

THE STUDY OF SELECTED MACHINABILITY PARAMETERS AND OPERATIONAL PROPERTIES OF MATERIALS USED FOR MEDICAL DEVICES

Abstract

The aim of this study is to analyze selected parameters of machinability and operational properties of materials used for medical devices, on example of Ti6Al4V titanium alloy, X2CrNiMo17-12-2 and X5CrNiCuNb16-4 stainless steels after finish turning under dry, fluid and MQL (Minimum Quantity Lubrication) conditions.

The thesis consists of an introduction, six chapters and a summary, as well as final conclusions. The first chapter presents the current state of knowledge about the details of chip shaping, cutting forces, parameters of geometric structure of the surface, tribological properties and corrosion resistance of titanium and its alloys and stainless steels. In the second chapter the scientific hypotheses are presented, the aim and scope of the work is determined. The third chapter characterizes the materials tested, describes the conditions and the range of research, the scientific equipment used and also presents and justifies the choice of the PSI (Parameter Space Investigation) method for experiment planning. The fourth chapter shows the analysis of research results concerning the influence of cooling conditions on chip formation and the cutting force when finish turning of the materials tested in a wide range of cutting parameters. The fifth chapter illustrates the results of research relating to the effect of finish turning conditions on the amplitude parameters of the geometric structure of the machined surface (SGP), 3D surface topography, material ratio curves and isotropy of the tested materials surface after machining in a wide range of cutting parameters. The sixth chapter describes the results of research about the effect of cooling conditions and topography of the machined surface on the tribological properties and corrosion resistance and bioactivity of the tested materials surface after finish turning. The thesis is concluded with a summary and more important final conclusions, which show the validity of the theses, introduce recommendations on the conditions of finish turning of titanium alloys and stainless steels and recommendations for achieving favorable tribological properties and bioactivity.