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Hristich M.A.¹, Lushchin S.P.²

¹ student of group E-412a sp NU "Zaporizhzhia Polytechnic"

² PhD (Phys.-math. sciences), associate professor NU "Zaporizhzhia Polytechnic"

USAGE OF MODERN MAGNETIC ALLOYS IN ELECTRICAL DEVICES

Today, one of the most promising magnetic alloys for electrical devices is neodymium magnets. A neodymium magnet is a powerful permanent magnet consisting of an alloy of the rare earth element neodymium, boron, and iron (NdFeB). It shows high pulling power and high resistance to demagnetization. Neodymium magnets lose no more than 1...2% of their magnetization in 10 years. They are used in relays and sensors, rotors of electric motors and generators at industrial hydroelectric power stations and wind turbines. They are used instead of excitation winding that enables large currents through the rotor windings, and also allows you to do without sparking brushes. The use of neodymium magnets in the rotors of brushless synchronous generators and multi-turn brushless DC motors is easy to control and does not require special maintenance.

Powerful neodymium magnets on the motor rotor allow you to achieve a greater torque on the shaft. Such an engine heats up much less than a collector engine. As a result, the engine efficiency is higher, power indicators per kilogram of weight are higher, a wide range of adjustment of the speed of rotation of the rotor and almost complete absence of generated radio interference. Structurally, engines of this type are easily adapted for operation in water and in aggressive environments.

The use of neodymium magnets in electric motors and generators is determined by the operating temperature, so it is essential to operate them in the permitted temperature regime. When heated above the Curie temperature, they demagnetize and lose their magnetic properties. That is, excessive operation of an electric motor or generator can lead to its overheating, which will cause its further inoperability. We have analyzed existing magnetic alloys according to operating temperature, residual magnetic induction, coercive force, and magnetic energy. Neodymium magnets of class 38EN have the best performance characteristics: operating temperature $T = 200\text{ }^{\circ}\text{C}$, residual magnetic induction 1220...1250 mT, coercive force $\geq 2388\text{ kA}$, magnetic energy 287...310 kJ [1].

REFERENCES

1. Режим доступу: <https://neodim.net.ua/uk/harakteristiki>