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Influence of sawing direction on edges quality in oriented wood-based materials

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Abstract: *Influence of sawing direction on edges quality in oriented wood-based materials.* Influence of sawing direction on quality of edges for different wood-based materials was investigated. There were chosen six kinds of wood composite: block panels, standard plywood, building plywood, compressed plywood, electrician compressed plywood and OSB. There were estimated two kinds of irrelative machinability indicators: WA which concerns chipping and WB (size of burrs) Each material was machined along and across fibers in outer layer. Panel saw machine were used in experiments. Grooving aggregate didn't work. In order to estimate quality of edges, tool microscope was applied. Bottom side of each panel was taken into account. The best machinability due to edges quality according to both indicators showed block panel.

Keywords: machining quality, wood-based materials, sawing, machinability indicators

INTRODUCTION

Idea of machinability can be perceived in different way. It was assumed that machinability means vulnerability of given material on machining. As machining properties can be analyzed cutting resistance during machining chosen materials, structure of chips or tool life. But the most significant from practical point of view is quality. In case of solid wood some procedures are widely known and used due to standard ASTM D 1666-87. This standard predict six base kinds of machining and five levels of quality obtained by visual inspection.

However in case of wood based materials situation seems to be much complicated. There is no unique criterion for all wood composites whose structure differentiate in wide range. For some of them more important is chipping on edges (especially with finishing outer layer) whereas for another is more important outstanding burrs. Methodology of chipping quantities assessment was in details developed by Salje and Drueckhammer 1984 or Porankiewicz 2003. Proposed by mentioned above authors indicators such as weighted area of chipping or max length of chipping used Pałubicki et al. 2007 in order to investigate influence of cutting parameters on edges quality after sawing. However in case of materials without outer coating such as raw MDF this indicator could be insufficient. Some solution in this situation seems to be measurement of burrs et. outstanding fibers on examined cross-section of machined element. This indicator allow to analyze quality of edges after machining MDF [Ohuchi and Murase 2005]. From above citied purposes the most appropriate strategy should used for machinability investigations of wood based materials both earlier listed indicators (chipping and burrs).

Aim of this work was comparing machinability of different wood-based materials according to direction of sawing (longitudinal and perpendicular against fibers).

MATERIAL AND METHODS

There were subjected to assess (6 kinds – OSB, block panels, standard plywood, building plywood, compressed plywood, electrician compressed plywood). Experiment was carried out according procedure described in work of Czarniak et al. 2013. Standard panel saw HOLZMA HPP 250 showed in Fig.1 was used to experiments. On the spindle of machine

was installed saw blade Leitz with following parameters: ø350, FL/FA, z=72. Grooving aggregate during machining was switched off. Rotational speed amounted 4310 rpm, at cutting speed v=45 m/s feed was settled on 25 m/min. There were made three repetitions. Dimension of workpieces was 30 x 50 mm. Subsequently, by usage of tool microscope edges quality was analyzed on bottom side of workpieces (at the side of outgoing of sawing blade). View of microscope MITUTOYO TM 500 was showed in Fig.2.

Fig. 1 View of panel saw HOLZMA HPP 250

Fig. 2 View of tool microscope Mitutoyo TM 500

Disparate structure of outer layers caused that two cuts longitudinal and perpendicular to direction of grains in outer layer were done. Then, there were calculated irrelative indicators described below:

- indicator type A describe maximal damages (chipping) which come up in direction inner workpieces,
- indicator type B describe maximal burrs which outstand from edges in direction outer workpieces.

So, in case of indicator A (Fig.3) there were taken into account chipping. However in case of indicator B (Fig.4) relevant were burrs which occurs outside workpieces and wasn't torn out.

