

The Effect of Laser Surface Hardening on Surface Hardness of Mild Steel

M. N. M. Salleh ¹, M. Ishak ¹, M. H. Aiman ¹, Q. Zaifuddin ¹

¹ Faculty of Mechanical and Manufacturing Engineering, UMP.
mdnaquiddinsalleh91@gmail.com

Abstract:

Laser surface hardening (LSH) has become the most vital process to increase the hardness of a mild steel surface, especially to overcome the wear issues in machining parts, where mild steel was hugely applied due to its advantages such as less air pollution, low cost of maintenance and easy to handle compare to other conventional surface hardening process. The laser surface hardening of mild steel has been performed using fiber laser machine which is having a maximum peak power of 30 watts, with 1060 nm of a wavelength above the surface of mild steel having the dimension of 15 × 15 × 6 mm. The Vickers hardness test on the laser hardened surface of this metal was measured with a load of 0.5 kgf and 10 seconds dwell time for ten indentation points, randomly. It was found that the highest average microhardness value was 281.72 HV on the surface of sample hardened by a laser power of 21 Watt and 40 mm/s scanning speed. Across the cross-section area, the affected hardened depth was measured at 19 ± 2.5 μm from the surface. At this region, fine martensitic grain structure was observed which contributes to the higher microhardness value. Higher laser power produced higher surface hardness, meanwhile higher scanning speed lead to lower surface hardness.

Keywords: Laser Surface Hardening; Mild Steel; Fiber Laser; Vickers's Hardness; surface hardness

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