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Influence of the speed machining to the tool life during processing of the particleboard

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Abstract: *Influence of the speed machining to the tool life during processing of the particleboard.* In the article relationship between cutting speed and tool life during machining particleboard was estimated. The mentioned researches were conducted with usage of three rotation speeds of the spindle. In the experiment milling cutter with one blade was used. The diameter of cutter was 40 mm. During experiment grooves were milled to the depth of 6 mm with the constants feed to the blade 0.15 mm. For determining the degree of exhausting the tool VBmax indicator was used (maximum width of wear on clearance face of cutting edge). According to received results was established, that during the milling of the particleboard, the speed of machining has the significant effect to the life of the cutting tool.

Keywords: tool, milling, tool life, cutting speed

INTRODUCTION

Machining wood materials including particleboard is a process often performed in many branches of industry. The process of the machining should be conducted in such way, to possibly lower costs and get the required quality. Therefore, the long topicality of the cutting tool is a desirable feature. In many articles concerning the milling of particleboard a link between the speed of machining and the tool life of the cutting tool was observed [Stefaniak 1970, Porankiewicz 1993]. However many aspects from this scope still aren't clear, therefore this issue should still carefully be examined.

MATERIALS AND METHODS

Examinations were conducted on the CNC milling centre BUSELLATO JET 130. As a tool was used milling cutter with one blade (FABA). The diameter of cutter was 40 mm [Fig. 1]. The angle of the blade of the knife was 76 degrees; knives were made from the carbide. As a material for machining was used particleboard. During experiment grooves were milled to the depth of 6 mm and the length of 450 mm [fig. 2]. For determining the degree of wearing of the edge VBmax indicator was used (maximum width of wear on clearance face of cutting edge). VBmax was being read out on the workshop microscope. The criterion of blunting the blade was adopted on the level of 0.5 mm. The research was made for the three rotation speeds of the spindle n1 = 18000; n2 = 15000; n3 = 12000 rpm what at the given diameter of the tool correlating to cutting speed of v1 = 37.68; v2 = 31.40; v3 = 25.12 m/s. (table 1).

Tab.1 Milling parameters

Number of tool	Cutting speed [m/s]	Rotational speed of spindle n [obr/min]	Feed per revolution [mm]	Feed [m]	Depth of machining [mm]
1	37.68	18000	0.15	2.70	6
2	31.40	15000	0.15	2.25	6
3	25.12	12000	0.15	1.80	6

Fig.1 Milling cutter

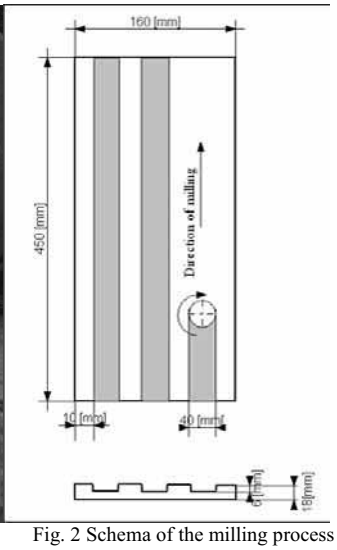

Fig. 2 Schema of the milling process

RESULTS

On fig. 3 the results of experiment were shown. For the v1 speed the blade covered with the criterion of blunting (VBmax > 0.5 mm) is fulfilling after milling 4.95 m. For the v2 speed, VBmax = 0.51 was get after machining grove for lengths 6.3 m. At the speed of v3 machining this length is 9.9 m. Results are demonstrating, that together with the increase in the speed of machining, pace of wearing out tools clearly grow.

