Annals of Warsaw University of Life Sciences – SGGW
Forestry and Wood Technology No 72, 2010: 423-426
(Ann. WULS-SGGW, For and Wood Technol. 72, 2010)

Pro-ecological technology of wood sawing with circular saw blades

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Abstract: *Pro-ecological technology of wood sawing with circular saw blades*. In this paper material and energy-saving potential of sawing with circular saw blades is described. Furthermore, examples of effects of pro-ecological technology application in industry are presented.

Keywords: ecology, wood cutting, circular saw blade, circular sawing machine

INTRODUCTION

The ecological friendship is a basic demand, which is placed for contemporary manufacturing processes.

In the field of wood sawing with circular saw blades, which belongs to basic cutting methods in the wood industry, the ecological friendship first of all is connected with material and energy-saving of the process. The application of the technologies in sawmills, which allow the users to reduce raw material losses and energy consumption, gives measurable advantages not only economical but also ecological [1 Orlowski, 2 Orlowski et al.].

REDUCTION OF RAW MATERIAL LOSSES IN THE SAWING PROCESS

An analysis of raw material losses arising in the sawing process reveals that their value depends on (fig. 1A) [3 Wasielewski]:

- tooth overall set of the circular saw St,
- accuracy of the axial position of teeth in relation to the workpiece B,
- irregularity of surface after sawing Rt.

Thus, a reduction of material losses of the sawing process with circular saw blades calls for:

- a reduction of the tooth overall set of the circular saw (application of thin saw blades),
- an increase of sawing accuracy,
- a reduction of the saw blade spacing.

The effects of those actions are presented in fig. 1. The reduction of the tooth overall set of the circular saw, an increase of sawing accuracy and also a reduction of the saw blade spacing could cause both an absolute loss and a relative loss, and additionally entails an increase of the raw material yield of the sawing process.

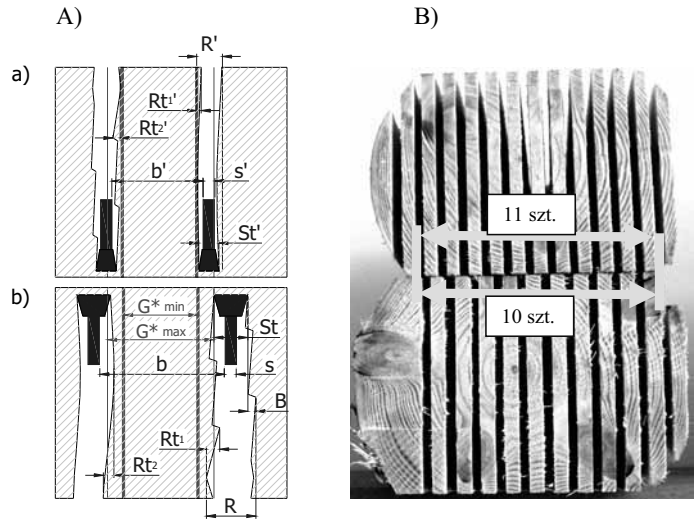

Fig. 1. Effects of raw material losses while sawing of wood, where: a) material-saving sawing, b) traditional sawing issue, A) theoretical sawing scheme, B) industrial examples of sawing with the same number and dimensions of the obtained sawn lamellae

Sawing with raw material losses reduced can be called as a material-saving process. The comparison to the traditional process (common used in sawmills) is the best method of the effect assessment. Criteria of material-saving sawing effect could be: a reduction of the absolute raw material losses (R'<R), a reduction of the relative raw material losses, an increase in raw material yield or just a comparison of the lumber number obtained from the determined workpiece input width. Another way could be a comparison of the workpiece input width which is needed for receiving of the defined number of pieces as a result of sawing process [3 Wasielewski].

EXAMPLES OF RAW MATERIAL- AND ENERGY-SAVING WOOD SAWING

Examples of industrial comparison of raw material- and energy-saving sawing with the traditional re-sawing, with circular saw blades, are shown in fig. 1B and fig. 2.

In figure 1B an example of effects of material-saving sawing with a traditional technology is presented. The assessment was done on the basis of the comparison of the ready element number obtained from the same workpiece input width. In the analysed example the obtained effect are as follows:

- about 10% larger raw material yield,
- for one circular saw roughly 16% less sawdust,
- power of the cutting process (per one saw) is about 16% lower. An example of the material-saving sawing effects comparison to the traditional one on the basis of the total workpiece width needed for the obtainment of the same elements is performed in fig. 2.