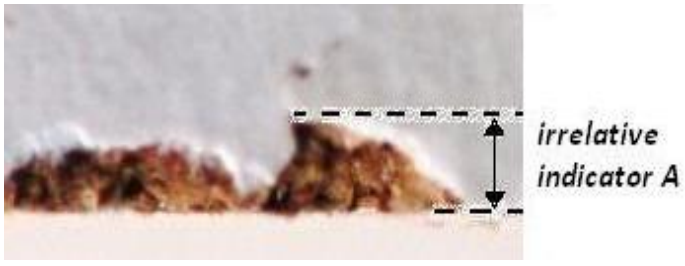

Fig. 3 Indicator of machinability type A

Fig. 4 Indicator of machinability type B

RESEARCH RESULTS

According to presented below graph (Fig.5) follows that extremely difficult in machining according to indicator A (across grains) turned out compressed plywood (4,5mm). While the smallest chipping in this direction about 0,6mm was observed in case of block panels and building plywood. Taking into account differences between sawing directions extremally wide spread was noticed in case of compressed (both kinds) and standard plywood. The most universal material which behaved similar in both directions and level of chipping maintain on not very high level was block panel. Indicator B (Fig.6) distinguishes by

not so high diversity as indicator A. This time, values for block panel seems to be the most beneficial. Difference between along and across grains are about 20% and their level is clearly lower (about 50%) than other materials.

