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Analysis of noise emission in wood bucking

EDWARD KOWAL, GRZEGORZ DUDARSKI, CZESŁAW CZĘSTOCHOWSKI
University of Zielona Góra, Faculty of Mechanical Engineering

Abstract: *Analysis of noise emission in wood bucking*. This paper presents the problem of noise during mechanical bucking of wood. The analysis of noise was made during wood bucking with different hardness and depending on the direction of bucking comparing to the grain, along and across the grain.

Keywords: noise, wood bucking,

INTRODUCTION

The process of machining wood materials is connected with a high emission of technological noise. Noise level is dependent on several factors: the type of cutting tool, its rotational speed, feed rate, and many other less important [1]. The bucking process, wood planning and milling are among the loudest ones. The noise during drilling, turning or grinding seems to be less nagging [2]. This paper presents the problem of noise during mechanical bucking of wood. The analysis of noise was made during wood bucking with different hardness and depending on the direction of bucking comparing to the grain (along and across the grain).

METHODOLOGY OF TESTS

Wood samples used for testing were made of three types of wood of different hardness and construction and were used in carpentry with the same frequency. They were:

- Poplar – a broad-leaved tree, non-heartwood, white wood with a tint of grey and green, hard to detect vessel elements, non-durable wood, medium-hard.
- Pine - coniferous species, resin productive, heartwood, wood yellow and white, invisible medullary rays of the tree, fairly durable wood, soft wood.
- Oak - a broad-leaved tree, heartwood that is between light brown and dark brown, wide medullary rays of the tree, wood durable, very hard.

Samples of standardized dimensions 100 mm x 50 mm x 500 mm and humidity in the range of 13-15% were bucked along and across the vessel elements.

There was used a method of research, which allowed to:

- Make an assessment of the noise level on the basis of changes in processing time,
- Make an evaluation and analysis of the noise level, depending on the type of wood and direction of the bucking,
- Make an assessment of noise emissions while wood bucking on the basis of the frequency of sound,

The study was performed the saw table DPTA-40 equipped with a circular saw for cutting wood and plastic, with teeth NV type with a diameter of 400 mm (400 x 2.0 x 30 x 140). Maximum blade speed – 2 800 rpm / min. Hanging saw over a table top - 55 mm.

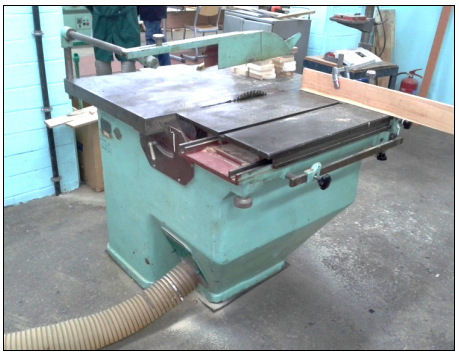

Fig. 1 Table saw DPTA-40

The measurements of the noise level were made using the sound and vibration analyzer SVAN912A of Svantek company. Measuring point was located at a distance of 1 meter, perpendicular to the saw blade, 10 cm above the table saw. Measuring time covered the whole process of bucking the sample and was 10 seconds. There was used manual sample feed with the speed of 1 cm / sec, the same for all types of wood. For each species of wood and direction of bucking the measurement was repeated five times.

RESULTS OF MEASUREMENTS AND ANALYZES

During the bucking process of standardized wood samples there was registered the noise emission with the frequency of 0.1 s. Results are presented as the timing of variation of noise level in the time.

