1.1.20. MAGNETIC TESTING OF STRESSES AND STRAINS IN AREAS OF STRUCTURAL HETEROGENEITIES IN STEEL ARTICLES

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Evaluation of stresses and strains occurred during operation of structural elements and machine parts having in their composition layers with different physical properties attracts attention of specialists in various methods of non-destructive testing. Herewith, the task of operative testing of the state of every layer occurs in order to evaluate its further operability and/or repairability. Paper demonstrates advantages of magnetic method for evaluation of stresses occurred during operation in case-hardened layer, transit zone and core of axisymmetric articles by the way of example of steel of 20 and 45 grades subjected to gas carburizing and laser thermal strengthening, respectively.

Proposed method is based on the assumption that, in magnetic relation, such articles can be presented as a composite with magnetic soft core, magnetic hard surface layer and transit zone occupying interim position under its magnetic properties. Number of peaks recorded during this procedure on the dependence of differential magnetic permeability μ_d on the value of reverse magnetization field H corresponds with the number of layers in article being different by magnetic properties. Magnetic measurements carried out in-situ in conditions of tension and torsion made it possible to study how the shape of field dependence $\mu_d(H)$ varies in the event of elastic-plastic straining.

It was established that displacements of magnetic permeability peaks in the area of stronger magnetic fields and dramatic falls of the peak height are conditioned by involvement of various layers of article into the plastic deformation and occur in strictly defined succession as stresses corresponding with yield point of every layer are achieved.

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