

The effect of laser surface hardening on the surface hardness of mild steel

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

Faculty of Mechanical and Automotive Engineering Technology, Universiti Malaysia Pahang, Pekan, Pahang, 26600, Malaysia

Abstract

Laser surface hardening (LSH) has become the most vital process in order to increase the hardness of a mild steel surface, especially to overcome the wear issues in machining parts, where mild steel was hugely applied. This is due to its advantages such as less air pollution, low cost of maintenance and easy to handle compared to other conventional surface hardening process. The laser surface hardening of mild steel has been performed using fibre laser machine which is having a maximum peak power of 30 Watt, with 1060 nm of wavelength above the surface of mild steel having dimension of $15 \times 15 \times 6$ mm. The Vickers hardness test on the laser hardened surface of this metal were measured by 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 sectional area, the affected hardened depth was measured at 19 ± 2.5 μm from the surface. In this region, the 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; Fibre Laser; Vickers's Hardness; surface hardness.