REPAIR & REFURBISHMENT OF COMPONENTS USING LASER MATERIAL DEPOSITION (LASER CLADDING)

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Overview

Enhancing service life by surface treatment and recovering component after post damage could have significant economic benefits. Die tool costs 10% of cast part. Repair and refurbishment are increasingly common practices, seeking to maximize unit lifetime, availability and profitability.

During hot forming of aluminum alloys, dies made up of hot work tool steels get exposed to severe operating conditions that cause significant thermal and mechanical fatigue, high pressure and high hot erosion from flowing molten alloy and result into surface damages like heat checks, erosion and chemical attack in prime locations, limiting or diminishing the service life of the tools. Laser cladding has been successfully used to repair the damaged dies and put to re-use.

Key Features

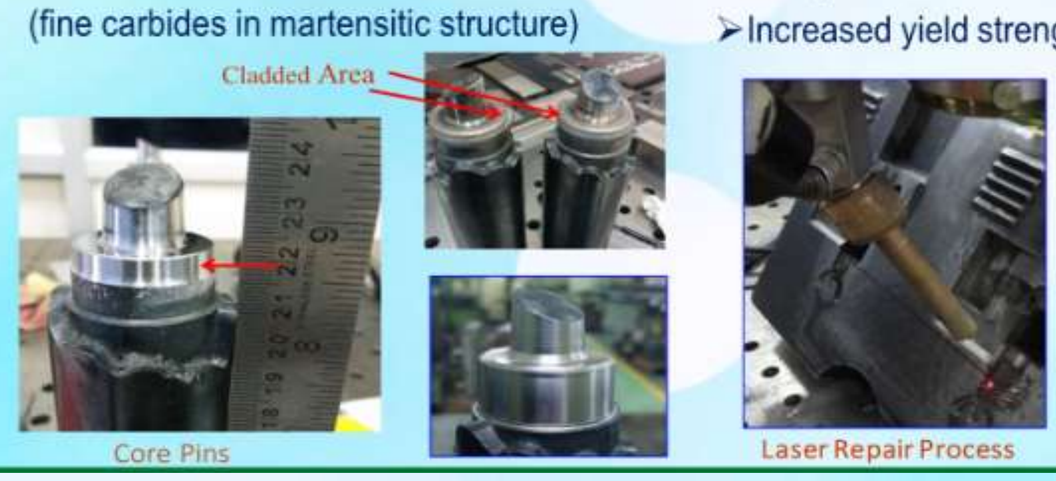
- **Repair is possible without preheating of the components/tools**
- **Low heat input to the component, so less damage**
- **Narrow soft zone created with relatively high hardness**
- **Fully automated and repeatable**
- **Precise deposition and less post processing**
- **Flexibility to adopt the process for different components**
- **Selective clad coating where needed**
- **Excellent metallurgical bond between coating and surface**
- **No post clad heat treatment required**
- **Erosion corrosion resistant**

Applications

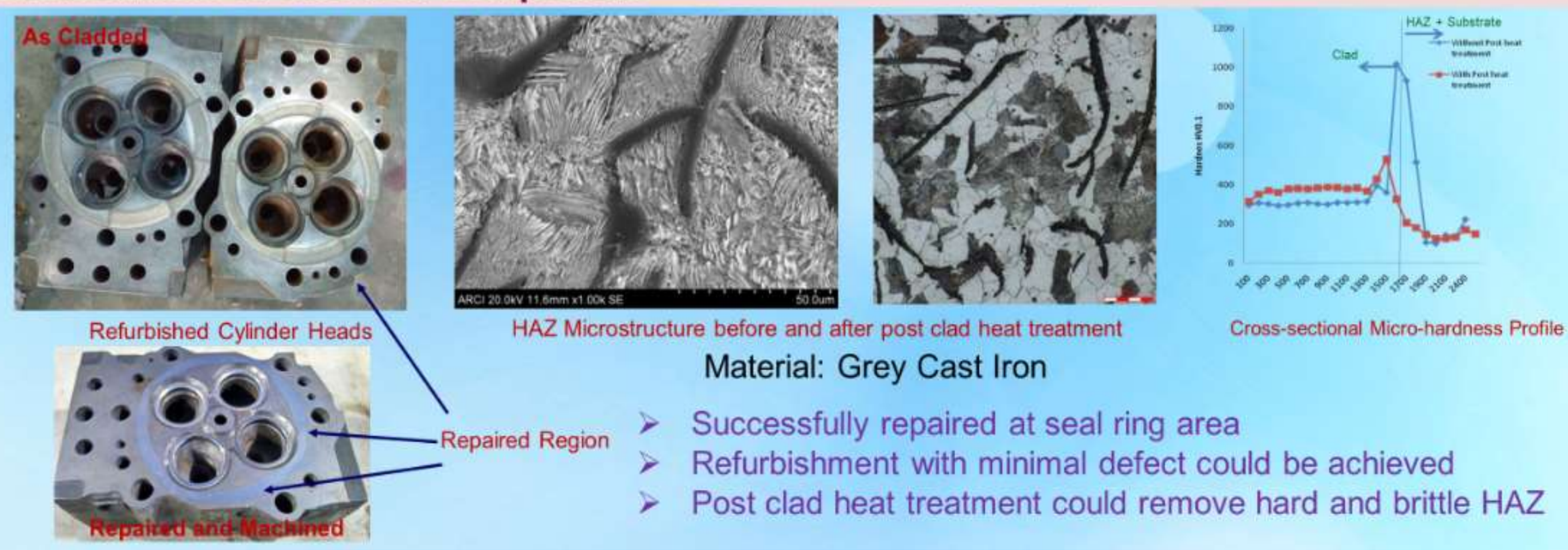
- **Pressure die casting tools**
- **High Temperature Extrusion tools**
- **Hot Forging tools**
- **Hot forming and Punching tools**
- **Repair and refurbishment of aerospace components**
- **Thermal power plant components (power plant burner tip)**

Die Tool Repair

- AISI H13 hot work tool steel (5% Cr)
- Clad + tempered condition (fine carbides in martensitic structure)
- Hardness - 600-650 VHN
- Compressive residual stress
- Increased yield strength



Refurbishment of Cast Iron Component



Material: Grey Cast Iron

- Successfully repaired at seal ring area
- Refurbishment with minimal defect could be achieved
- Post clad heat treatment could remove hard and brittle HAZ

Technology Status

- **Successfully completed testing of repaired PDC tools on real-time conditions (case study)**
- **Successfully completed life enhancement of a thermal power plant component using laser cladding**

Intellectual Property Development Indices

IPDI	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Activities	Basic concepts and understanding of underlying scientific principles	Shortlisting possible applications	Research to prove technical feasibility for targeted application	Coupon level testing in stimulated conditions	Check repeatability/ consistency at coupon level	Prototype testing in real-life conditions	Check repeatability/ consistency at prototype level	Reassessing feasibility (IP, competition technology, commercial)	Initiate technology transfer	Support in stabilizing production
Status										