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Anton Chulkov[1], Nataliia Zhukova[2]
[1]PhD student, EP Dpt., NU "Zaporizhzhia Polytechnic"
[2]PhD (Philology), associate professor "Zaporizhzhia Polytechnic"

IMPROVING THE PERFORMANCE CHARACTERISTICS OF AIRCRAFT ENGINE TRANSMISSION PARTS

In modern aviation turbojet engines, the design of parts and units of highly loaded transmissions is based on the principles of increasing the physical and mechanical properties of the main parts of the units drive boxes through the use of advanced processing methods based on chemical-thermal and electroplating processes.

The main parts of transmissions are stator case parts made of light alloys based on magnesium and aluminium, as well as parts of the rotor group gears made of structural heat-resistant and wear-resistant steels.

One of the most promising methods of hardening the working surfaces of the gear wheels of aircraft engines is the technology of ionic nitriding in a hydrogen-free saturating gas medium, which eliminates the metal hardening by hydrogen and ensures considerable saving of energy and gases. The ion-plasma surface modification in a non-hydrogen environment opens up new possibilities for improving the strength and durability of gears. This process has a number of advantages in comparison to hydrogen media, such as the elimination of the harmful effects of hydrogen on the metal (hydrogen embrittlement and hydrogen corrosion), improved plasticity of the nitrided layer and reduced consumption of electricity and gas, as well as improved working conditions and environmental protection.

In its turn, micro-arc oxidation (MAO) is one of the newest methods to increase wear and corrosion resistance of aircraft engine body parts made of valve-type materials. The peculiarity of this method is transmitting high anodic currents through the electrolyte in which the metal object is immersed. Such currents cause local micro-plasma discharges on the surface of the oxidized metal which lead to dissolution of its surface and active interaction with oxygen to form oxide layers. The temperature in these discharges rises to 7000…10000 °C, which causes melting of the created oxide coatings, endowing them with unique physical and chemical properties. Thus, the oxide layer, despite its relatively high porosity, effectively protects the oxidized metal from corrosion due to the fact that it is in the pores where the most intensive growth of oxides occurs. In addition to this there is a surface increase in hardness.

Scientific research, as well as development of processing and coating technologies in the above methods to improve the properties of parts and components of modern aircraft engines transmissions will lead to a significant increase in the operating life of products to ensure the ability to withstand operational hazards.