

## ABSTRACT

The subject of the dissertation is the study of porosity and fatigue strength in the aspect of the quality of the powder bed PBF (Powder Bed Fusion), and its task is to determine to what extent the degraded bed affects the quality of components obtained from the SLM process, DMLS on fatigue properties. The dissertation analyzed the weight reduction aspect of the RL050 servo valve body based on the application of additive technologies using powder bed metal (PBF). The main direction for this purpose is to reduce the weight of the components of the structure. Reducing the weight of structural components indirectly reduces the energy consumption of the materials used in their construction and directly reduces the share of energy required to operate them.

The first chapter provides an introduction to the rationale and prospects for using incremental technology of the PBF powder bed variety for metal alloy powders.

The second chapter analyzed the known powder bed-based additive techniques and their variations. The status of the issue in the area of SLM (Selective Laser Melting) and DMLS (Direct Metal Laser Sintering) techniques was analyzed in terms of the physical properties of the obtained structures.

In the third chapter, a thesis was formulated, assuming that the parameters of the incremental process and the post-process degradation of the powder bed of 1.2709 steel for the sintering of this powder by the (DMLS) method significantly affect the strength of the parts obtained by this method. The purpose and scope of the work are presented.

The fourth chapter deals with the research object and research methodology. The test object in the form of a servo valve body and test specimens are presented. The test methodology, along with a presentation of the apparatus used, are the next sections of Chapter Four.

Chapter five collects the test results. Preliminary and fundamental tests are presented. The studies concerned the share of porosity in the obtained structures, strength, fatigue strength, and the quality of the powder bed of 1.2709 steel.

The sixth chapter is a summary and conclusions of the research and their practical application in the production process in the form of a manufacturing process methodology.