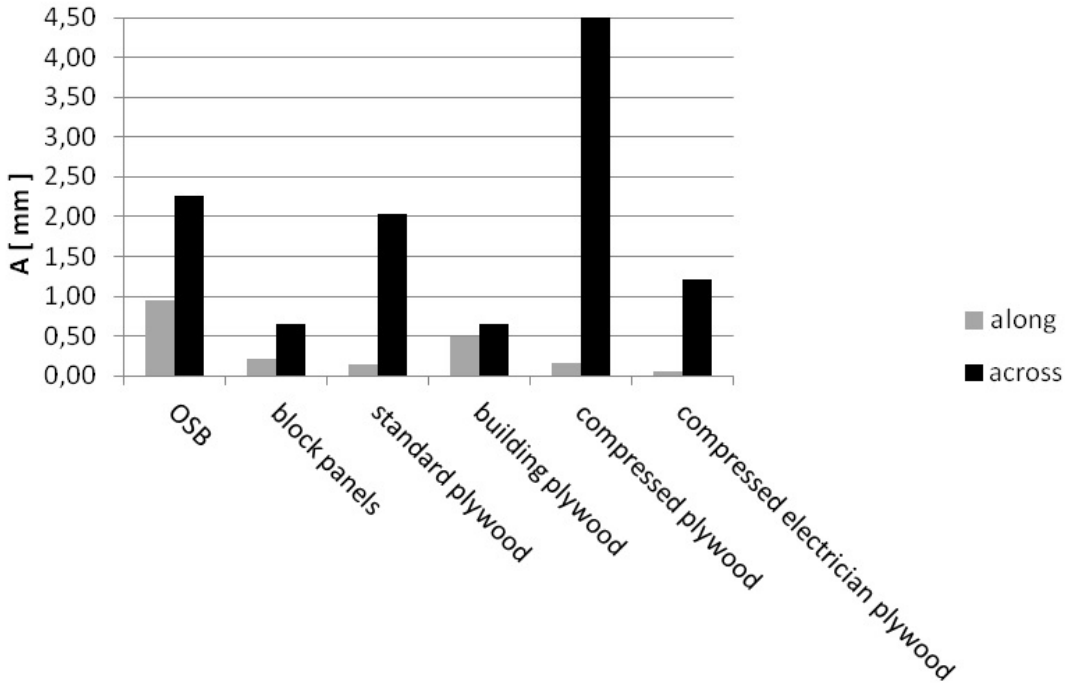

Fig. 5 Results of machinability indicator type A

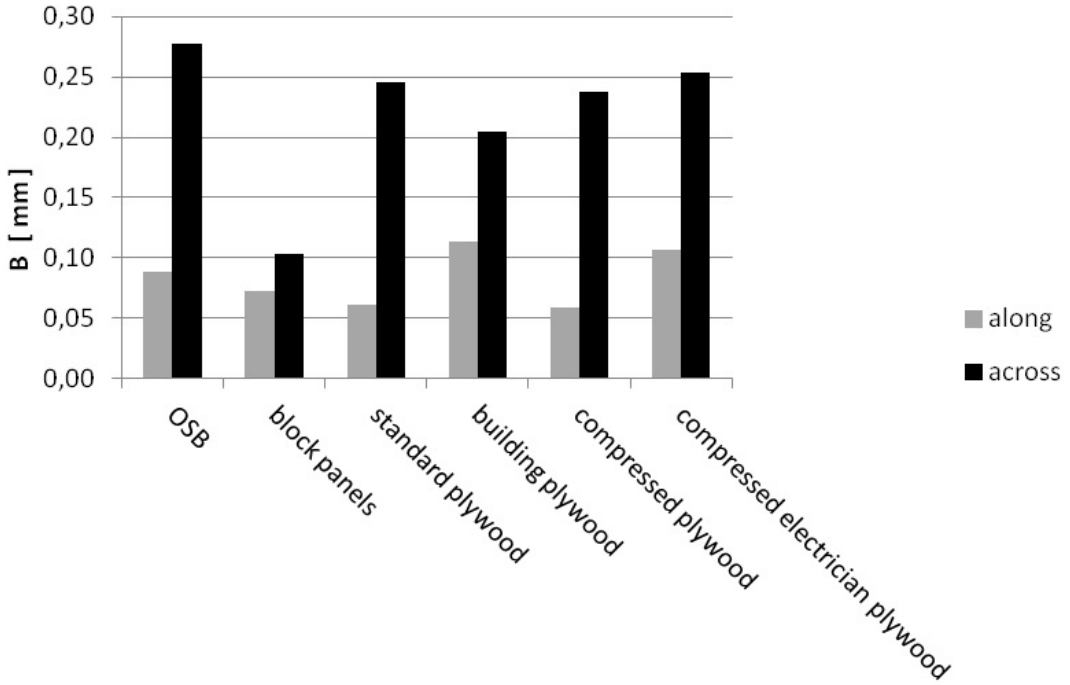

Fig. 6. Results of machinability indicator type B

CONCLUSION

From mentioned above result follows that:

1. The best machinability due to edges quality according to both indicators showed block panel. Only difference between sawing directions in case of indicator A are higher than for building plywood.
2. The worst machinability according to indicator A was observed for compressed plywood, then for OSB, standard and electrician compressed plywood.
3. In case of indicator B block panels turned out the best. Additionally , spread of values between sawing directions was very low.
4. In general, indicator A is very sensitive on direction of sawing.

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Streszczenie: *Wpływ kierunku cięcia na jakość krawędzi w orientowanych materiałach drewnopochodnych.* W artykule porównano jakość obróbki sześciu typowych komercyjnych płyt drewnopochodnych z uwzględnieniem kierunku cięcia (wzdłuż i w poprzek włókien). Te materiały to: OSB, lignofol, sklejka standardowa, sklejka szalunkowa, płyta stolarska oraz „elkon", czyli sklejka elektrotechniczna. Do oceny jakości użyto dwóch bezwzględnych wskaźników tj. wskaźnika A - określającego średni ubytek na krawędzi (wyrwania) oraz wskaźnika B - określającego jak duże są cząstki materiału odstające od powierzchni rzazu. Przy użyciu standardowej pilarki panelowej przeprowadzono cięcia każdego z analizowanych materiałów w dwóch kierunkach. Badania pokazały, że największe wyrwani na krawędzi wystąpiły w przypadku lignofolu, przy czym różnice między cięciem w poprzek i wzdłuż były bardzo duże. W przypadku obu wskaźników pozytywnie wypadła pyta stolarska, której jakość obróbki była najlepsza.

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