

# Focus on CSIR research in Laser Hardening

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## Laser Hardening

Laser hardening is a metal surface-treatment process complementary to conventional flame and induction-hardening processes. A high-power laser beam is used to heat a metal surface rapidly and selectively to produce hardened case depths of up to 2.5 mm with hardness values of up to 65 Rockwell C. The high hardness of the martensitic micro-structure provides improved properties such as wear resistance and increased strength. Due to compressive residual stresses introduced to the hardened surface, fatigue properties are also vastly improved.

## Advantages of laser hardening

The laser is most appropriate for treating small areas on sensitive, high-value components. Specific advantages compared to conventional processes are as follows

- Selective areas can be hardened without affecting the surrounding material;
- Minimal heat input results in limited distortion and reduces the need for additional machining;
- Treatment depth is accurately controlled and highly reproducible;
- Superior hardness can be obtained compared to conventional processes;
- No external quenching is required;
- A quick turnaround time is achieved;

- Down and upstream cost savings are possible;
- The process can be automated and integrated with other inline production processes; and
- It is environmentally friendly.

## Typical applications of laser hardening

- Turbine Blades
- Automotive:
  - » Drive shafts and stub axles
  - » Car door torsion springs
  - » Synchronous gears and gear selectors
  - » Components in auto steering pumps
  - » Piston rings
  - » Piston ring grooves in heavy duty engines
- Forming Tools and Moulds:
  - » Selective areas
  - » Cutting edges
- Problematic Geometries:
  - » Linear guide rails
  - » Structures with radii and ridges
  - » Rim geometries
  - » Inside surfaces of holes

Laser transformation hardening is an essential technology to the South African industry, enabling users to compete worldwide in the production of cost-effective, high-quality products.



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