Mathematical modeling and analysis of flux-switching permanent magnet machine

Vladimir Prakht, Vladimir Dmitrievskii,
Vadim Kazakbaev

Abstract. A complete dynamic computer model of flux-switching machine is presented. The model takes into account, core losses eddy current losses in permanent magnets and features of the machine design in detail. It also allows studying highly dynamic transient processes in electric machines with arbitrary control algorithm.

Contents

Hybrid and pure active power filters in the common application

Tomasz Adrikowski, Dawid Buła, Marian Pasko

Abstract. The conception of parallel operation of pure active power filter (APF) and hybrid active power filter (HAPF) in three-phase energetic power system with unbalanced load is presented. The purpose of the filters is elimination of source current harmonics and compensation of reactive power in source-load system, with assumed efficient division of filtering task between both filters. HAPF is designed for rough filtration—it filters the fifth harmonic only, while the remaining harmonics are eliminated by APF. Using SLPS interface, the control system of filters was modelled in MATLAB-Simulink environment, and the three-phase energetic power system with source, load and filters was implemented in OrCAD-Capture&PSpice environment.

Contents

Computation of current density in cylindrical charges in the process of induction heating by code Flux 3D

Joanna Kolańska-Płuska, Jerzy Barglik,
Bernard Baron, Zygmunt Piątek

Abstract. A model of an induction heater implemented in code FLUX 3D is presented. Performed are multi-variant computations of current density distribution for frequency of the power source $f = 4400$ Hz. Knowledge of the distribution of current density is crucial for determining the input impedance of heating that is strongly influenced by the parameters of the power source.

Contents

Analysis and simulation of LCTLC resonant inverter with multifunction output

Mariana Beňová, Branislav Dobrucký

Abstract. Design analysis and simulation of power resonant inverter with integrated LCLC filter and VF transformer (LCTLC) is carried out. The filter provides sinusoidal output voltage for sensitive loads with harmonic distortion about 5 % in the whole range of the load (0–100 %). The LCTLC filter is supplied from either a single-phase voltage inverter in the full-bridge or half-bridge connection, or from a simple DC/DC buck converter. The output can be considered as simply controlled AC HF power generator (power supply) or DC rectified output (DC power supply), and/or as AC LF source with variable frequency.

Contents

Investigations of calculation accuracy of power system electromechanical eigenvalues based on analysis of selected disturbance states

Piotr Pruski, Stefan Paszek

Abstract. Accuracy of calculations of electromechanical eigenvalues of the multimachine power system state matrix is analysed. The approach is based on instantaneous power disturbance waveforms taking into account introduction of a disturbance to different units. There were analysed the instantaneous power waveforms occurring after introducing the disturbance in the form of a rectangular impulse of different height to the voltage regulation system of generators in generating units of different powers. In order to increase the computation accuracy, computations were repeated many times. The computation results were averaged. A hybrid algorithm consisting of genetic and gradient algorithms was used for computations.

Contents

Description of software determining optimum maintenance sequence for 110 kV power circuit breakers with SF$_6$

Vladimír Král, Stanislav Rusek, Radomír Goňo

Abstract. The third stage of work on the development of Reliability Centred Maintenance (RCM) software for distribution system network elements is described. Analysed is particularly the case of a 110 kV power circuit breakers with SF$_6$. The software design is based on RCM software and previously developed software for the maintenance of 110 kV VMM power circuit breakers and 110 kV/MV transformers. When determining an optimum maintenance sequence, the appropriate parameters of technical conditions and operational importance are required. The paper describes the structure of input databases and the possibilities of the first version of software which comprehensively addresses this issue for power circuit breakers with SF$_6$.

Contents

Computer simulation of
human cardiovascular system

Daniela Gombarska, Barbora Czippelova

Abstract. A computer simulation of electromechanic analogy of human cardiovascular system is developed for the purpose of study haemodynamics. It allows studying a body under physiological conditions or evaluate effect of pathologic changes in the organism and possible impact of therapy without any invasive technique.

Contents

Design of a stepper transducer with ferrofluid

Petr Polcar, Daniel Mayer

Abstract. A new conceptual project of transducer using a ferrofluid is presented. The transducer is expected to achieve higher operation parameters than the classical actuator with air due to lower reluctance of magnetic paths. The mathematical model of the device is solved numerically using a code based on a fully adaptive higher-order finite element method. The methodology is illustrated by a representative example.

Contents

Effects of thermal radiation and mass diffusion on free convection flow past an impulsively started infinite vertical plate with ramped temperature

Marneni Narahari

Abstract. The effects of thermal radiation on unsteady free convection flow of a viscous incompressible fluid past an impulsively started infinite vertical plate in the presence of chemical species concentration and a temperature boundary condition which follows a ramp function up until some specified time and then remains constant has been investigated. The fluid is assumed to be gray, emitting–absorbing but non-scattering medium, and the optically thin radiation limit is considered. The dimensionless governing equations are solved using Laplace transform technique. The velocity and temperature profiles and the Nusselt number are shown on graphs for different air flows. The variation of skin-friction is also shown in tabular form. The effects of different parameters like radiation parameter, thermal Grashof number, Schmidt number, mass to thermal buoyancy ratio parameter and time are discussed. It is observed that the velocity increases with decreasing radiation parameter. The Nusselt number increases as time increases to unity and thereafter decreases to the steady state gradually. The interaction of free convection with thermal radiation near a ramped temperature plate has also been compared with the flow near a plate with constant temperature.

Contents