The Analysis of Optimal Designs of Magnetoelectric Machine

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This paper provides an analytical solution to one of the main objectives within theoretical foundations of electrical engineering, formulated in particular to reflect the decision making while designing new types of synchronous generators with permanent magnets. The purpose of this paper is to obtain an analytical solution for the determination of the induced Electromotive Force (EMF) in the loop placed in a magnetic field of the permanent magnet while in relative motion. The necessity for such generators is determined, above all, by development of the area of small-scale energy sector due to the emergence on the consumer market of affordable and accessible strong magnets of neodymium alloy NdFeB. The stand includes: a frequency converter, an induction motor, a synchronous generator, an active load resistance, power protection and inclusion industrial electrical network. The concept of choosing the form of cross section of steel magnetic poles and permanent magnets in the structure of synchronous generator based on the solution of electrical engineering task concerning educed electromotive force in the turn. Formulated is the task of the optimizing the structure of magnet system of magnetoelectric machine while providing various criteria of optimization and preserving the general criterion corresponding to the minimum of active materials mass. An example of in the calculation of the magnetic system of a magnetoelectric machines based on the finite element analysis. The pictures of magnetic field of the generator in an idling mode, the transverse and the longitudinal armature reaction at the nominal current in the stator winding are presented in the paper.

Keywords: magnets, field, emf, winding, flux.