

ASSESSMENT OF HARDNESS EVOLUTION OF HEAT TREATED AMS6414 STEEL BY USING NON-DESTRUCTIVE METHODS

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1. Abstract

This work concerns the development of procedures for assessing the hardness of AMS 6414 steel samples after the case-hardening and induction hardening process, by using non-destructive magnetic techniques. The eddy current and Barkhausen noise methods were used to assess the hardness of 7 samples subjected to tempering treatment in various temperatures ranging from 120 to 190°C. The eddy current method was used to measure the phase angle changes of the lift-off signal obtained from the measurements of samples with different hardness.

The phase angle of the eddy current signal strongly depends on the electrical conductivity and permeability changes of the investigated material. These specific physical properties of material are sensitive to stress and simultaneous hardness changes caused by heat treatment at different tempering temperatures. Therefore the hardness of material could be predicted by measurement of the phase angle changes.

Assessment of hardness by using non-destructive methods also based on the envelope analysis of Barkhausen effects signals. This method could be used to identify the hardness changes of tempered layers with an accuracy of 10HV. In order to verify the obtained results from both of nondestructive tests, the microstructure analysis were carried out and micro-hardness profiles were made on the cross sections of the samples.

In present work, non-destructive methods were also used to identify the changes of hardened layers thickness in materials characterized by microstructural gradient and thus different hardness distribution.

2. Keywords

Carburizing, induction-hardened layer, Barkhausen noise, eddy currents, micro-hardness profiles

3. References

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