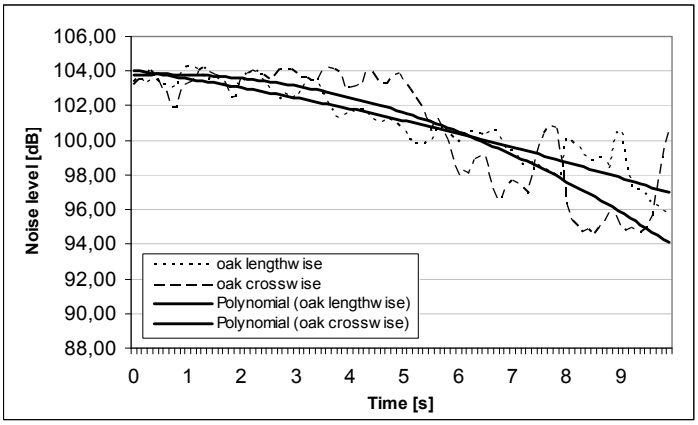

Fig. 2 Oak wood - change the level of noise in the process bucking

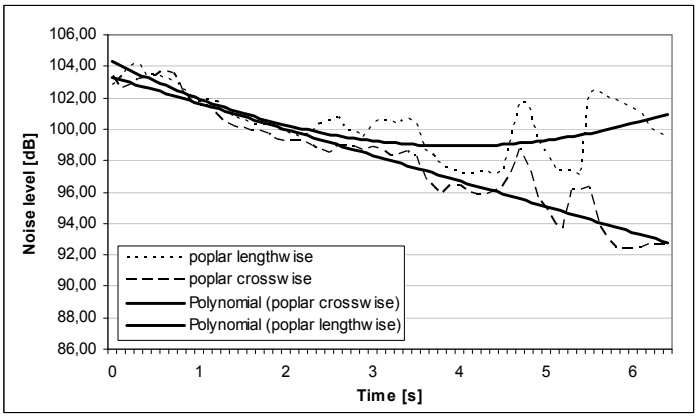

Fig. 3 Poplar wood - change the level of noise in the process bucking

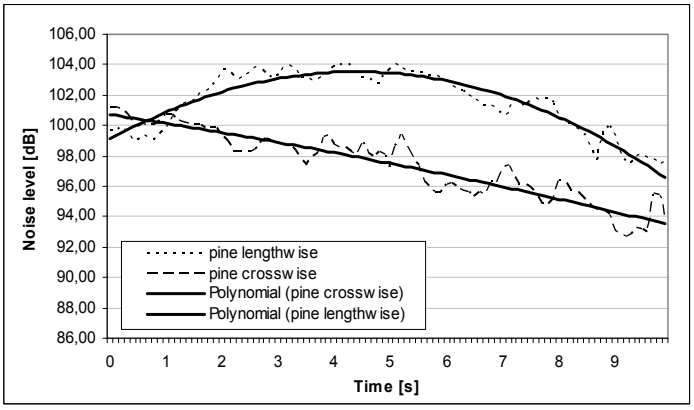

Fig. 4 Pine wood - change the level of noise in the process bucking

The graphs of 2 – 4 present the analysis of changes in noise levels depending on the bucking direction (lengthwise and crosswise) for the three studied species of wood. The graphs show average results of five measurements.

There were assessed noise levels that depended on the bucking direction of selected wood species. It was noted that the noise level during bucking in the lengthwise direction is greater than in the crosswise direction to the wood vessel elements.

