

Stress monitoring in steel elements via detection of AC magnetic permeability changes

T. Szumiata,¹ K. Hibner,¹ K. Dziewiecki,² Z. Mazur,² A. Gockiewicz,¹
M. Gzik-Szumiata,¹ B. Górka,¹ and M. Witoś³

¹*Department of Physics, University of Technology and Humanities in Radom,
Krasickiego 54, 26-600 Radom, Poland*

²*Institute of Applied Mechanics and Power Engineering,
University of Technology and Humanities in Radom,
Krasickiego 54, 26-600 Radom, Poland*

³*Air Force Institute of Technology,
Księcia Bolesława 6, 01-494 Warsaw, Poland*

The influence of mechanical stress on low frequency AC magnetic permeability was studied. The cold-drawn bars with C45 steel were subjected to investigation. The tensile stress was applied by means of material testing machine. The registered changes of magnetic permeability of the stretched rods were almost frequency-independent in low frequency limit. A significant mechanomagnetic hysteresis was observed slightly evolving from cycle to cycle with tendency of stabilization. The extension of basic Stoner–Wohlfarth model of magnetic permeability allowed to fit the data in the range of the increasing tensile stress and to estimate the change of the internal stress due to the relaxation effect.