

## **The influence of wire electrical discharge machining parameters on the shape accuracy and surface quality of a fir tree slot**

### **Abstract**

The aim of the thesis was to determine the influence of the selected setting parameters in the wire electrical discharge machining of Inconel 718 on the shape accuracy, surface roughness, thickness of the white layer and hardness in the white layer of a fir tree slot.

In the first part of the thesis, an analysis of the state of knowledge on wire electrical discharge machining WEDM of nickel alloys is presented. The Inconel 718 alloy was characterized and its applications in the design of the aircraft engines were presented. The adoption of alternative methods of machining fir tree slots of aircraft engines was proposed. An analysis of the advantages and disadvantages of wire electrical discharge machining WEDM in comparison with the common fir tree slots machining methods, as well as with other proposed machining methods, was conducted. The limitations and problems of WEDM machining were also analysed.

A test stand was designed and constructed, which allowed for conducting the experimental tests of wire electrical discharge machining WEDM of Inconel 718 alloy. The tests were performed in two stages. First, machining tests with a single finishing pass, using HP and MP power supplies were conducted. Then the obtained results of measured parameters were analysed, and the setting parameters were selected for the following stage. In the second stage, a strategy with two finishing passes and the LC power supply was assumed. The surface quality and shape accuracy of all the strategies and power supplies were compared.

The dissertation was concluded with cognitive and utilitarian conclusions. Further research possibilities concerning the adoption of wire electrical discharge machining WEDM in manufacturing critical parts, such as aircraft engine components, were presented.