

Metal magnetic memory effect in non-destructive tests

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In the article a passive method of non-destructive testing has been described. The method relies on the metal magnetic memory effect – the change of magnetization of ferromagnetic and metastable paramagnetic alloys in weak magnetic field of the Earth \mathbf{H}_E (vector parameters depend on the geographic location of the object) under the influence of the unknown changes: the external magnetic field $\Delta\mathbf{H}(t)$, mechanical stresses $\sigma_m(t)$, thermal stresses $\sigma_T(t)$ and degradation of material structure $D(t)$ [1, 2].

The results of SWOT analysis were elaborated: 1) strengths and weaknesses of the **Metal Magnetic Memory (MMM)** passive method of NDT; 2) threats resulting from incomplete description of the theoretical MMM method (i.e. influence of complex stress state and plastic range of polycrystalline material in macro scale), existing measuring application measurements and ISO 24497 standard; 3) research and development needs indispensable to improve the reliability of diagnostic symptoms used in NDT.

The scope of research works conducted in Poland was presented for the purpose of authenticating diagnostic symptoms of MMM method and extension of its capabilities to structural health monitoring (SHM) and prognostics and health management (PHM). The subject at hand was portrayed with the results of laboratory and operational tests, including the comparison with the **Magnetic Rope Testing (MRT)** active method of NDT - Figure 1.

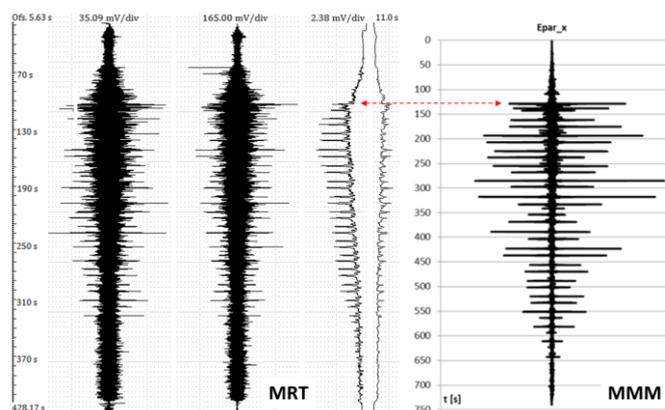


Figure 1. Comparative NDT study of compacted wire rope (MRT and MMM methods) [3].

[1] Bozorth R. M., Ferromagnetism. John Wiley & Soon, Inc, Hoboken, New Jersey, 2003.

[2] <http://www.ndt.net>.

[3] Witos M., Zieja M., Fallahi N., Kwaśniewski J., NDE and SHM of Critical Parts Using Magnetic and Electromagnetic Methods. DOI: 10.13140/RG.2.2.29923.04647.