

International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India



Laser Hardening of Crank Shafts

Overview

- Crankshaft is one of the critical parts in an automotive engine, generally made of medium carbon steel requiring good wear resistance at contact areas (at bearings contact region and pin area) coupled with high load-bearing capacity. Laser surface transformation hardening process provides excellent surface finish with elimination of post-process machining requirement, no part distortion and easy adaptation to any dimension. Excellent control on the energy input leads to a uniform hardened layer across the component. A two-wheeler air-compressor crankshaft made of En18D material was successfully laser hardened and field trialled. Hardness in the range of 500 – 650 HV with a uniform case depth of about 300 μm was achieved. Net residual stress in the treated layer was \sim -310 MPa with 2-3% retained austenite. Laser hardened crankshafts showed 30% more life in field trials

Key Features

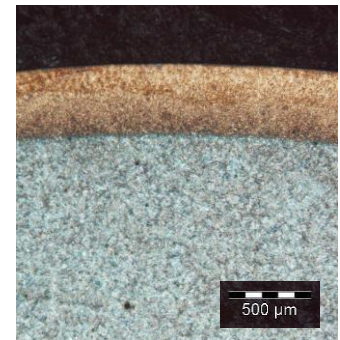
- Selective and localised hardening process
- No coolant or quenching medium required
- Uniform hardened layer throughout the processed area
- Negligible change in the surface roughness
- Compressive stresses in the hardened region
- Automation possible



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Potential Applications

- Crank shafts
- Cam shafts
- Gears



Cross-sectional micrograph of laser hardened region

Technology Readiness Level **100%**

- Laser hardened crank shafts showed 30% more life in field trials

Preliminary	Proof of concept	Scale-up	Prototyping	Validated
20%	40%	60%	80%	100%

Major Publications

1. "Laser Surface Hardening of Crankshafts", SAE 2009-28-0053

Centre for Laser Processing of Materials (CLPM)

ARCI, Balapur PO., Hyderabad 500005, Telangana, India

Tel : +91 40 24452450 / 24452424 / 24452304; Fax : +91 40 24442699

Email: manish [at] arci [dot] res [dot] in / shariff [at] arci [dot] res [dot] in / director [at] arci [dot] res [dot] in