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EFFECT OF CNC MACHINING PARAMETERS ON SURFACE QUALITY OF DIFFERENT KIND OF WOOD

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Abstract— Computer Numerical Control (CNC) machines are increasingly popular in the production of furniture and wood products. The effective use of CNC machines depends on the processing parameters, which also affect the quality of the processed surface. This study aimed to determine the effect of feed rate and spindle speed on surface roughness of various type of wood. Three wood spacies (fir, beech, oak) were cut with three different spindle speeds (9600, 11200, and 12800 rpm) and four different feed rates (4000, 5000, 6000 and 7000 mm/min) using end mill tools on the CNC machine. An analysis of variance (ANOVA) was performed to evaluate the impact of cutting parameters. To determine the surface quality of wood the surface roughness measurements were performed and two surface roughness parameters (Ra and Rz) were determined.

Keywords: CNC milling, surface raughness, spindle speed, feed rates, wood

Research objective and methodology - The first part of this research was milling three type of wood (beech , oak, fir) on CNC milling machine. A combination of three rotational speeds (9,600 rpm, 11,200 rpm, 12,800 rpm), and four feed rates (4 m/min, 5 m/min, 6 m/min and 7 m/min) were determined for CNC processing. The second part of this research was to determine wood surface quality in "Mitutoyo SJ-201P Portable Surface Roughness Tester" was used for measuring of roughness, on the entire surface within the sampling length (Ra) and vertical distance from the highest peak to the lowest valley (Rz)..







CNC milling and surface quality measuring

Surface roughness of oak, beech, and fir processing with different parameters

Conclusion - This study aimed to determine the effect of feed rate and spindle speed on surface roughness of various types of wood. The feed rate, spindle rotation and wood species are important and effective factors. Results show that when processing oak with the same processing parameters, lower surface roughness values are obtained compared to beech and fir. ANOVA showed that the data obtained by experimental testing do not significant effect for a 95 % confidence level. In order to determine the statistical difference between the data, it is necessary to increase the number of tested samples, increase the difference between feed rates and increase the differences between spindle rotation.

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