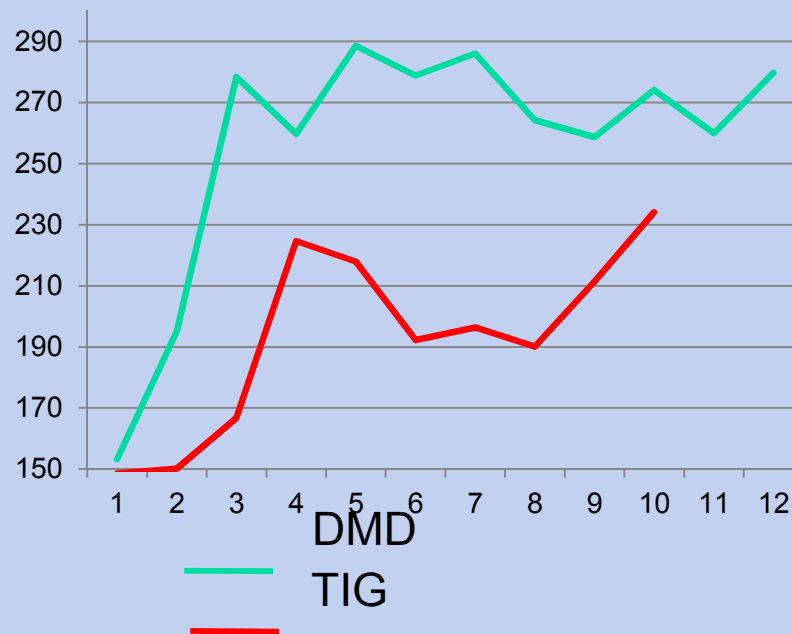


Fine microstructure

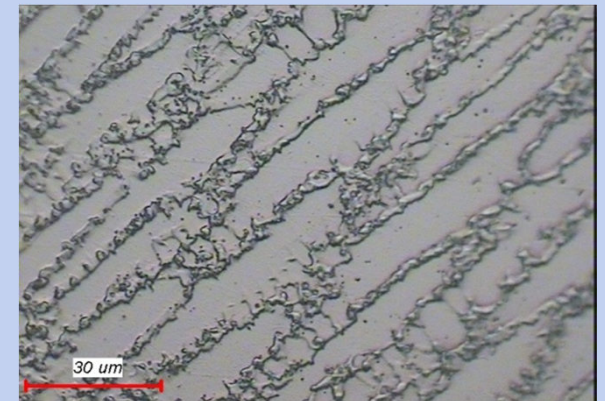
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TIG

Hardness (Vickers)