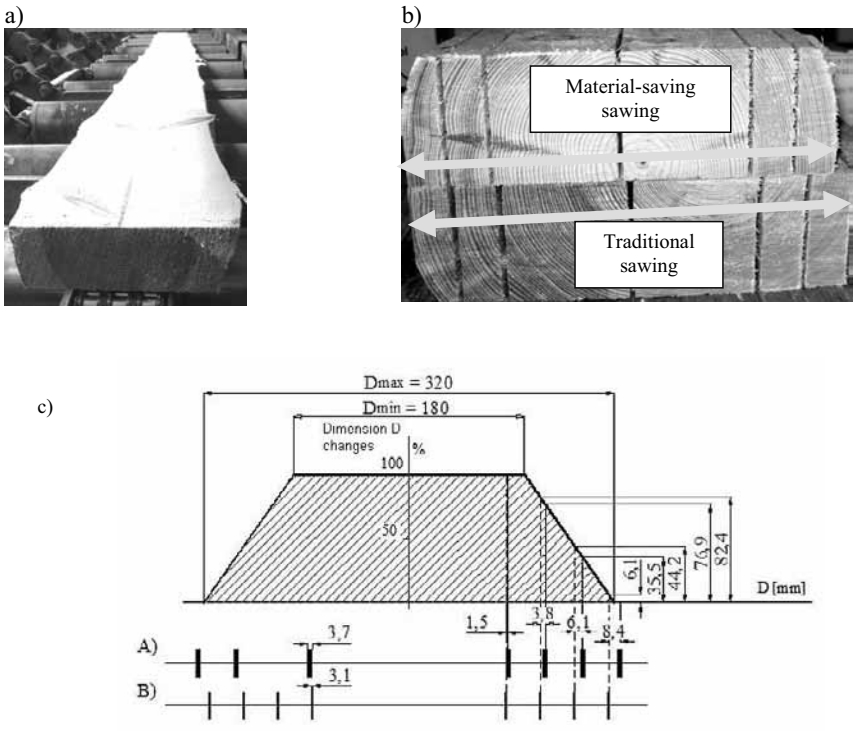

Fig. 2. Comparison of effects of the material-saving to the traditional sawing technology, where: a) general view of the input raw material, b) workpiece total width for the obtainment of the same elements, c) distribution of changes of the input workpiece width and circular saw blade spacing

In the presented example, the main material (as timbers) and side lumber (boards) were obtained on the two arbor circular saw in industrial conditions (fig. 2b). The input raw material, shown in fig. 2a, did not have the constant width and moreover workpieces differed between each other with the width. The plank dimension D is the most crucial factor determining the raw material yield. It was defined as a minimum width of the workpiece with the absolute height. The dimension D in the batch of sawn planks changed as it is presented in fig. 2c. The use of narrow-kerf circular saw blades allowed us to turn the spacing of circular saws from the traditional case (fig. 2cA) into the material-saving sawing (fig. 2cB). In those sawing conditions, from one hundred sawn pine planks have been obtained: $2\times(76.9 + 35.5) = 224.8$ pieces of side lumber in the case A, and in the case B $2\times(82.4 + 44.2 + 6.1) = 265.4$ items of the side lumber. Thanks to application of the pro-ecological technology there was achieved:

- about 18% increase in the amount of the side lumber,
- roughly 16% less sawdust,
- about 16% a lower values of the cutting power consumption.

SUMMARY

The use of narrow-kerf saw blades and an increase of the sawing accuracy reduces the both cutting losses and cutting energy consumption while sawing of wood. The better use of

the input raw material in the presence of the lower cutting energy consumption is the basis of the pro-ecological technologies of wood sawing. The application of those technologies allows the sawmillers to reduce raw material consumption and furthermore brings measurable economical profits.

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Streszczenie: *Proekologiczna technologia przecinania drewna piłami tarczowymi.* W niniejszym artykule opisano możliwości materiało- i energooszczędnego przecinania piłami tarczowymi. Przedstawiono również przykłady efektów zastosowania proekologicznych technologii przecinania w przemyśle.

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