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Abstract

Casting defects like microshrinkage porosity or degenerate graphite play a major role in fatigue behaviour of ductile cast iron. This phenomenon is even more evident in heavy-section ductile iron castings where defects are more frequent and difficult to control. This work is aimed to investigate the fatigue behaviour of heavy-section pearlitic ductile iron castings obtained with different in-mould inoculation treatments. It has been found that the inoculation process modifies the microstructure of the alloy, dimension and morphology of defects. The higher the nodule count, the lower the microshrinkage cavities dimensions.

The fracture surface of broken samples has been investigated by means of Scanning Electron Microscopy in order to identify crack initiation points and fracture mechanisms. Metallographic analyses have been carried out to measure nodule count and nodules dimensions and to identify the matrix microstructure. Statistics of extreme values and Murakami approach have been used to analyse the influence of defects on the fatigue behaviour of the materials analysed. It was found that a synergic effect between degenerate graphite particles and microshrinkage porosities reduces the fatigue strength of pearlitic ductile iron castings.

Keywords: ductile iron; fatigue; defects; extreme value analysis; inoculation.