PARAMETERS OF A CONSTANT MAGNETIC FIELD SOURCE FOR A PORTABLE ELECTROMAGNETIC-ACOUSTIC TRANSDUCER

Bolyukh V.F., Suchkov G.M., Mygushchenko R.P., Kalnytskyi M.E.
National Technical University "Kharkiv Polytechnic Institute", Kharkiv

Permanent magnetic field sources (PMFS), which are designed to magnetize ferromagnetic objects located at a considerable distance (up to 20 - 50 mm), are used in various fields of science and technology. Thus, electromagnetic-acoustic transducers (EMAT) are used to control and diagnose ferromagnetic products with dielectric coatings or deposits on the surfaces.

The thickness of the coatings of the controlled products can reach up to 5 mm, and deposits, for example, on the inner surfaces of pipelines, up to 20 mm and more. The efficiency of these converters depends on the degree of magnetization of the surface layer of the object remote from the PMFS [1, 2]. An autonomous PMFS as part of a portable EMAT is considered, which consists of a permanent magnet 1, a ferromagnetic screen 2, a ferromagnetic control object 3 and an inductance coil 4 (Fig. 1). The calculation limit of the scattering field 5 and the central axis of the magnetic system 6 are shown.

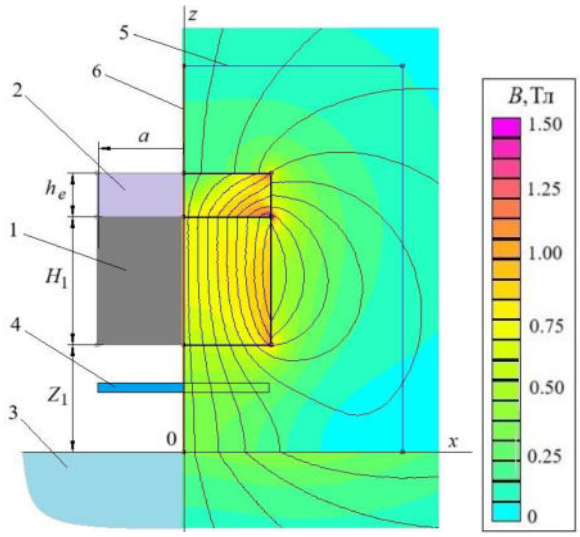

Fig. 1. Scheme of an autonomous PMFS as part of a portable EMAT and magnetic field distribution

It was established that for the selection of rational parameters of an autonomous PMFS it is necessary to use an integral criterion that takes into account the magnetic field in the surface layer of the ferromagnetic control object, the scattering magnetic field, the volume of the permanent magnet, which determines the mass and dimensions, and the cost of the PMFS, as well as the force of attraction to the control object. The results of experimental studies on a sample of an autonomous source, which contained 6 sections of a permanent magnet made of *NeFeB* ceramics with dimensions of 50x50x10 mm^3, with an error of up to 9% correspond to the results of the calculation of the magnetic field on the surface of a ferromagnetic sample with a thickness of 40 mm.

Literature:

1. Suchkov G.M., Bolyukh V.F., Kocherga A.I. et al. Increasing the efficiency of the surface-mounted ultrasonic electromagnetic-acoustic transducer on account of the magnetic field source. *Technical electrodynamics*, 2023, no. 2, pp. 3-8. https://doi.org/10.15407/techned2023.02.003.

2. Mygushchenko R.P., Suchkov G.M., Petrishchev O.N. et al. Information-measuring electromechanical transducers for assessing the surface quality of ferromagnetic metal products using ultrasonic Rayleigh waves. *Technical electrodynamics*, 2017, no. 2, pp. 70 – 76. https://doi.org/10.15407/techned2017.02.070.