RZESZOW UNIVERSITY OF TECHNOLOGY

Discipline: Mechanical Engineering

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SUMMARY OF THE DOCTORAL DISSERTATION

The impact of conventional shaping and innovative Power Skiving method machining on the forming quality characteristics of treated surfaces and the properties of the carburized layer of gears made of Pyrowear 53 steel

This dissertation concerns the impact of the Fellows cutting method and the implemented Power Skiving technology on selected quality features which include among others: geometric parameters of star (planet) gear teeth made of Pyrowear 53 steel and the properties of the carburized layer described by its depth and hardness. The aim of the dissertation is to demonstrate that the usage of the Power Skiving technology does not deteriorate selected product features characteristic of the gear teeth, both before and after the thermo-chemical treatment processes, with regard to the control sample, which are gears subjected to the machining process using Fellows method and confirmation of the hypothesis poses.

The hypothesis of the work says that the usage of an effective tooth shaping process using the Power Skiving method in the production process of gears made of Pyrowear 53 steel does not adversely affect the geometric features of the teeth and the quality features of surfaces subjected to the machining process. Moreover, it does not adversely affect the properties of the surface layer made in the next steps of the technological process, including the carburized layer of the areas subjected to the machining process, in relation to the values of the considered parameters obtained with the use of conventional machining using the Fellows method. The work presents theoretical foundations of issues related to gear teeth, among others: the considered manufacturing technologies, description of the surface layer, interpretation of geometric errors and the production of a carburized layer as a result of the application of thermo-chemical treatment. The hypothesis was confirmed by conducting a series of experiments related to the determination of the machining parameters of the implemented Power Skiving method and the sequence of verification tests of the selected parameters describing the geometry of the gearing of the star (planet) gear, the surface layer and the carburized layer. Statistical analysis was used to compare selected parameters obtained with the use of both machining methods and to demonstrate that the Power Skiving method is not inferior to the Fellows method, despite the effectiveness of the process. It has been proven that the use of efficient machining methods does not have to be associated with deterioration of the parameters describing the treated surface and the carburized layer.

The result of research work is the implementation of Power Skiving technology in the production environment of Pratt & Whitney Rzesz6w S.A.