Abstract

In engineering, surfaces with specified functional properties are of high demand in various applications. Desired surface finish can be obtained using several methods. Abrasive finishing is one of the most important processes in the manufacturing of mould and dies tools. It is a principal method to remove unwanted material, obtain desired geometry, surface quality and surface functional properties. The automation and computerization of finishing processes involves utilisation of robots, specialized machines with several degrees of freedom, sensors and data acquisition systems.

The focus of this work was to investigate foundations for process monitoring and control methods in application to semi-automated polishing machine based on the industrial robot. The monitoring system was built on NI data acquisition system with two sensors, acoustic emission sensor and accelerometer. Acquired sensory signals were analysed in time-frequency domain and specific process features are extracted in relation to machining parameters and processed surface properties.

Development and research of the process monitoring was done with background in evaluation of surface roughness parameters. The characterization of surface topography was essential part of engineering of new tools and machine elements. Therefore, the generation of surface texture should be indirectly monitored, and the machining parameters should be adjusted appropriately. Based on evaluating of the surface parameters, polishing process was quantified in terms of material removal volume. This property shows how efficient the surface processing is and leads to end point time detection of the process. It is one of the central topics in polishing process control due to its monotonous and time-consuming nature. To deal with it, the process was segmented using discretization methods. The applied methodology was proposed for implementation as an on-line system and is considered to be a part of the next generation of STRECON NanoRAP machine.