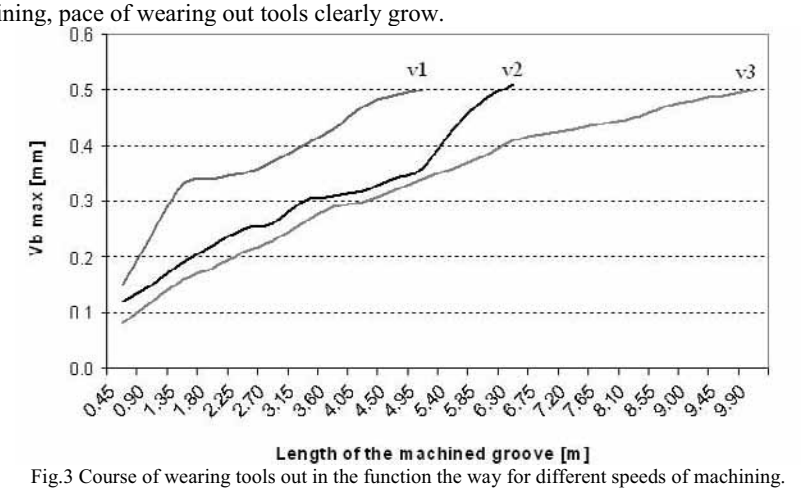

Fig.3 Course of wearing tools out in the function the way for different speeds of machining.

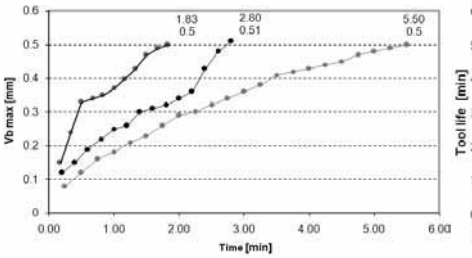

Fig. 4 Course of wearing tools out in the function of the time for of different speeds of machining

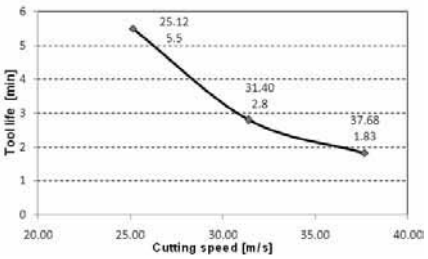

Fig. 5 Influence of the speed machining to the tool life

For above data analytically fixed rates of the F.W.Taylor pattern were calculated.

$k = -2{,}56$ oraz $C_v = 49{,}25$

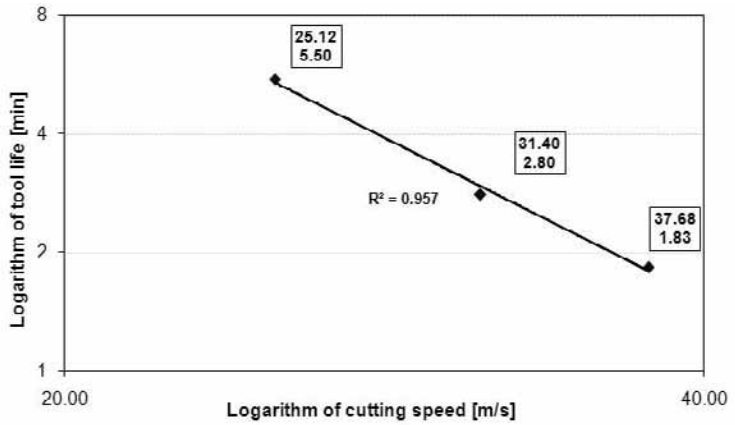

Fig. 6 Dependence of the tool life to the cutting speed.

On the fig. 6 a logarithmic graph of the influence of the cutting speed to the tool life is shown. For above data the rate of the determination amount is R= 957.

CONCLUSION

Results of above examinations allow for expressing the following conclusions:

1. Speed of machining the particleboard with the tool from carbides has explicit influence on the tool life of the cutting tool.
2. The increase in the speed of machining is reducing the tool life of the cutting tool.

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Streszczenie: *Wpływ prędkości skrawania na trwałość narzędzia podczas obróbki płyty wiórowej.* W artykule określono wpływ prędkości skrawania, na tempo zużywania się narzędzia podczas skrawania płyty wiórowej trójwarstwowej. Badania przeprowadzono z zastosowaniem trzech prędkości obrotowych wrzeciona. Do badań użyto głowicy frezarskiej jednoostrzowej o średnicy 40mm. Frezowano rowki o głębokości 6mm ze stałym posuwem na ostrze 0,15mm. Do określenia stopnia zużycia narzędzia posłużono się wskaźnikiem Vbmax (maksymalne starcie na powierzchni przyłożenia). Na podstawie otrzymanych wyników stwierdzono, że podczas frezowania płyty wiórowej, prędkość skrawania ma znaczący wpływ na trwałość narzędzia tnącego.

Słowa kluczowe: narzędzie, ,skrawanie, trwałość, prędkość skrawania

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