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The preparation method of experimental studies of the wood sawing process

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Abstract: *The preparation method of experimental studies of the wood sawing process.*
The article presents methods of operation for preparing experimental studies of the wood sawing process on the narrow-kerf sash gang saw PRW15M. Preparation of studies process was divided into stages: preparation of samples, measurement of physical properties of wood (moisture content of wood, density of wood), measurement of structural properties of wood (average width of annual growth and average fraction of late wood).

Keywords: experimental studies, wood, density of wood, annual growth, fraction of late wood.

INTRODUCTION

The process of experimental studies of the wood sawing induce destruction of samples (they are sawn into thin pieces). Therefore, it is important to examine the samples and to gather as much information as necessary for further analysis before sawing (destruction) of piles is. The preparation process of experimental studies of the wood sawing was divided into three stages: preparation of samples, measurement of physical properties of wood and measurement of structural properties of wood [1, 2]. The physical properties which measurement should be made, were taken: moisture content of wood and density of wood. The properties of wood structure proposed for the measurement before the experimental studies are then: average annual growth and an average fraction of late wood [2].

Nomenclature

a	sample thickness [mm]
b	sample width [mm]
l	sample length [mm]
V	sample volume [cm^3]
m	sample mass [g]
ρ	sample density [g/cm^3]
MS	measuring section (30 mm)
AI	annual growth [mm]
WLW	width of late wood [mm]
SLW	fraction of late wood [%]

PREPARATION OF SAMPLES

Dimensions of wood piles, depend on the operating parameters of the machine on which the study are going to be carried out (e.g. stroke of the saw frame, the number of blades in the gang, fastening system) [1, 5]. Samples for the narrow-kerf sash gang saw PRW15M were prepared with the following dimensions: height 80 mm, width 45 mm and length 600 mm.

Implementation of the samples was commissioned to sawmill plants which have a fleet of machines that ensures appropriate high quality prisms. For the study it was decided to use the same material that was previously used for endurance sorting by various methods [1].

MEASUREMENT OF PHYSICAL PROPERTIES

The physical properties of samples prepared for experimental studies which were measured are: moisture content and wood density [2].

The measurement of moisture content of wood was made by using an electronic moisture content meter for wood WRD-100, with a compensation system which takes into account the effect of the ambient temperature for there measurement value [5]. The measurement was performed at random just before experimental sawing.

The measurement of density of wood was performed by using the stereometric method [2]. This method consists in measuring the volume of the sample by measuring the various dimensions (length, width, height), and the determination of the sample mass.

The dimensions of cross-sectional sample (width, height) were measured by using the caliper with the accuracy up to 0.05 mm, at six points, equally spaced on the length of the pile. The measure of the samples length was performed with a tape measure with the accuracy of 0.5 mm. On each of the sides of the piles there were made two measurements of length, which gave a total of 8 measurements per sample. The results of all the dimensions of the sample were checked by statistical method (Grubbs's test), in order to eliminate blunders (measurement errors) [3, 4]. After checking the results of measurements individual dimensions were calculated by using the arithmetic mean.

The volume of the specimen was calculated with the accuracy of 0.005 cm^3, from the relationship:

$$V = \frac{l \cdot b \cdot a}{1000} \ [cm^3], \tag{1}$$

The measurement of samples mass was made by using a RADWAG balance type WPT/R 1.5/3C, with the measuring range up to 3 kg and measurement accuracy of 0.5 g.

The density was calculated by using the formula [2]:

$$\varrho = \frac{m}{V} \left[\frac{g}{cm^3}\right], \tag{2}$$

After receiving the density values of individual samples there were subjected to statistical analysis to eliminate the errors of measurement (blunders with the use of Grubbs's test) [3, 4], and then for each group of samples the average density (arithmetic mean) was calculated.

MEASUREMENT OF STRUCTURAL PROPERTIES OF WOOD

Important properties of wood that can be useful for subsequent analysis are: average annual increase of wood, and the average share of late wood. Measurement of these properties for the prepared samples was carried out by own methodology.

