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Name : Bulan Bin Abdullah, *PhD*

Title : An Improvementof Mechanical Properties Of Ductile Iron And Niobium Alloyed Ductile Iron Through New Heat Treatment Cycles

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This research is focused on three different heat treatments and they are austempering, tempering and a new heat treatment cycle of ductile iron and niobium alloyed ductile iron. The selection of all heat treatment parameters were based on TTT and CCT diagram which were simulated by JMart Pro Software. The microstructures were observed after etching with 2% Nital using light microscopy and Scanning Electron Microscope (SEM). The structures were verified by XRD analyses. The physical and mechanical tests were then evaluated through density measurement, Rockwell hardness (ASTM E18), Tensile (TS EN 10001-01) and Charpy impact (ASTM E23) tests. The fracture surfaces after tensile test and impact test samples were examined using Scanning Electron Microscope (SEM). The results showed improvement of 60% on tensile strength and 84% on impact toughness with addition of niobium into ductile iron. Superior mechanical properties were obtained after the new heat treatment cycle compared to austempering and tempering processes. This is due to the formation of fine ferrite platelets and lower bainitic structures and dimple rupture fractograph. It was also found that the tensile strength and impact toughness of austempered and tempered samples decreased with respect to longer holding times and higher heat treatment temperature. The development of the new heat treatment cycle in this research is successful in producing high strength materials. This treatment can easily be utilised in heat treatment industry compared with austempering process which required a special salt bath as quenching media.