Abrasion resistance of alloy coatings deposited by plasma spraying

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Abstract. Abrasion resistance of a series of plasma deposited alloy coatings was tested. Fe-based alloys (high-alloy Cr- and Cr-Ni-steels, Fe-Al, Fe-Cr-Al, cast iron) and a Ni-Cr alloy were studied. A device for testing slurry (corundum in water) abrasion corresponding to ASTM G75-02 was employed for this purpose. For comparison, two coatings exhibiting extreme abrasion behaviour were measured by the same method: highly abrasion resistant plasma deposited WC-Co and poorly resistant arc sprayed Cr-Ni-steel. To reveal the possible differences between alloy coatings and bulk alloys, the results obtained from plasma deposited high-alloy steel coatings and bulk steels of virtually the same compositions were compared. In addition to the abrasion behaviour, hardness and microhardness (i.e. hardness of a single alloy splat) were determined. The observed differences in abrasion resistance of plasma sprayed alloy coatings were relatively small. This also relates to bulk steels. On the contrary, the coatings tested for comparison behaved in a very different manner. The cast iron coating was slightly more abrasion resistant than other plasma deposited coatings. The reason is probably the presence of Fe_3C. No correlation between abrasion resistance, hardness and microhardness was revealed. This is due to the complex structure of plasma sprayed coatings, by which the abrasion resistance is affected more than by composition of individual alloys.

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Ant colony system for reliability optimization design problem of multi-state power system

Omar Bendjeghaba, Dris Ouahdi

Abstract. A metaheuristic ant colony system (ACS) combined with the universal Ushakov's technique for reliability optimization design problem of multi-state series-parallel power system is proposed. The ACS uses the universal Ushakov's technique to evaluate the different reliability (availability) indices of the system, where the ant searches for the best reliable machines. The machines are characterized by their cost, performance and reliability. A case study is presented and an implementation of the optimization approach is carried out using MATLAB software. The obtained results show that the presented approach is adequate for solving the reliability optimization design problem of power systems especially at the initial design stages.

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Disturbance influence on partial discharge measurement and methods of its elimination in case of digital data processing

Lenka Karasová, Karel Záliš

Abstract. New equipment for partial discharges measuring, together with a suitable methodology of its evaluating, are presented. The text is concerned with disturbance elimination in the case of the partial discharge measurement. The trend today is to process measured data in the digital (discrete) form. In this case we have to use suitable computing programs for the processing and saving of measured data. However, great problems in the evaluation of partial discharge data are focused in various sorts of interferences. For unmanned operation of the measuring equipment are algorithms for disturbance elimination necessary. We have developed two basic algorithms for the elimination of main disturbing signals from digitized partial discharge data. Two mathematical theorems are applied to all measured samples by the computing program. Another way for the elimination of disturbances from partial discharge data is to apply mathematical wavelet analysis, which makes possible the elimination of more types of disturbance.

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Integrodifferential model of pulse current in long massive nonferromagnetic cylindrical conductor

Pavel Karban, Ivo Doležel

Abstract. A novel approach to determining of the spatial and temporal distribution of current density in massive electrically conductive nonferromagnetic bodies is suggested. The approach is based on the integrodifferential method of higher order of accuracy. Presented is the basic continuous mathematical model of the problem and possibilities of its numerical processing. The methodology is illustrated by an example of the distribution of pulse current density in a massive cylindrical conductor.

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On chaotic systems synthesis and synchronization

David Pánek, Jiří Lahoda, Josef Hrušák, Milan Štork

Abstract. A new approach to chaotic system synthesis is treated. The proposed method is based on usage of the modified dissipation normal form. It is shown that the approach based on the dissipation normal form can be used for continuous-time and discrete-time chaotic systems synthesis. There are discussed possibilities of synchronization continuous-time chaotic system in the paper. In the last part of the paper are shown two examples of practical application. The first one is a communication scheme using modulation with chaotic carrier and the second application is a simple example of usage chaotic systems in cryptography.

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On constrained approximation in higher-order finite element methods in 2D

Jakub Červený

Abstract. Both adaptive and higher-order finite element solvers are becoming more and more common in applications. For practical reasons, these solvers are often required to support irregular meshes. In this paper we review methods for the handling of meshes with hanging nodes for both nodal and hierarchic higher-order FEM in two spatial dimensions. We also present an original algorithm for the treatment of arbitrarily-irregular meshes in *hp*-FEM. Practical implementation details and data structures that are often omitted elsewhere are also included.

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