METHOD FOR DETERMINING THE ELECTROMAGNETIC PARAMETERS OF THE LINEAR DYNAMIC MODEL OF THE THREE-PHASE INDUCTION MOTOR BASED ON THE TRANSIENT RESPONSE TEST TO A DC VOLTAGE STEP SIGNAL

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Abstract. The paper presents a method for determining the electromagnetic parameters of the linear dynamic model of the induction motor with a three-phase stator winding in a star connection (with the star neutral point isolated) and a polyphase rotor winding (simple cage type) in the short circuit - based on the transient response test in the stator phase electric current intensity, upon the sudden connection of a direct voltage source in the electrical circuit of the stator phase windings A and B, corresponding to the particular topology of the three-phase stator electrical circuit, in which the stator phase windings B and C have galvanically connected input terminals.

MODELING, PRACTICAL IMPLEMENTATION AND TESTING OF A TWO-PHASE HYBRID STEPPER MOTOR: DIFFICULTIES AND PROSPECTS

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Abstract. The paper presents the three-dimensional finite element modeling (FEM) of a small-sized hybrid two-phase stepper motor (HPM) with a displacement step of 1°. The static torque characteristic and the holding torque are determined from the field solution using different three-dimensional FEM models. The difficulties of modeling a motor with significant magnetic anisotropy, specific to this type of motor with both transverse and axial magnetic fields, are explained. The essential aspects of the technological realization of this motor are presented, and the experimental results obtained for the HPM with a stator made of sheet metal are interpreted.

THE ELECTRICAL TRANSFORMER –AN INVENTION THAT REVOLUTIONIZED ELECTRICAL ENGINEERING

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Abstract. The transformer is the equipment that revolutionized the long-distance transmission of electrical energy. Many of the applications of electricity are related to this electrical equipment, which has been designed and perfected through the contributions of numerous experimenters, scientists, engineers, and technicians over two hundred years of creative efforts. This work synthesizes the stages of accumulation of scientific and technical knowledge in electromagnetism, which led to the patenting and construction of the first electrical transformer in 1884-1885. In addition to the chronological milestones of the genesis of the electrical transformer, the contributions made by this equipment to the inauguration of a new stage in the development of human society based on comfort and productivity are also illustrated. The new directions of research and development in which sustainability is the key element show that the electrical transformer will not remain just an artifact preserved in museums.

RESISTIVE HTS SUPERCONDUCTOR LIMITER FOR FAILURE CURRENTS

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Abstract. The present work refers to the realization of some applications of HTS superconductors in alternating current, of significant importance for the protection of electrical networks and, respectively, the transport of electrical energy: fault current limiter and superconducting cable, realized in ICPE-CA within the Applied Superconductivity Laboratory. The fault current limiter is of resistive type and is made with HTS superconducting material of YBCO type in the form of a strip of 6 mm width and 0.11 mm thickness [1]. The experimental model realized was tested for currents of 200 A AC, its operating temperature is -196 ºC, immersed in liquid nitrogen. The operating principle is based on the superconductor exiting, under the influence of fault currents higher than the nominal current IA> IN, from the superconducting state and its transition to the resistive state, at which point the current is bypassed through an alternating circuit [2], thus protecting the primary circuit.

The HTS superconducting cable is designed to transport intense currents (102 – 103 A), presenting very low Joule losses compared to conventional conductors [3]. The cable is made with HTS superconducting material of the YBCO type with a critical temperature of 92 K used in the form of a strip with a width of 12 mm and a thickness of 0.11 mm [1]. The cryogenic cooling of the superconducting material is performed with liquid nitrogen at a temperature of -196 ºC.

ON THE DYNAMIC STABILITY OF SYNCHRONOUS MACHINES

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Abstract. The paper details, through simulation, using dynamic mathematical models, the evolution of the electromagnetic torques of a high-power synchronous motor when applying a constant torque shock.

ANTI-AGING PROPERTIES OF LDPE-TiO2 NANOCOMPOSITES LDPE-TiO2

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Abstract. This paper presents an experimental analysis by dielectric spectroscopy of the influence of TiO2 nanoparticles on the electrical properties of low-density polyethylene (LDPE), which determines the delay of the aging of the thermally stressed polymer. The results show that both the real part of the complex conductivity and the tangent of the dielectric loss angle of the analyzed LDPE-TiO2 nanocomposite decrease for one month under thermal stresses at 90 °C. At the same time, these properties' values increase immediately after applying thermal stresses on LDPE without nanoparticles.

AUTOMATION STATION FOR DIDACTIC APPLICATIONS

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Abstract. Automation training stations are fundamental platforms for applied training in industrial automation, facilitating the understanding and applying theoretical concepts in controlled experimental environments. This paper details designing and implementing an automation training station equipped with current industrial components for university laboratories, providing an advanced educational environment. Thus, the platform allows users to practice fundamental automation concepts, develop and test control algorithms, and simulate industrial processes in safe and accurate conditions.

SOLUTIONS FOR THE ANALYSIS OF THE OPERATION OF AN ELECTRIC TRACTION MOTOR ON SMALL-SCALE EXPERIMENTAL MODELS

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Abstract. The paper presents a study on the findings of design data for small-scale experimental models for an electric motor intended for use in the car powertrain system. The first stage describes a procedure for determining the requirements and characteristics of an electric traction motor based on the specifications of the car body, a standardized driving cycle, and technical prescriptions related to the construction of public roads. Considering the particularities of the electric motor load in traction applications, the configuration of a test bench under laboratory conditions is presented. Two experimental models with reduced power at a scale of 1:10 are proposed, which allow for a low-cost analysis of the operation of the actual motor at maximum torque and maximum speed, respectively. A reduced-scale version of the test bench allows the same loading system for the tests of the two experimental models.

