

On the investigation of surface induced-residual stresses due to shot peening using needle probes technique.

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Over the years, shot peening has been a successful method in preventing, or substantially retarding stress corrosion cracking, crack initiation and growth, and other fatigue phenomena in engineering components [1]. This process aims at creating substantial levels of compressive residual stress in a thin near-surface layer of material due to tensile plastic deformation of a surface layer [2]. However, little attention has been laid on the constructive effect degree of peening process on material properties and the residual stresses inherited from the processing history of the component. Recent evolutions in the field of non-destructive testing and evaluation (NDT&E) led to the development of magnetic-based NDT techniques making use of the fundamental coupling features between stress and magnetic field within small magnetic domain structures of ferromagnetic materials [3][5]. The disproportional effect under tensile and compressive stresses (as the case under shot peening) at the result of the magnetic properties' asymmetry behaviour of ferromagnetic materials, referred as the Villari effect [6] results from stress demagnetization at the vicinity of the elastoplastic indented area [7]. This paper uses the needle probe method to investigate on the residual stresses' effects on identical strips peened surfaces of wrought iron material due to single shot of variable amplitudes using a calibrated impulse hammer. The results show the asymmetry evolution of the magnetic properties with increasing induced-residual stress as described in [8] (see Figure 1).

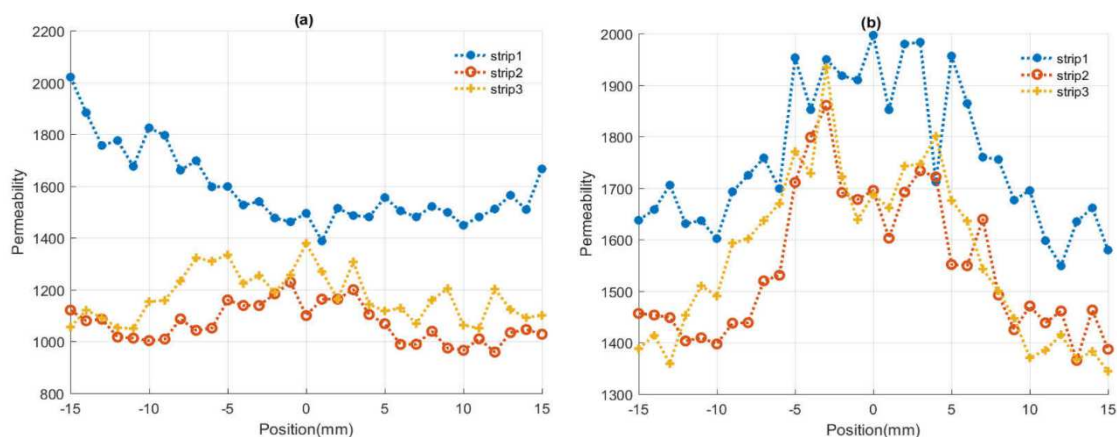


Fig. 1 Comparison of magnetic permeability of three strip samples (a) top surface (b) bottom surface

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