Surface roughness evaluation of the formed parts produced by the multi-pass cold metal spinning applying laser textured tool

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Metal spinning is an incremental forming process based on the forming a flat metal disc on a lathe into many different shapes. It is used in wide spectrum of production areas including those requiring parts with high precision and improved surface integrity. There are a lot of metal spinning parameters which defines and affects the quality of the produced components. Some of them are parameters related to the tool-workpiece interface. These parameters have essential influence on the final surface integrity of processed parts [1-5].

According to this, the paper brings the results of an experimental study of the multi-pass cold metal spinning process employing a laser-textured tool of 90MnCrV8 (1.2842) steel. The tool with a nose radius surface modified by pulse laser machined hexagonally arranged texture made up of dimple-like depressions with a diameter of 100 μm, depth of 20 μm and density of 6 % was applied for testing of surface hardening of DC01 low carbon steel sheet of the thickness 1 mm by applying various spinning tool pass profiles (convex, linear, and concave), mandrel speeds of 400, 800, and 1200 min^{-1} and tool feeds of 0.4, 0.8, and 1.2 mm. On the cylindrical-shaped spun samples the surface roughness of the spun cup wall was evaluated. The measurements in 0°, 45° and 90° directions related to the blank material rolling direction were realised and these responses were compared with those, which have been observed on the parts produced by the conventional, non-textured, tool.

The analysis showed that applying a laser-textured roller reduces the arithmetic mean height of the spun part roughness profile *Ra* by about 30 % compared to this, achieved using the non-textured roller. The *Ra* reduction of about 15.2 % compared to the initial roughness of the blank material was documented while the influence of the planar anisotropy of the material on the surface roughness was not proven.

This research was supported by the KEGA project 026STU-4/2023.

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