

Influence of modification of veneers on 3D – forming

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Abstract: *Influence of modification of veneers on 3D – forming.* The paper gives the evaluation of influence of modification of beech veneers on 3D – forming. We researched the influence of type of veneer and type of modifying substance on maximal deformation at bending. The tests were done in beech veneers - tangential and radial veneers. Veneers were modified by various types of silicone resins, wax-oil coating, and polystyrene. Tangential beech veneer, modified by strongly hydrophobic silicone resin, reached the biggest deformation in bending.

Keywords: veneer, 3D – forming, deformation in bending, silicone resin, polystyrene

INTRODUCTION

Wood is a material that can be processed in various ways; it can be refined and formed. The wood bending technology has been known long since. At present, we are increasingly concerned with a possibility of 3D – forming of wood.

3D – forming of thin materials can be described as simultaneous or sequential multidirectional bending (Wagenführ, Buchelt, 2004). Results of the tests, evaluating 3D – forming of veneers, has been published in papers by Olejník (2012), Gabľas (2012), Zemiar et al. (2012), Langová et al. (2013), and Slabejová and Šmidriaková (2013 a,b,c). From the view point of 3D – forming, there is necessary to find a proper modification of veneer, which will increase the maximal deformation in tension and then the maximal deformation in 3D – forming.

The purpose of this work was to understand the influence of modification of veneer (modification by various modifying agents) on the value of deformation in 3D – forming. The methodology of experimental tests was based on the Erichsen test for evaluation of formability of metals. We also studied the influence of the type of veneer (radial or tangential veneer).

MATERIALS AND METHODS

For the experimental tests, we used beech specimens (*Fagus sylvatica* L.) made from cut veneer (radial or tangential) with wood moisture content of 6 ± 2 %. The specimen, designed for measuring of deformation in spatial bending, was of a circular shape having a radius of 50 mm and thickness of 0.6 mm.

Specimens were divided into seven groups:

1. tangential veneer – untreated,
2. radial veneer – untreated,
3. tangential veneer – treated by hydrophilic crosslinkable silicone resin S-7739,
4. tangential veneer – treated by strong hydrophobic crosslinkable silicone resin S-8741,

5. radial veneer – treated by strong hydrophobic crosslinkable silicone resin S-8741, diluted 2:1,
6. radial veneer – treated by wax-oil coating Naturnah Hartwachs 96050,
7. radial veneer – treated by polystyrene solution (polystyrene waste dissolved in technical petrol in the ratio 1:1).

The silicone resin, wax-oil coating, and solution of polystyrene were applied with a brush on both sides of the veneer.

Deformation in spatial bending was measured with the testing machine LaborTech 4.050. To bend the specimens, we used a punch of a spherical shape with a radius of 40 mm.

RESULTS AND DISCUSSION

From the graph in Figure 1, we can see that the greatest deformation in spatial bending was measured in the beech tangential veneer modified by hydrophilic silicone resin.