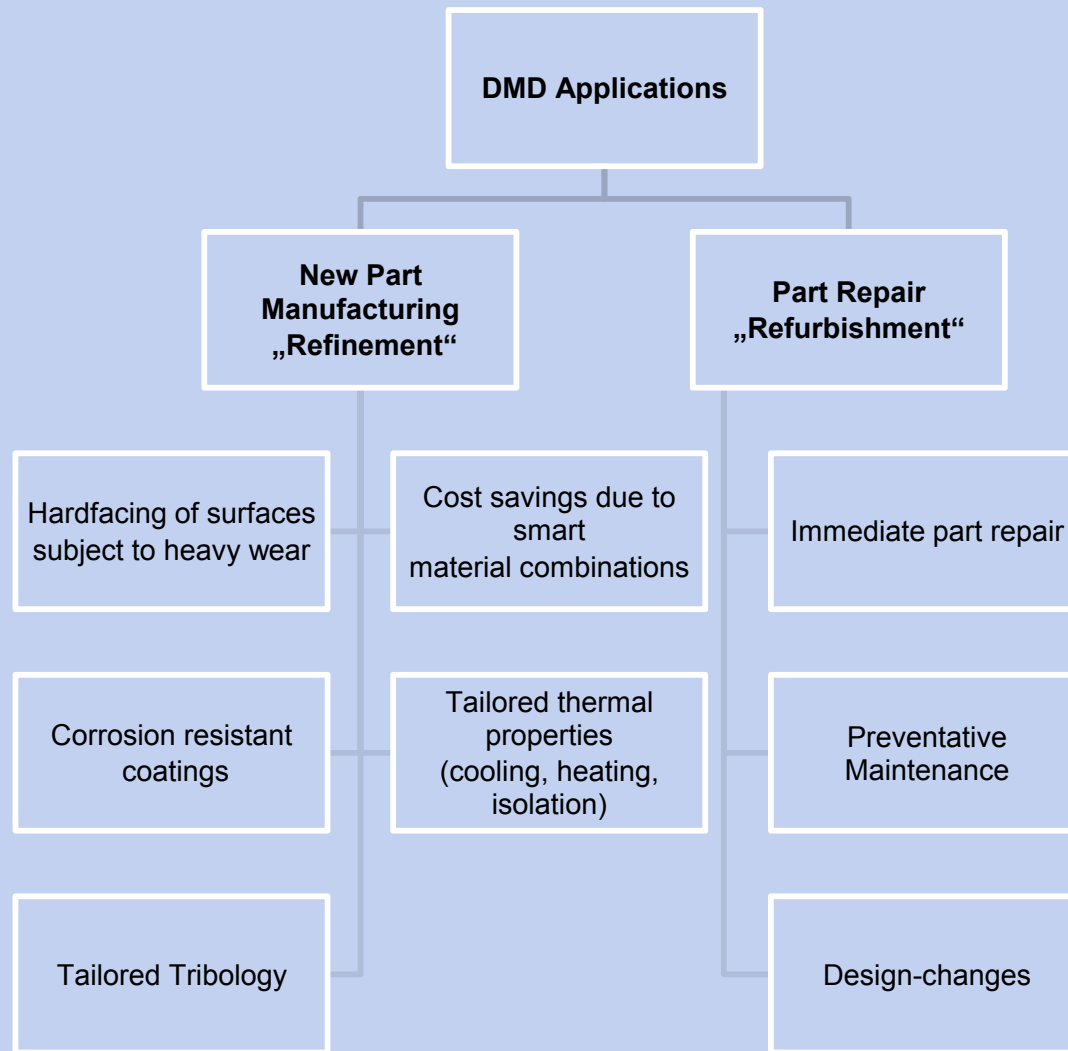
deep dilution



Rough microstructure



Classification of