NOVEL METHOD FOR NON–DESTRUCTIVE EVALUATION OF CRACK DEPTH FROM EDDY–CURRENT TESTING SIGNALS

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Abstract. A novel method for crack depth evaluation in eddy-current non-destructive testing is introduced. A detected crack is checked by several probes to get more information about the crack. The probes provide different depth profiles of eddy currents under a pick-up coil. The crack signals obtained from the probes are linearly superimposed and the ratio of the superposition is changed in a wide range. The amplitude of the superimposed crack signal and its corresponding phase are analysed with respect to the value of the ratio. Unique feature values of the ratio are then extracted according to the defined criteria. Both numerical investigations and experimental verification reveal that the feature values of the ratio provide clear indication about the depth of the detected crack. Moreover, the proposed method enables to evaluate the depth of a defect that is much deeper than the standard depth of penetration.

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UTILIZATION OF MICROWAVES IN MATERIAL DEFECT INVESTIGATION

Dagmar Faktorová

Abstract. A microwave measurement of metal defects using relevant theoretical assumptions is described. The cracks are estimated from the microwave practice and waveguide technique is exploited. Deeper defects which are hardly detected by conventional techniques are focused. The results of the measurements are shown in graphs and discussed. The principal results are the frequency dependencies of the output signal on the crack depth and the possibility of the detection of this depth by microwaves. The microwave detection of the presence of cracks without contact and any coupling medium is demonstrated.

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LINEAR EQUIVALENT CIRCUIT OF HALL EFFECT GENERATOR

Miloslav Košek, Tomáš Mikolanda, Aleš Richter

Abstract. Hall Effect devices find a wide spectrum of technical applications, but the complete effect description is only in special literature. A relatively simple microscopic theory based on classical electron-gas model is presented and linear equivalent circuit of the Hall generator is derived from the model. This model is applied to a numerical simulation of a practical device. The simulation results in the full set of device parameters and a lot of characteristics. Both the parameters and characteristics depend strongly on semiconductor charge carrier density. Numerical results reveal that the Hall generator is a soft source of low voltage and produces very small output current and power, much less than 1 % of driving one. Efficiency and parameters are limited by the heat production in a probe of a small size. Heat production also leads to nonlinearity of the device. Characteristics reveal that constant driving current source can be replaced by a more convenient constant voltage source under standard conditions.

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MAGNETIC SUSCEPTIBILITY MEASUREMENT USING MAGNETIC RESONANCE TOMOGRAPHY

Miloslav Steinbauer, Karel Bartušek

Abstract. An innovative method is introduced, designed for measurement of the magnetic susceptibility of weakly magnetic materials. The method uses magnetic resonance (MR) tomography and it is necessary to immerse specimen into reference medium with measurable MR signal (water is suitable). Compared to the existing MR methods of susceptibility measurement, described method enables to determine the magnetic susceptibility of such materials which give no MR signal, but is suitable only for homogeneous materials with a regular shape. For a non-homogeneous material and/or irregular shape this method must be modified, as is discussed in the conclusion of the paper.

The principle of this method was analytically designed and numerically modeled. Usability of the method was experimentally verified in the laboratory. Measurable value of the magnetic susceptibility is of the order 10^{-7}.

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OPTIMIZATION OF OVERALL COSTS IN DESIGNING COMPLEX LIGHTING SYSTEMS

Ryszard Nawrowski, Andrzej Tomczewski

Abstract. Problems of the light field analysis applied to optimization of total expenses of electric lighting systems are considered. The light field is described by the Fredholm integral equations. For the purposes of the cost optimization, a modified genetic algorithm is used. The objective function of economic character is formulated and the constraint groups and the method of their application are shown. Examples of calculation related to the interior lighting systems are presented.

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FUZZY MODEL BASED CONTROL OF THERMAL SYSTEMS

Pavol Fedor, Daniela Perduková

Abstract. A simple methodology of investigation and fuzzy description of the basic properties of dynamic systems is dealt with, and the possibilities of its application in their control are studied. Basic properties of proposed control structures are presented in model examples. A brief description of its application in the temperature control in an injection moulding machine is provided.

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DYNAMIC MODEL OF A UNIVERSAL MOTOR WITH RESPECT TO ARMATURE REACTION AND SATURATION EFFECT

Pavel Záskalický

Abstract. The dynamic model of a universal motor is of vital importance for the simulation of its behaviour on various operation conditions. Its development is based on the design data and assumption of harmonic supply voltage. The corresponding computer model (written in Matlab-Simulink) allows for the determination of the waveforms of the speed, current and torque of the machine in different operation regimes. The voltage induced in the rotor is determined as a function of the magnetic core saturation and armature reaction. The characteristics of the motor are computed using the circuit parameters determined by measurements.

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