Each sample was photographed at two ends of front planes. Photos were taken on the prepared stand, with a steady light. Afterwards, the pictures were imported into Autocad programme, then scaled to the dimensions of the actual sample. Using the tools in Autocad programme it was measured the width of annual growth and width of late wood in annual

growth over a 30 mm measuring section positioned perpendicularly to the tangent drawn to the ring determining the growth ring (Fig. 1).

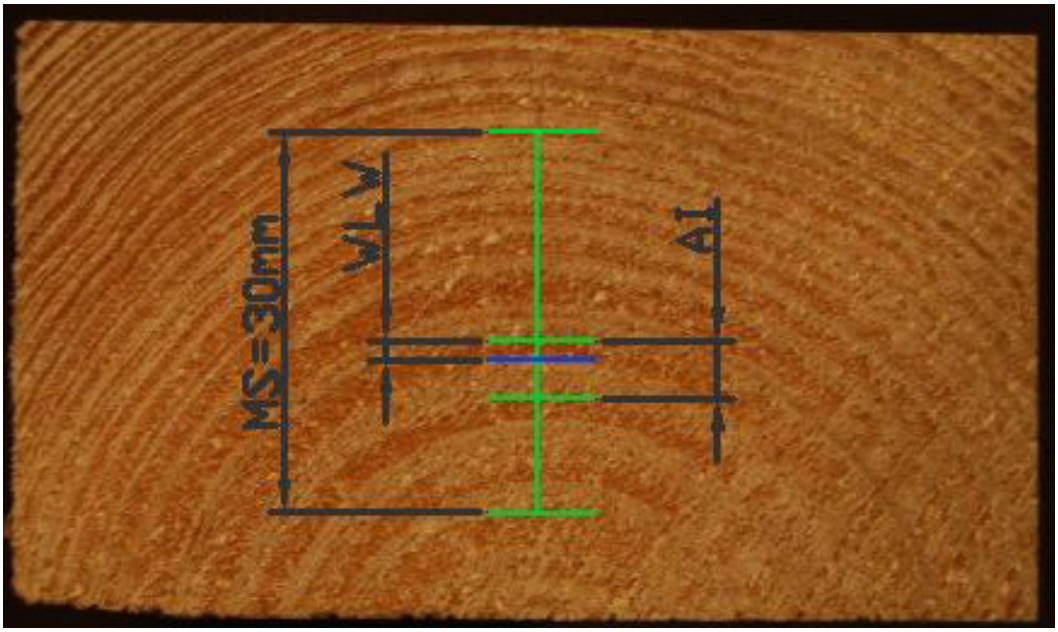

Fig. 1. The determination method of the width of annual growth and the width of late wood: MS – measuring section, WLW – width of late wood, AI – annual growth

For all samples from selected regions of origin as the average annual growth (arithmetic mean) has been calculated. The average fraction of late wood *SWL* is calculated from the relationship of the width of late wood *WLW* to the average annual growth *AI* (Eq. 3).

$$SLW = \frac{WLW}{AI} \cdot 100\% \ [\%] \tag{3}$$

CONCLUSIONS

The preparation process of empirical studies of wood sawing presented in this paper allows us to obtain much more of valuable information on the test wood samples, which may be useful in the future for many additional analyses of obtained results of sawing wood. Gathering this information before the relevant experimental studies seems to be necessary, due to the nature of the research which results in destroying the samples.

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Streszczenie: *Sposób przygotowania badań doświadczalnych procesu cięcia drewna.* W artykule przedstawiono sposoby działania, mające na celu przygotowanie badań doświadczalnych procesu przecinania drewna sosnowego na małogabarytowej pilarce ramowej PRW15M. Proces przygotowania badań podzielono na kilka etapów: przygotowanie próbek, pomiar własności fizycznych drewna (wilgotności drewna, gęstość drewna), pomiar własności strukturalnych drewna (średniej szerokości przyrostów rocznych oraz średniego udziału drewna późnego w słoju).

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