Cladding Applications



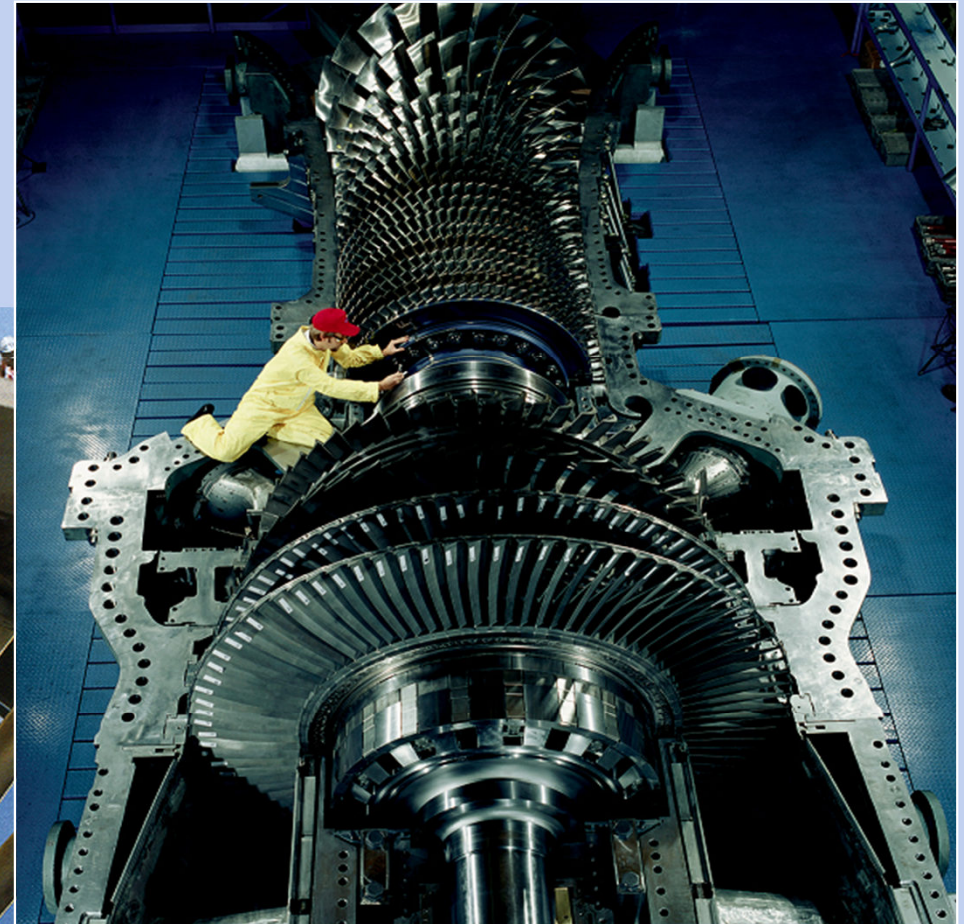
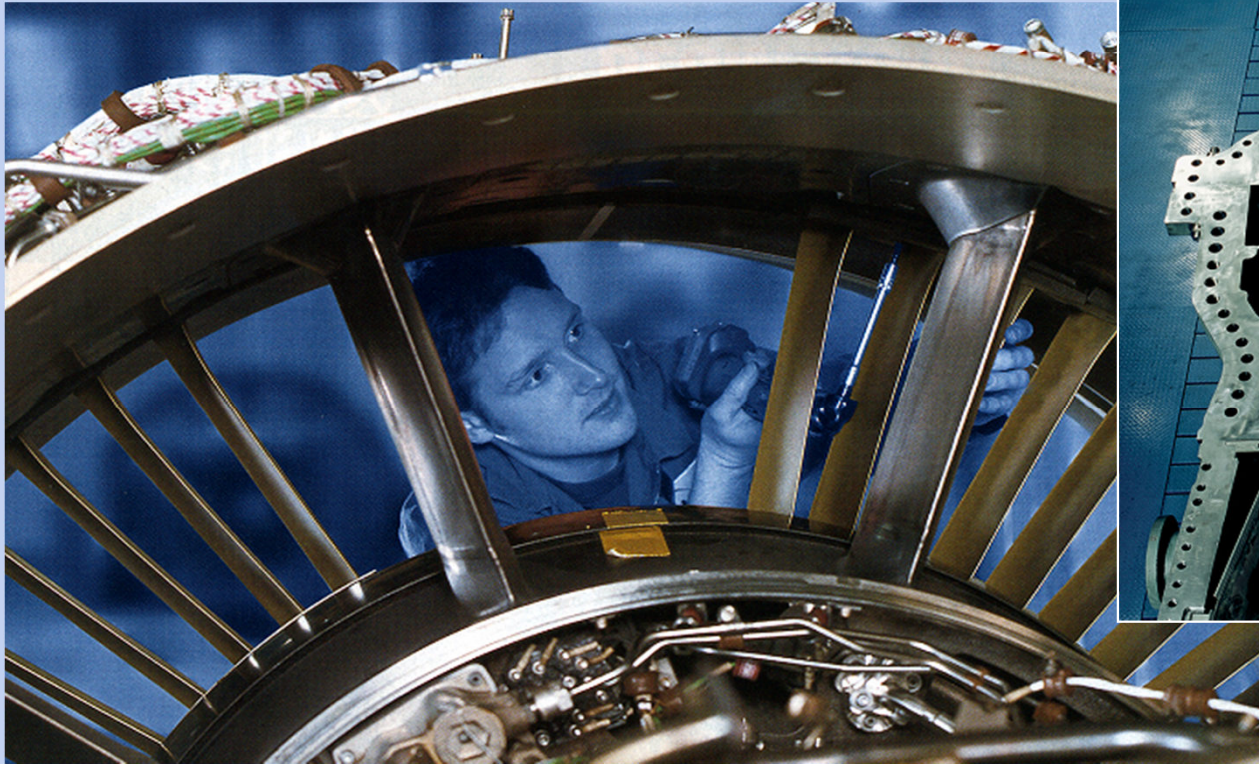


