ABSTRACT

Nickel-based superalloys are commonly used in the technology of parts of the aerospace industry that are exposed to oxidizing environments, high temperatures and cyclical stresses during operation. In the dynamically developing aviation industry, it is important to constantly improve the processes of manufacturing engine components and to expand the knowledge of industry specialists in the field of construction of individual components, their working conditions, as well as the materials used in their construction. Shaping the knowledge of employees affects the speed of reaction to the factor causing delay in the production flow of aircraft parts. In the work, a detailed analysis of the production cycle of the 1st Stage Compressor Turbine Blades was carried out, on the example of the ŻS6U-WI material, taking into account the technological deviations in order to develop a model of proceeding in the modification of the process in the area of changes enabling the achievement of the quality of the parts produced in PWR in accordance with aviation requirements. The works were divided into four main stages. The first stage is a description of the status of the issue in relation to the analysis of the production process of the 1st Stage Compressor Turbine Blades in the context of the planned process modification activities. In the second stage, tests were carried out to verify the input material (semi-finished product) in relation to the use of blades in the precision casting process. In the next stage, the heat and thermo-chemical treatment processes used in the technology of turbine blades were subjected to a critical analysis in the scope enabling modification of their parameters guaranteeing the quality of castings compliant with the standards of the companies ordering the product. The fourth stage included the analysis of the impact of surface finishing and abrasive blasting process parameters on the mechanical properties of the blades. In order to confirm the possibility of changing the parameters of special processes, microstructure tests were performed and the fatigue resistance of the blades was assessed at each stage of the research. This made it possible to verify all production activities to confirm the application possibilities of the developed technology in the production process of finished aviation products. The developed results and the described conclusions allow for an efficient production flow.