Thermoinductive Investigations of Magnetic Materials for Surface Cracks

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Abstract

Thermoinductive investigations have been carried out on steel work-pieces with the goal of detecting surface cracks. Experimental results show that the method is well suited to find the position of the cracks. Different finite element simulations are used in order to model the temperature distribution in the work-piece and around the cracks, and the derived analytical equations describe the heat transfer process. Results of the numerical simulations and the analytical calculations are compared with the experimental results, and a very good correspondence found. Additionally, the influence of the crack depth on the temperature increase around the flaw is investigated, and a formula derived, which enables the calculation of the crack depth from the measured excess temperature.

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