FIVE-PHASE ELECTRONIC CONVERTER DEDICATED TO POWERING AN ASYNCHRONOUS MOTOR USED TO DRIVE AN ELECTRIC VEHICLE

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Abstract. This presentation concerns developing and testing an experimental model of a frequency converter based on IGBT transistors, controlled by a microcontroller, used to power a 5-phase asynchronous machine with a nominal power of 5 kW. The hardware implementation and the main elements of the control and diagnostic software, developed to ensure the control of a general-purpose converter, which can be used to drive a light electric vehicle powered by batteries, are presented. The measurements also include the behavior of the drive when a phase separation fault occurs.

EV POWERTRAIN USING COMPUTER-AIDED CONCEPTION

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Abstract. One of the simplest ways to rapidly obtain the main characteristics of an EV (Electric Vehicle) powertrain is by calculating the requested values from resistant forces acting on the vehicle. A powertrain covering the operation area of the car can give satisfaction. The autonomy is sustained by the onboard energy source (battery), and the maximum speed and acceleration performances come from the possibility of establishing and maintaining a maximum current through the battery, power electronics, and electric motor. In this context, the present paper is focused on a possible methodology achieved using a computer-aided conception. After determining the characteristics of each powertrain component using calculation and simulation, the behavior of the EV is analyzed under a complete simulation of the powertrain**.**

SPECIAL CONICAL WIRELESS CHARGING SYSTEM FOR DRONES

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Abstract. Wireless power transfer systems are integrated nowadays into more and more electromagnetic devices. An application with good potential for such systems is the wireless charging of batteries of autonomous/semiautonomous drones; these aerial vehicles have been used in the last decade for many domestic or military purposes. The operation range of such remote-controlled vehicles is limited because their batteries are limited in size, weight, and stored energy. Thus, the drone batteries should be charged more often. Wireless Charging Stations (WCS) spread in an established operation region can be used for this purpose once the drones are equipped with intelligent algorithms able to choose optimally the closest charging pad based on specific parameters such as programmed route, drone position, battery state of charge, locations of spread WCSs, weather conditions, etc.

The WCSs are more flexible and less sensible to weather conditions (rains, mud, dust, winds, etc.) than classical plugin charging systems. However, a good alignment of transmitter and receiver coils of WCSs remains a challenging aspect in case of harsh weather conditions (strong winds or storms), and solving this problem is paramount for an efficient charging process.

The solution analyzed in this paper is a WCS for drones operating in difficult weather conditions. The proposed system can self-center the transmitter (Tx) and receiver (Rx) coils and to efficiently lock and release the drone using an electromagnetic system. The Tx coil is mounted on a magnetic

concrete pad, and the Rx coil is mounted on a ferrite plate placed on the drone's belly. The analysis of the solution to determine its performance characteristics and limitations is carried out using the finite element (FE) method implemented in the professional software package Flux®.

SOFTWARE TOOLS USED TO SIMULATE THE OPERATION OF WEAK CURRENT ELECTRICAL FILTERS

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Abstract. In this paper, some of the currently available software tools for simulating low-current electrical circuits are presented and analyzed. The purpose of using several types of software tools is to help future researchers in the field find the software tool best suited for the study and analysis of the operation of low-current electrical circuits. Simulations for a low-pass active filter in Butterworth topology are performed.

PIEZOELECTRIC LINEAR MOTOR FOR ESSENTIAL OIL EXTRACTION APPLICATIONS

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Abstract. Various methods of extracting essential oil from various plants can be used, but among the unconventional techniques is the microcavitation process and substance separation using linear piezoelectric ultrasonic motors. The microcavitation provided by the ultrasound source offers additional advantages over conventional extraction methods by distillation. The paper uses the finite element method to present the numerical modeling of an axially symmetrical linear piezoelectric ultrasonic motor in a permanent harmonic regime.

METHODOLOGY AND APPLICATIONS IN POWER TRANSFORMER MONITORING

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Abstract. This paper presents the importance and applicability of dissolved gas analysis (DGA) in monitoring the health of power transformers, which are essential in electrical distribution networks. The reliability of transformers is critical, and DGA represents an effective method for early detection of internal faults by measuring dissolved gases in the insulating oil. Different interpretation techniques, such as the Duval triangle and Roger methods, are discussed for identifying fault types based on the concentration and ratio of the resulting gases. The paper also explores the limitations of these methods and future perspectives, proposing a multi-method approach based on machine learning algorithms to improve the accuracy and consistency of DGA interpretation.

RECENT ADVANCEMENTS IN ENVIRONMENTAL VIBRATION ENERGY CONVERSION WITH TRIBOELECTRIC NANOGENERATORS

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Abstract. Triboelectric nanogenerators represent a promising direction for realizing very low-power renewable sources of electrical energy intended for powering portable electronic devices and sensors used in Internet of Things networks. Their attractiveness is due, first, to the ability to efficiently convert the kinetic energies specific to a wide variety of ambient vibrational sources with low frequencies, such as human movement, the movement of waves, wind, acoustic waves, etc., but also to other factors such as low weight and relatively low cost. This paper gives a brief presentation of triboelectric nanogenerators, their operating mechanisms, and their structural configurations. By way of illustration, some examples of triboelectric nanogenerators in various fields of current interest are presented.