Laser-based engineering services for the repair and maintenance of high-value plant components

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The Great Shift

Centralized Production	Slow moving, carbon intensive supply chains	Warehouses full of physical inventory	Manufacturer centric supply chain
			
Network of localized microfactories	Faster, sustainable and less expensive digital supply chains	Digital inventory	Customer centric

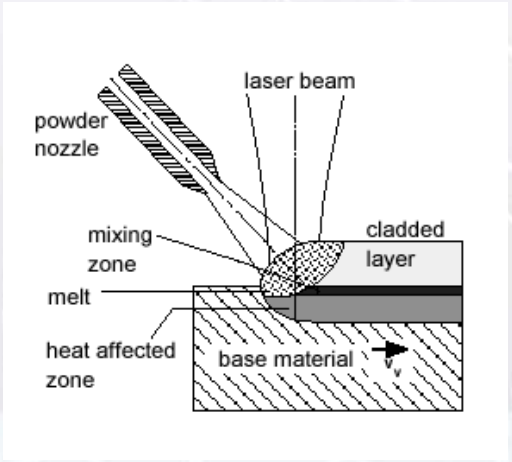
Paradigm Shift in Manufacturing Industry

Quality Focus	Customized Focus
LEAN Production	SMART Manufacturing
- Just in time - Pull Policy - Electronic Data	- Economies of Scope - Global Manufacturing - Agile Manufacturing - Internet-Based Manufacturing

Future Production: Manufacturing

Industry support

- R&D programs – Informed by **Industry** needs specific to South Africa
- Consultation on laser-based solutions to manufacturing problems
- Feasibility (PoC) studies
- Process development
- Decision Support
- Industrialization



Laser Technologies for Industrial Production Engineering

Most versatile high power laser processing R&D facility in SA

Laser Shock Peening

Laser Additive Manufact

Laser Metal Deposition (Cladding)

Laser Engraving/ Milling

Laser Hardening

Laser Welding

Laser Cutting

Material Characterisation, Evaluation & Non-destructive Testing

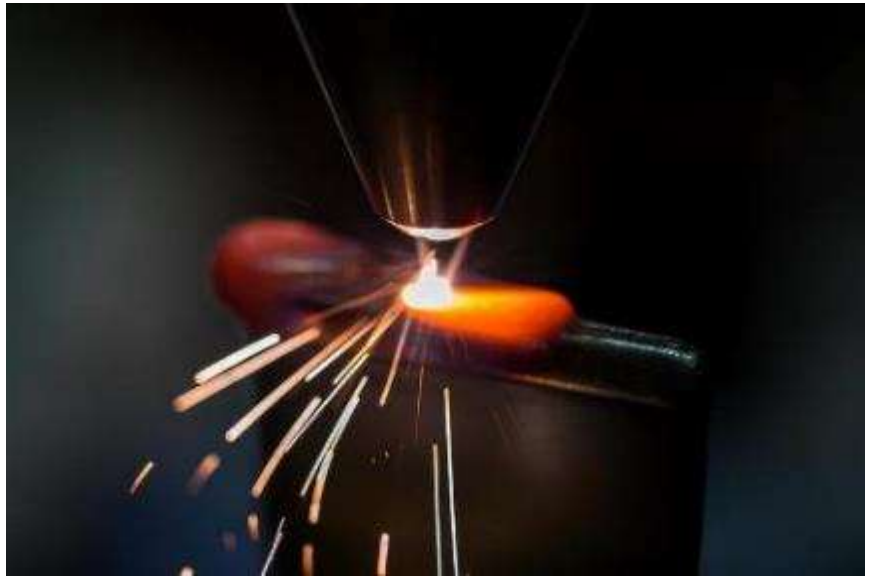
Laser Engineering Services

Laser-Enabled Manufacturing (R&D)

Advantages of Laser-based Engineering Services

- **Cost savings**
  - Alternative to component replacement
  - Improved performance eg. increased lifetime
- **Technical**
  - Exceptional process control
  - Low heat input
  - Highly Flexible
  - Well suited to full process automation
  - Quality of the manufacturing process
  - Faster throughput
  - Reduced environmental impact
  - Lower energy consumption
  - Non-conventional Solutions

Laser Surface Engineering – Energy Sector



Steam turbine Stage 3 Straddle Root blades:

- Process development for blade tenon rebuilding started in 2013
- Weld qualification and NDT methods developed in collaboration with Eskom Rotek and RT&D
- In-situ repair tests done on scrapped Duvha rotor
- In-situ understrap replacement of a Majuba and three Duvha rotors at Rotek – most recent in January 2022 replaced 3 in-situ understrap
- Pilot industrial roll-out done – rebuilding of boxed set of 42 blade tenons

Restoration of Compressor

- Journal welding of the AFK rotor, the blades on the AFK rotor and the tip repair of the blade visible
- Impact
  - Improved the efficiency of the rotors by approximately 10%
  - Significant energy cost savings

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Laser Surface Engineering – Mining Sector

- Currently replacement cost is R800,000 to R1,000,000 per event. These costs are made up of the components, repairs to the bucket attachment points, logistics and labour costs
- Replacements occur every four months and take ~10 weeks to complete resulting in total cost of ~R24.3 million pa
- Based on previous laser-based refurbishment applications and case studies a conservative repair estimate of 50% of replacement cost can be assumed and an improvement of 50% in performance
- Impact
  - Maintenance savings per annum
  - Reduced impact on production per annum
  - Decrease capital investment
  - Cost impact

Help our service be successful

Access to Data

Access to personnel, interviews and walkthroughs

Access to IT for integration

Green light for New Industries

Approval for testing

Feedback on parts installed

THANK YOU