

Studies concerning the chip formation at the longitudinal drilling of the beech wood with help high speed camera

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Abstract: *Studies concerning the chip formation at the longitudinal drilling of the beech wood with help high speed camera.* The paper presents an important data basis concerning the chip formation at the longitudinal drilling of the beech wood in longitudinal section with the direction of fiber of 0°, 30°, 45° and 60° using helical drills with diameter of $\Phi 8$ mm. Images recorded with high speed camera were processed and the results obtained from the researches have been analyzed and discussed.

Keywords: chip formation, chip shape, beech, high speed camera, helical drill

INTRODUCTION

The study for chip formation at wood drilling present a special importance for processing analysis and require thorough research. This paper present some from results obtained in based on some research concerning this issue. For analysis, the authors of this paper have discussed about the chip formation at longitudinal drilling of beech wood with drill of 8mm.

THE EXPERIMENT

Experimental researches were made on a milling machine FSU-22. For make holes it was used a helical drill plated with CMS with cylindrical shaft flattened with diameter of $\Phi 8$ mm, with two channels, the peak angle of $2\kappa = 60^\circ$ and angle of inclination of the propeller $\omega = 13^\circ$.

After checking the working parameters on each sample who was cutting in longitudinal section with direction of bending fiber of 0°, 30°, 45° and 60° from beech timber with humidity of 8-12% and dimension of $L \times l \times g = 195 \times 40 \times 37$ [mm x mm x mm] were made five holes with drilling depth of 30 mm.

Experiments were made on these work conditions: speeds ranging between 110 and 345 rot/min and feed speeds between 80 and 250 mm/min.

The study concerning chip formation at drilling wood of beech was made using high speed camera Inline Model 250, connected to the computer, which reached speeds record of 60, 125 and 250 frames per second. Before making recordings it was adjusted the image, digital brightness of image, recording speed (60 frames per second) and camera resolution. Recorded files were saved with RAW extension, and then were viewed and analyzed using the PAC application player.

For chip analysis it was used an stereomicroscope STEMI 2000C Zeiss with digital camera embedded type Canon Power Shot G9, cold light source type KL 2500 LCD and Axiovision software with which we made the acquisition and processing images obtained (with camera).

Was positioned the chips which were obtained after processing through drills, on the microscope table, and then were set: the stereomicroscope objective at 0.65 x to enlarge and brightness of the light source to obtain a clear picture. Images obtained with the digital camera were saved, processed, analyzed and discussed.

RESULTS

Some between results obtained concerning chips formation during the process of longitudinal drilling of wood are presented in figure Fig. 1. and Fig. 2.

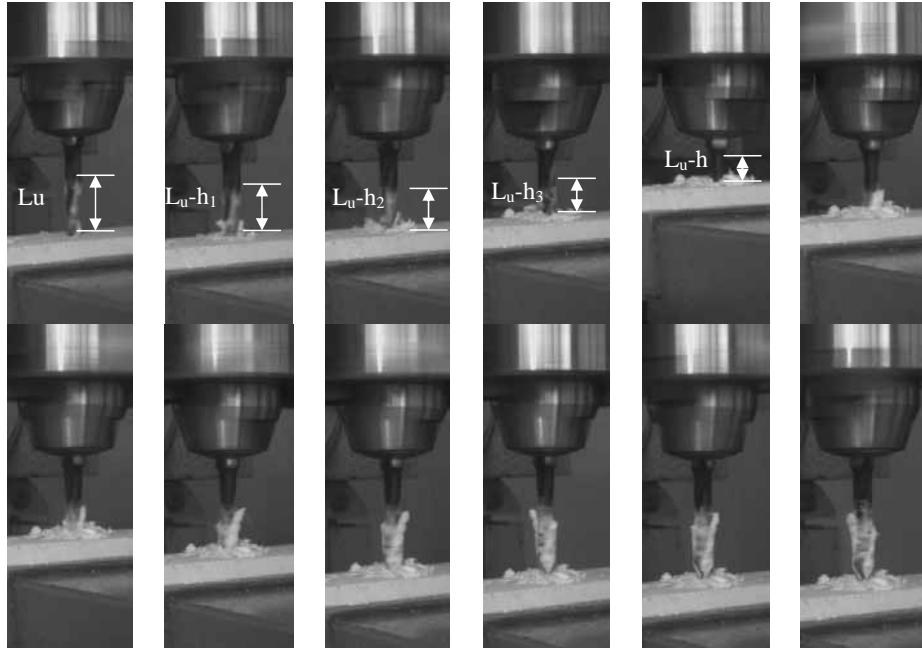
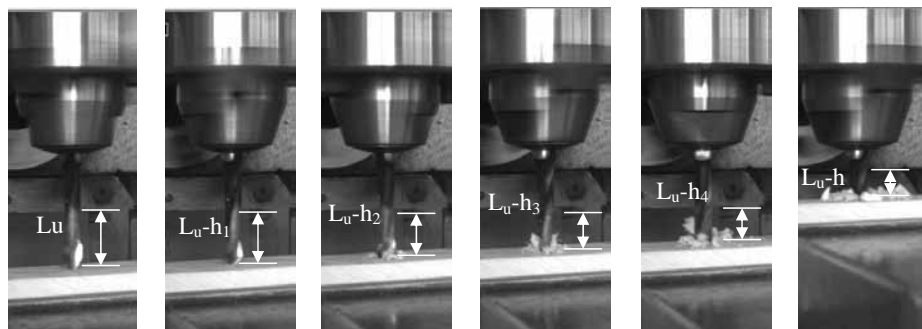