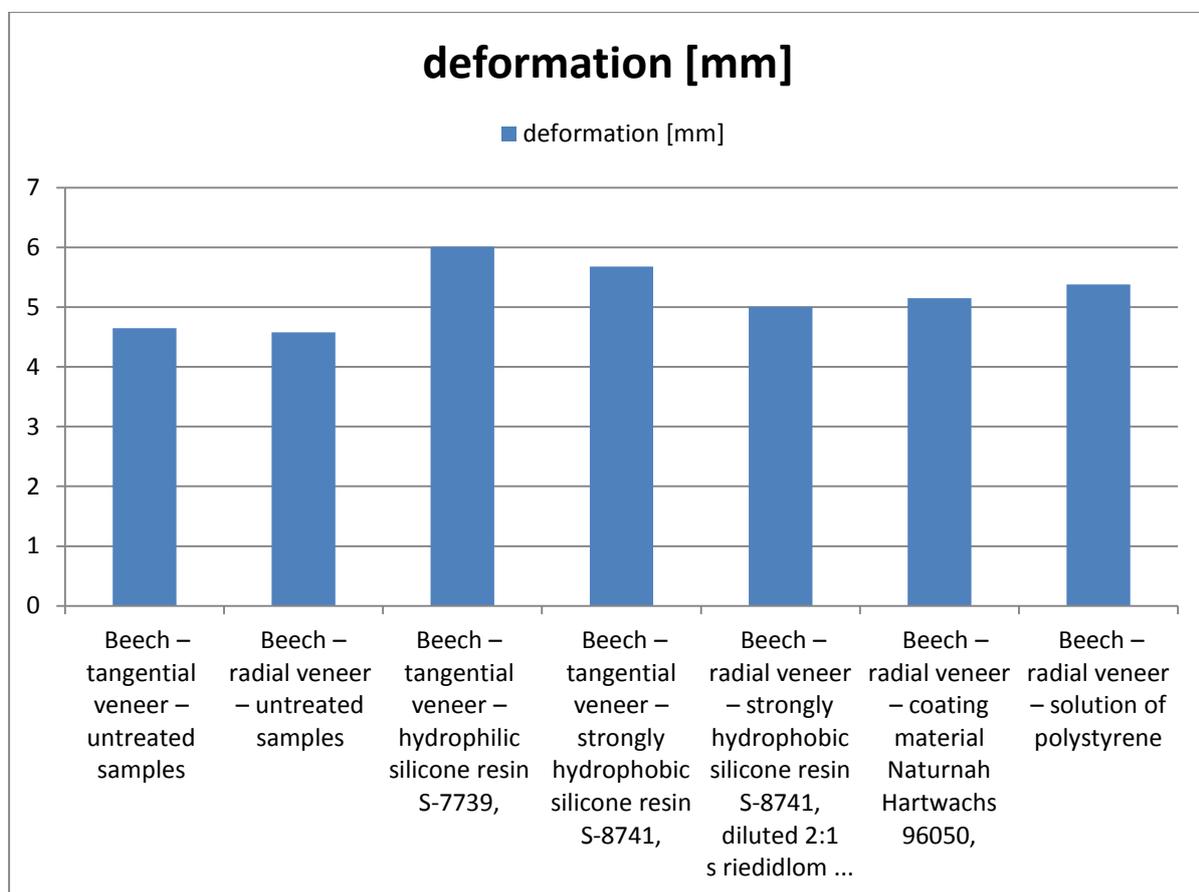


Figure. 1 Maximal deformation in bending test – beech veneer, tangential or radial, untreated or treated by various modifying agents

Figure 1 shows that all of the modifying agents used for modification of beech veneers (tangential or radial) increased deformations in spatial bending. The hydrophilic silicone resin increased deformation in tangential veneer by 29 %; strong hydrophobic silicone resin increased it by 22 %. In the radial veneer, from all the studied modifying agents, the polystyrene solution most increased deformation in spatial bending – by 17 %; coating

Naturah Hartwachs 96050 increased it by 12 %; and strongly hydrophobic silicone resin diluted 2:1 by only 9 %.

The results of the experimental measurements have confirmed our assumption that treatment of beech veneer by a polymer will increase wood properties concerning 3D – forming. From all the chosen modifying agents, from the view point of improved deformation in 3D – forming, the hydrophilic silicone resin has been the best modifying agent. The same has been described in papers by Slabejová and Šmidriaková (2013a,b,c).

CONCLUSION

Based on the measured results, we can state that treatment of beech veneer (tangential or radial) by modifying agents has improved deformation in spatial bending. The most increased deformation was measured if beech veneer had been treated by the hydrophilic silicone resin.

In general, we can conclude that modification of veneer with a proper natural or synthetic resin improves wood properties for 3D – forming.

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Streszczenie: *Wpływ modyfikacji fornirów na formowanie 3D.* Praca opisuje wpływ modyfikacji fornirów bukowych na ich formowalność 3D. Opisano wpływ typu forniru oraz substancji modyfikujących na podatność na zginanie. Testowano styczne i promieniowe forniry bukowe, modyfikowane różnymi typami żywic silikonowych, olejów, wosków oraz polistyrenem. Styczny fornir bukowy modyfikowany hydrofobową żywicą silikonową osiągał najlepsze wskaźniki formowalności.

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