COMPARISON OF SINGLE-PHASE TWISTED AND ADJUSTED STATIONARY AND SPECIAL ELECTROMAGNETIC SYSTEMS

Varfolomiev I.V. **– student, gr. Ен 4/1,** ***vaniskys27@gmail.com***

Sadovyi O.S. **– Ph.D., docent.,** ***sadovuyos@mnau.edu.ua***

Mikolaev National Agrarian University

Relevance of research. Today, magnetic conductors of single-phase electromagnetic static devices (ESD) are made of electrical steel (ETS) by means of straightening, winding or bending of strips and sometimes by flattening and corrugation of strip blanks. The technology of winding the tape (roll) ETS in magnetic circuits with rectangular cross-sections of the rods is considered more advanced and extends to a capacity of 1000 kVA [1]. Single-phase ESPs are available with both twisted and charged magnetic circuits. However, to date, the issue of their analytical comparison has not been resolved [2]. Therefore, the solution of the problem of mass comparison, is material consumption of single-phase static electromagnetic systems (EMS) is important and relevant both theoretically and practically.

The purpose of research. Perform a numerical comparative analysis of the mass of single-phase EMS of low and medium power with twisted and charged rod and armored magnetic circuits.

The result of the study. The main requirement for electromechanisms and single-phase power supply systems, in particular for domestic use, is the minimum weight. Therefore, in accordance with the purpose of this work, a numerical comparative analysis of the technical level of planar rod, armor and spatial armor electromagnetic systems with twisted and charged magnetic circuits. To determine the advantage and justify the choice of single-phase transformer design, a universal method of target functions for optimization of electromagnetic systems with dimensionless technical level indicators and relative controlled variables was used [2,3]. In determining the objective functions based on the condition of electromagnetic equivalence, the materials used, winding current densities, average values of magnetic field induction amplitudes in rods and yokes, as well as performance and methods of cooling electromagnetic static devices were taken as the same.

According to the result of the calculations obtained the following values:

- the mass indices of the twisted magnetic circuit relative to the charged magnetic circuit are lower, with a copper winding by 2.66%, and with an aluminum winding less by 2.77%.

- the mass indices of planar EMS with twisted magnetic circuit, relative to armor EMS with charged magnetic circuit also decreased, by 2.17% with copper windings and by 1.43% with aluminum windings.

- the mass index of the spatial four-contour EMS with a twisted magnetic circuit relative to the planar armor EMS with a charged magnetic circuit decreased by 1.32% for the materials of the copper winding and by 0.44% for the aluminum winding.

Conclusion. It is established that the mass indices in the operating voltage range of the EMC with a twisted rod magnetic circuit have smaller values compared to the analogue of this EMS, but with a tuned magnetic circuit. The mass indices of planar EMC with twisted magnetic circuit are also determined, the values of which are smaller in comparison with planar armored EMS with twisted magnetic circuit. Comparing the mass index of the spatial four-contour EMS with a twisted magnetic circuit relative to the plenary armor analog with a charged magnetic circuit, it was also found that the value of the first EMS is in the range of decrease. Thus, we can say that these results provide promising ways to determine methods for improving EMS.

Literature

1. Stavinskii, A., Shebanin, V., Avdieieva, Tsyganov, A., Stavinskiy, R., Sadovoy, O. Dependence of the Indicators of Three-phase Transformers with Planar Plate Magnetic Wires from Variants of Rod Configuration. Proceedings of the International Conference on Modern Electrical and Energy Systems, MEES 2019September 2019, Pages 102-105. DOI: 10.1109/MEES.2019.8896451

2. Садовий О.С. Визначення показників маси та вартості планарних однофазних електромагнітних систем з прямокутними перерізами стрижнів. Електромеханічні і енергозберігаючі системи. 2020. – Вип. 3/2020 (51). – С. 27–33.

3. Stavinskii, A.A., Tsyganov, A. M. Desing and technological proposals for improving a singl-phase transformer with laminated magnetic core. Electrical engineering and electromechanics.2020№6.PP.11-18.