ANALYSIS OF THE MAGNETIC FIELD ANOMALIES OF A PIPE WITH DEFECT

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The magnetic field of a steel pipe with various defects is calculated. The dependence of field distribution anomalies on the turn of the primary exciting field is shown. This can be an informative sing for remote detection and identification of pipe defects.

Keywords: steel pipe, defect, magnetic field, calculation, anomaly, informative sign

A mathematical model was developed for theoretical studies of the influence of steel pipe defects on the distribution of its magnetic field (MF) [1]. We use the Finite Element Method Magnetics computer program to calculate low-frequency electromagnetic (including magnetostatic) problems on two-dimensional domains using the finite element method.

The dependence of the characteristics of the spatial distribution of MF on the parameters of the steel pipe defect, which is modeled by a cutout with different specified widths and depths, was calculated [1, 2]. Quantitative results of calculations of dependences of anomalies in the distribution of components of the magnetic field of the pipe, caused by various defects at different orientations of the primary excitation field, were obtained and analyzed.

It is shown that the normal to the pipe surface (radial) component of the magnetic field deformed by the defect is often several times larger than the tangential (azimuthal) component. The analysis of the results of the calculations [2] shows that the location of the extrema of the module and the components distributions of the secondary MF are different and significantly depend on the rotation of the primary exciting MF relative to the defect site.

These dependencies contain data on the location and parameters of the defect and can be used to form informative features of the measured signals.

The obtained results are intended for the development of methods and means for remote detection and determination of parameters of steel pipe defects under the coatings.

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