Features of application of additive technologies in the production of parts of gas turbine engines

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For development competitive aircraft engines it is necessary to use engine parts with high service characteristics and small mass. Traditional technologies based, for example, on precision casting or metal forming have significant limitations for the manufacturing of parts with are able to meet different requirements.

Recently developed additive technologies (AT) are promising methods for the production and repair of parts and assemblies of gas turbine engines.

The main advantages of using AT in aircraft engine are decreasing fuel consumption improving ecological characteristics, increasing reliability, weight reduction. AT permit to develop parts and assemblies that can't be made by traditional methods, including parts made of dissimilar materials. Other significant advantages of AT are the reduction of time and cost for development, production and maintenance, saving up to 90% of materials.

One of the main tasks of the development of GTE parts is weight reduction with the obligatory satisfaction of the strength and reliability requirements. Disks and blisks of compressors and turbines have a large mass and are the main parts, the fracture of which can lead to hazardous effects.

The possibility of creating turbine engine disc from Russian powder nickel alloy using additive manufacturing methods is considered in this paper.

A feature of the designed lightweight disk is the presence of a closed cavity. Manufacturing of such turbine disks is one of the most difficult tasks. Post-processing of disks also presents some difficulties. These and other problems of creating disk with a cavity are discussed, and ways to solve them are proposed.

The light hollow disks of a high-pressure turbine were made with the help of the developed methods. Various methods of non-destructive testing to detect manufacturing defects were used. The samples were tested to determine the mechanical properties of material. The preliminary tests of hollow disc were showed satisfactory results.

Studies have shown that the use of additive manufacturing can be considered for the manufacturing of turbine discs with cavities.

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