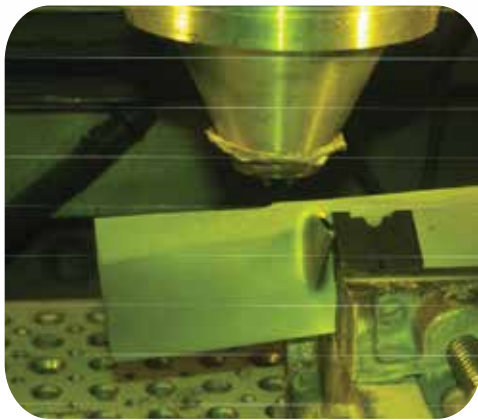


LENS[®] COMPONENT REPAIR SOLUTIONS

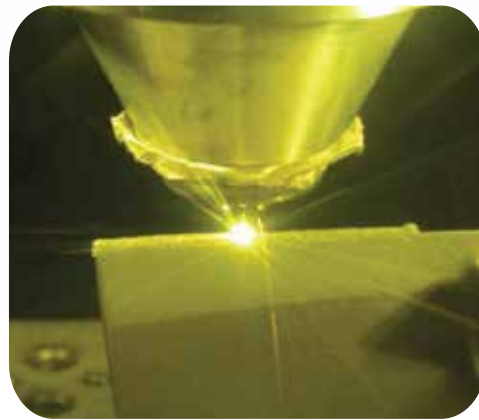
LENS[®] (Laser Engineered Net Shaping) Systems

The proven solution for high-value component repair or re-work

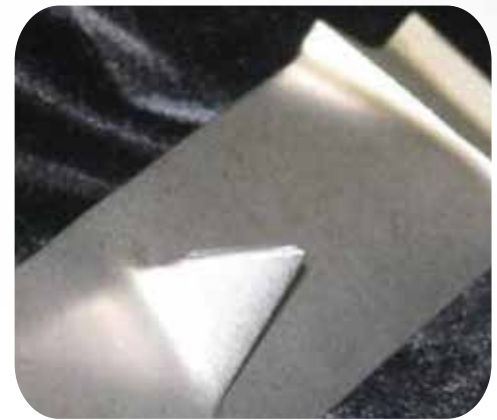
LENS systems deliver significant Return on Investment and functional advantages when repairing high-performance metal components. LENS is a highly targeted solution that can precisely add material to worn or damaged areas with minimal heat effect, enabling repair of the most sensitive thin-walled components such as those found in gas turbine engines. LENS systems push the envelope of component repair: turn the power up for rapid, economic material build-up; turn the power down for precise deposition with minimal post-machining.



Compressor Blade -
Before Deposition



Compressor Blade -
During Deposition



Compressor Blade -
After Deposition

FEATURES

- ▶ Superior material properties – full functionality
- ▶ Low heat input – low distortion and heat-affected-zone
- ▶ Near-net-shape repair – minimal finishing
- ▶ Low residual stress
- ▶ Closed loop feedback for precision deposition control
- ▶ Automated toolpath generation
- ▶ Vision system for accurate material placement
- ▶ High efficiency lasers for reduced cost of ownership

INDUSTRIES SERVED

- ▶ Aerospace
- ▶ Defense
- ▶ Industrial Gas Turbine
- ▶ Petrochemical
- ▶ Industrial

TYPICAL APPLICATIONS

- ▶ In service repair
- ▶ In process re-work
- ▶ Airfoil repair
- ▶ Vane repair
- ▶ Blisk repair
- ▶ Shaft repair
- ▶ Duct repair

LENS Systems Provide DoD with Millions in Annual Savings



The US Military's maintenance operations support more than 500 ships, 16,000 aircraft, 50,000 ground vehicles, and other military assets at a cost greater than \$60 billion annually. The military repair applications for LENS cover aircraft as well as land and sea based systems. The US Army's Anniston Army Depot (ANAD) was in need of a repair solution for various metal components in the M1 Abrams Tank. These components were deemed difficult or impossible to repair in the past, requiring expensive part replacement vs. cost-effective repair. After extensive research, ANAD acquired a LENS system. Since its introduction at ANAD in 2002, LENS has been approved as a repair process for eight engine components, saving the Department of Defense (DoD) millions annually. ANAD recently took delivery of their second LENS system in order to keep up with increasing repair demands.

LENS: Enabling Repair Technology

Low Heat Input

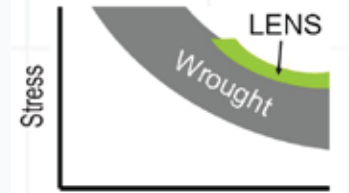
- Low distortion
- Small Heat Affected Zone
- Salvage "unrepairable" parts



Low distortion of LENS process allowed this part to be salvaged

Superior Mechanical Properties

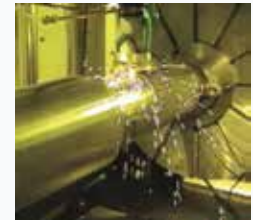
- Often equivalent to or better than wrought material
- Steels, Titanium, Inconel®, cobalt, and more
- Repair high performance components



Numerous studies have shown LENS fatigue properties to be equal or better than wrought materials

Complex Shapes

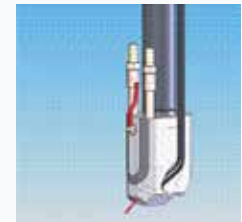
- Full 3-D repair capability
- From fine features to large volume build-up



Shaft repair by LENS 850-R System

Limited Access

- Repair non-line-of-sight areas
- Repair inside bores
- Custom designs for exceptional reach and accessibility



DeepRepair™ Head

Near-Net Shape

- Precise shaped laser deposition
- Reduced deposition time
- Reduced finishing time



Precise shape restoration minimizes post-finishing

ABOUT OPTOMECC

Optomec® is the world-leading provider of additive manufacturing solutions for high performance applications in the Electronics, Solar, Medical, and Aerospace & Defense markets. These systems utilize Optomec's patented Aerosol Jet Printed Electronics technology and LENS powder-metal fabrication technology. The company has a global customer base of more than 175 users that includes many industry-leading manufacturers.