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The Effect of Laser Treatment on the Erosion Resistance of a Copper -Nickel Austempered Ductile Iron

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Abstract : The present work investigates the effect of laser surface hardening on the erosion resistance of alloyed austempered ductile iron contain 1.5% copper and 1.5% nickel austenitized for different austenitising times. Continuous wave of CO₂ laser was used to heat by overlapping technique. The laser processing parameters used were; 1000 w, laser power, 1000 mm/min. Scanning speed and 40 L/min. Argon flow rate. After laser treatments erosion tests were carried out on the untreated and laser treated samples surfaces. The erodent particles used were pressurized silica +300 to 500 flows at speed of 50 m/sec. The erosion tests were performed at different angles 30°, 60° and 90°. Erosion tests showed significant reduction in the erosion rate after laser treatment at all impinging angles. Erosion resistance is improved depending on the impingement angle, (weight losses in grams at 90° > weight losses in grams at 60° > weight losses in grams at 30°). Increasing the impingement angle increases the erosion rate for both untreated and laser treated samples. This improvement in erosion resistance was attributed to the fine and homogenous structure, high hardness and the elimination of graphite nodules which were the source of notches.

Keywords : laser treatment, erosion, ADI, austempering, hardness, austenitising