Fig. 1. Sequences shooting at longitudinal drilling having direction of bending fiber of 30° , speed $n = 220$ rot/min, feed speed $u = 250$ mm / min, hole 3 (chip shape detached)



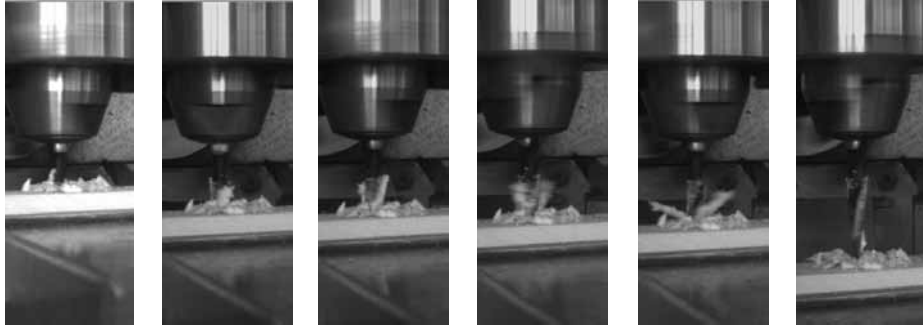


Fig. 2. Sequences shooting at longitudinal drilling having direction of bending fiber of 60° , speed $n = 220$ rot/min, feed speed $u = 250$ mm / min, hole 2 (chip shape detached)

The chip shape obtained at wood drilling is shown in figure Fig.3.

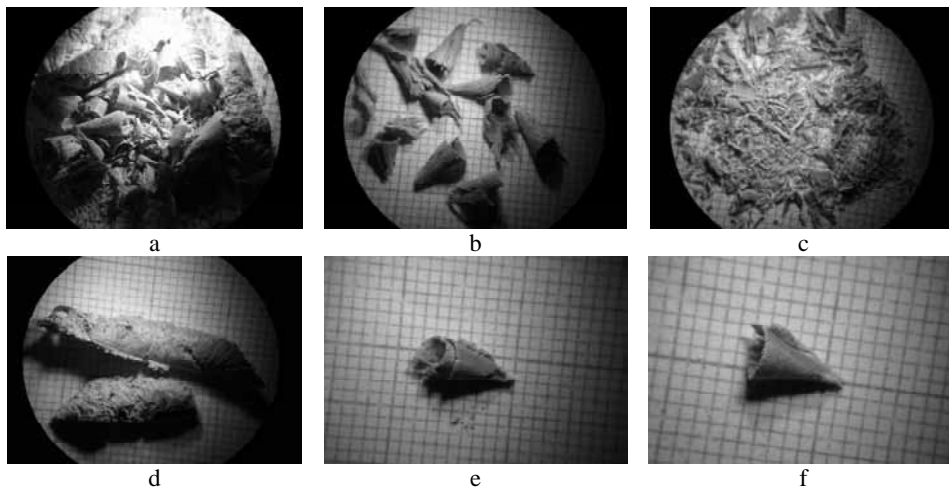


Fig. 3. The chip shape at longitudinal drilling of beech wood with blend fiber direction 45° , speed $n = 110$ rot/min, feed speed $u = 80$ mm / min, hole 3: (a) chips obtained during process; (b, e, f) chips of medium size (c) small chips (d) chips obtained through chips agglomeration on drill channel.

DISCUSSION AND CONCLUSION

Analyzing the formation process of chips to the longitudinal drilling wood we can observed:

- During execution of holes, the chips which are formed at entry of drilling in wood material are small dimensions. (Fig. 3c) These types of chips allow easy evacuation due to a relatively short path which they crossing up to their elimination.
- As the drill advancing is formed the heat generated by consuming mechanical work in the cutting process. Sometimes, the heat produced during the cutting process leads to: burning wood because of friction between tool and workpiece (Fig. 3d), increased wear and decreased ability of cutting tool.
- Chips formed (Fig. 3.d) during the drilling process, after a while at the end of hole, the chips can't be discharge efficiently, this choke drill channels on a part owing to tool

geometry, on the other hand inadequate regimens. As the drill out from wood, the chips are detached from the drill channel and fall, while in other cases they remain on the drill channels depending on their size and structure of wood.

- The chip shape depends on: the characteristics of the material of processing, the working parameters of the drill, geometry and tool wear.

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Streszczenie: *Tworzenie się wióra przy wzdłużnym wierceniu drewna buka.* Praca prezentuje tworzenie się wióra przy wierceniu drewna bukowego pod kątem 0°, 30°, 45° oraz 60° do włókien, przy użyciu wiertła śrubowego Ø8mm. Obrazy otrzymane kamerą poklatkową zostały obrobione, poddane analizie oraz omówione.

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