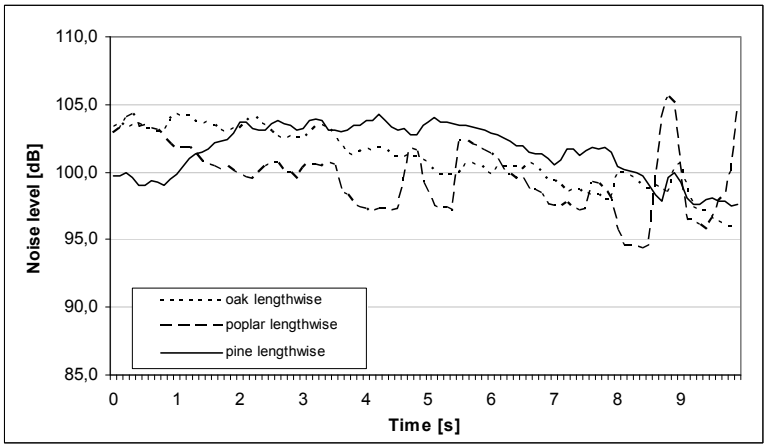

Fig. 5 Change in the level of noise in the process of lengthwise bucking

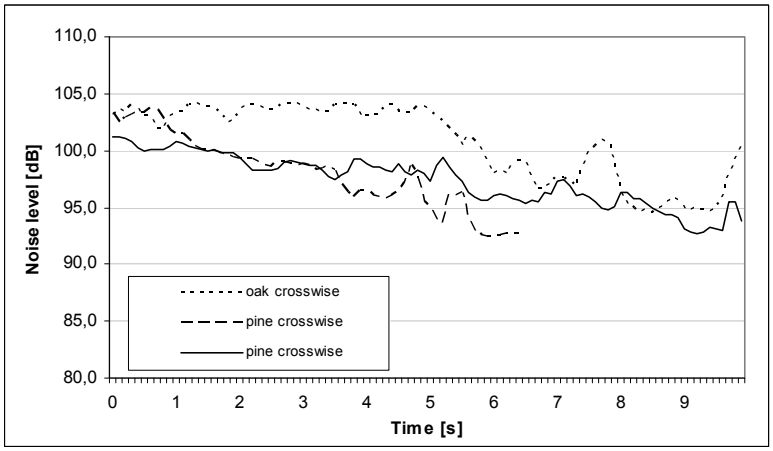

Fig. 6 Change in the level of noise in the process of crosswise bucking

The differences of noise levels are dependent on the wood species. For hardwood species, which is the oak, the differences are smaller, while the soft species that is represented by pine, noise while lengthwise bucking is considerably higher than in the crosswise

direction. Pine while lengthwise bucking emits the noise level of – 104 dB and 98 dB while crosswise bucking. Pine wood as only among the respondents, is characterized by a particularly high noise emissions during lengthwise bucking.

The next stage of the study included analysis of noise depending on bucking wood. The results of analyzes are shown in Figures 5 – 6.

Analysis of the results showed small variations of noise levels emitted depending on the species of wood. For most of the samples were observed characteristic tendency of decreasing noise levels with deepening of the saw in the bucking material. These changes are large, ranging from 5 – 8 dB. Oak wood while lengthwise bucking emits the noise level of – 103 dB at an early stage and 96 dB at the end of bucking. Noise during lengthwise bucking is characterized by higher amplitude of changes than while the crosswise bucking.

SUMMARY

The technology of mechanical wood processing is inextricably linked with high emission technological noise. The results of the study are one part of a project conducted to create conditions of work in the hall of the mechanical wood processing.

In conclusion, the results indicate that the noise level during the bucking in the lengthwise direction is greater than in the crosswise direction relative to the wood vessel elements. The differences of noise levels are dependent on the wood species. For hard species they are small and can be considered as negligible, while for the soft species, the noise while lengthwise bucking is considerably higher than in the crosswise direction. There is low differentiation of emitted noise levels depending on the species of wood. There was observed the effect of reduction of the noise level (5 – 8 dB) with deepening the saw in the bucking material. This implies a significant need for proper selection of blade sliding over the table.

The results are helpful in selecting appropriate parameters bucking wood, not only in terms of the quality of treatment, but also the noise level in the work environment. Further research in this area will focus on the optimal selection of technical and organizational that will reduce the technological noise in the halls of the mechanical wood processing.

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Streszczenie: *Analiza poziomu hałasu podczas mechanicznego przerzynania drewna.* W badaniach przedstawiono problemy emisji hałasu podczas mechanicznego przerzynania drewna. Analizy hałasu wykonano podczas przerzynania drewna o różnej twardości i w zależności od kierunku przerzynania, wzdłuż i w poprzek włókien.

Corresponding authors:

Edward Kowal, Grzegorz Dudarski, Czesław Częstochowski
University of Zielona Góra,
Faculty of Mechanical Engineering, Division of Engineering of Work Environmental,
65-264 Zielona Góra,
Szafrana 4 str, Poland
e-mail: e.kowal@eti.uz.zgora.pl, g.
e-mail: dudarski@eti.uz.zgora.pl
phone: 605 720 180