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ANALYSIS OF THE ENERGY LOSSES IN ALTERNAITING CURRENT GENERATOR ANDWAYS OF ITS PRODUCTIVITY IMPROVEMENT

Electric current is generated in generators, devices that convert any type of energy into electrical one. Generators include galvanic cells, electrostatic machines, thermopiles, solar panels, etc. The scope of each of the listed types of electricity generators are determined by their characteristics. Thus, electrostatic machines create a high potential difference, and are unable to create any significant current in the circuit. Galvanic cells can provide high current, but their life time is short. Electromechanical induction generators of alternating current play a predominant role in our time. In these generators, mechanical energy is converted into electrical. Their action is based on the phenomenon of electromagnetic induction. Such generators have a relatively simple design and allow high currents to be obtained at a sufficiently high voltage.

Due to electromagnetic induction, when the magnetic field changes an electric current arises in a conductor, mechanical energy is being converted into electrical energy. Let's consider the principle of operation of an electrical generator using the example of rectangular contour, rotating with the constant angular velocity in the uniform magnetic field (Fig. 1).

External forces cause the chain to rotate. When rotating, the magnetic field changes relative to a rectangular loop, and as a result an electric current appears in it. Due to the fact that the circuit changes phase and returns to its original position, the direction of the current changes.

During operation, energy losses occur in the generator, which are converted into heat and heating elements. Although the efficiency of modern generators is very high, the absolute losses are quite high too, and it leads to a significant increase in

the temperature of active steel, copper and insulation. An increase in the temperature of structural elements, in turn, results in their gradual destruction and a decrease in the service life of the generator. To prevent this, various cooling systems are used.

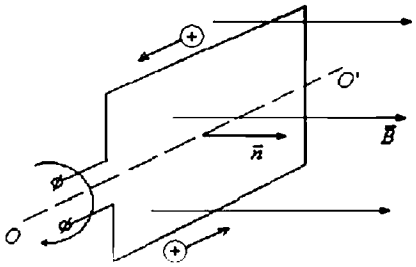

Figure 1. Principle of AC geneator opeation

There are the following types of cooling systems: surface (indirect) and direct cooling. Indirect cooling, in turn, can be air or hydrogen.

Hydrogen cooling systems are more often installed on large generators, since they provide better heat removal. Compared to air cooling, hydrogen has a higher thermal conductivity and ten times lower density. As long as hydrogen is flammable and explosive, the ventilation system is isolated and increased pressure is maintained.