Approved materials

base	materials	applications
cobalt	Stellite 6	Wear resistant (53 HRC)
	Stellite 21	Wear resistant (high temperature)
Nickel	Inconel 625	Corrosion resistant
	Inconel 718	High Mecanical properties
	WC (60%) NiCrBSi (40%)	Wear resistant
Ferrum	Tool steel	High hardness

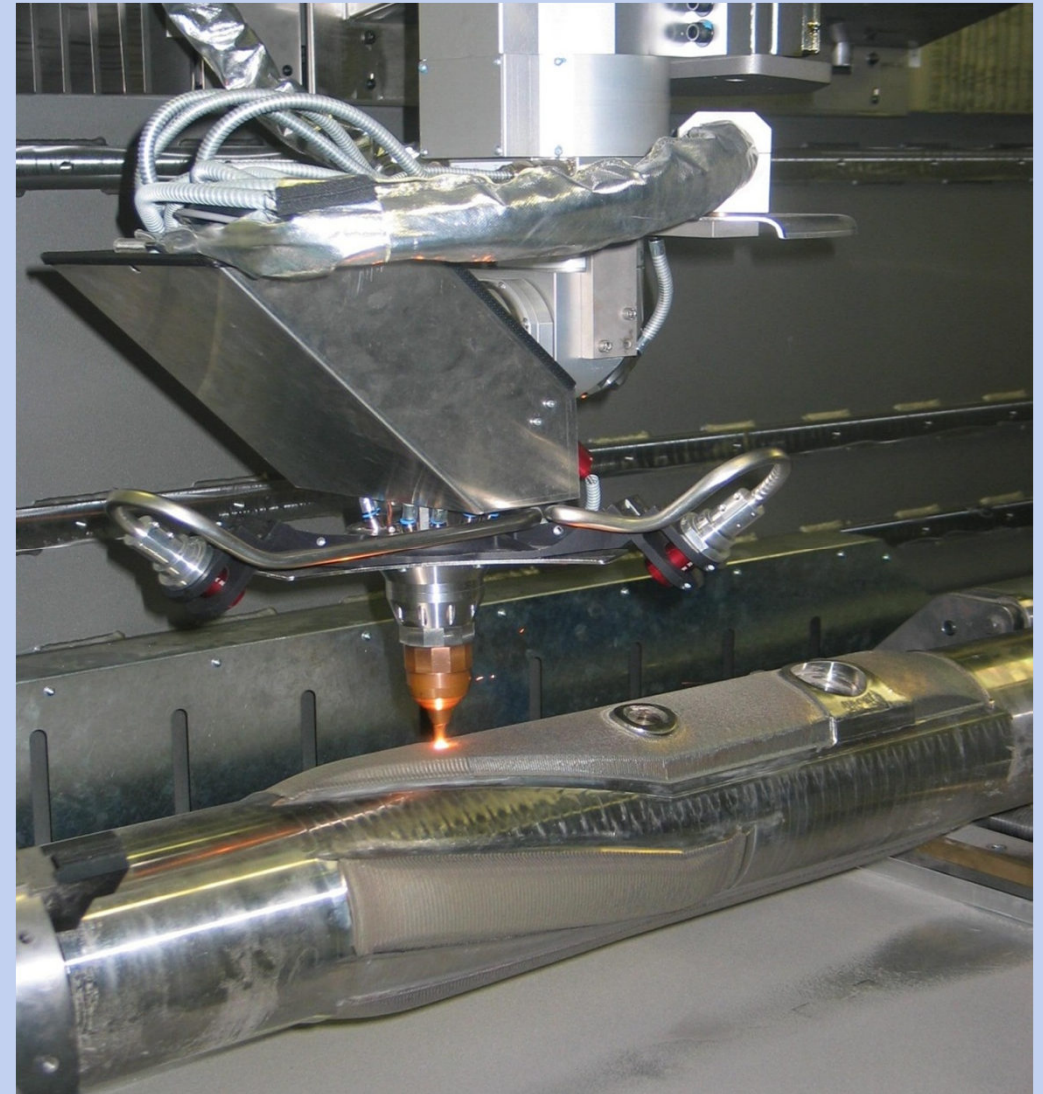


Turbines: Refurbishment and Heat Protection





Petrochemical Industries: Wear and Corrosion





Plastic Industries: Hardfacing of Extruder Parts





Forging: High Temperature Wear Resistance

