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# Wood-based panels veneered with different hardwoods in room temperature

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**Abstract:** *Wood-based panels veneered with different hardwoods in room temperature*. The goal of the study was to verify deformations of asymmetrically veneered panels with using American mahogany (*Swietenia macrophylla* King) on one side. American mahogany was chosen to studies because of low linear shrinkage and high porosity values. Studies of deflections were done on original stand. To verify quality of glue, there was additionally done pull-off test. It proved that examined glue has the same strength as standard industrial glues. Obtain results show that there is a optimal value of differences of linear shrinkage and porosity values that do no cause geometrical deformation of asymmetrically veneered boards.

*Keywords:* double-sidely asymmetrical veneering, porosity, geometrical stability

## INTRODUCTION

Problem of asymmetrical veneering exists in furniture industry since 40's of XX century [Hayward C. 1949]. It is known that this type of veneering leads to lowing costs but is also interesting because of design. Many authors of books that refers to wood preservation establish to idea of one-side veneering, but they concentate on veneering of solid wood. It is underlined that only few craftsmen could do this and they are not able to veneer asymmetrically panels that are thicker than 12 mm without deformations on drying out.

Across the years knowledge about asymmetrical veneering doesn't increase much, just because craftsmen that knew how to do this in some conditions didn't public their results [www.woodworkforums.com]. Nowadays, industry is interested in asymmetrical veneering around the world. Information on vertical portals from Poland, Australia and Great Britain shows that there is no industrial technology that makes opportunity to veneer wood-based panels this way [www.woodweb.com].

Studies done with one-side veneering with same species shows that it is possible to veneer chipboards on one-side only without casting elements. The key to this technology is glue that has flexible glue-line. As a result of described tests it was chosen polyisocyanate glue [Oleńska at all. 2011].

The aim of present studies is examination how samples asymmetrically veneered with hardwood species that has high porosity save their geometrical shape after veneering and varnishing despite of uneven amount of moisture content in composite layers.

## MATERIALS AND METHODS

In presented studies there were done two studies: checking deformation of elements and verification of quality of glue line. In the first part, measurement of geometrical deformations were done on specially designed stand for samples of dimensions 900x450mm and 18mm of thickness (Fig. 1). During measurements samples were situated vertically and they were supported with four pegs. Three of them have constant height (30mm). One of them is adjustable so it avoids deflections of sample. All pegs are fixed in the same distance from the edge of the sample.

According to figure 1 measurements were done diagonnally. There were assigned five areas on the surface of the sample. In each area five measurements were done. In studies, there were

firstly compared results for unveneered board to results for veneered, unvarnished board and secondly results for veneered, unvarnished board to veneered, varnished one.

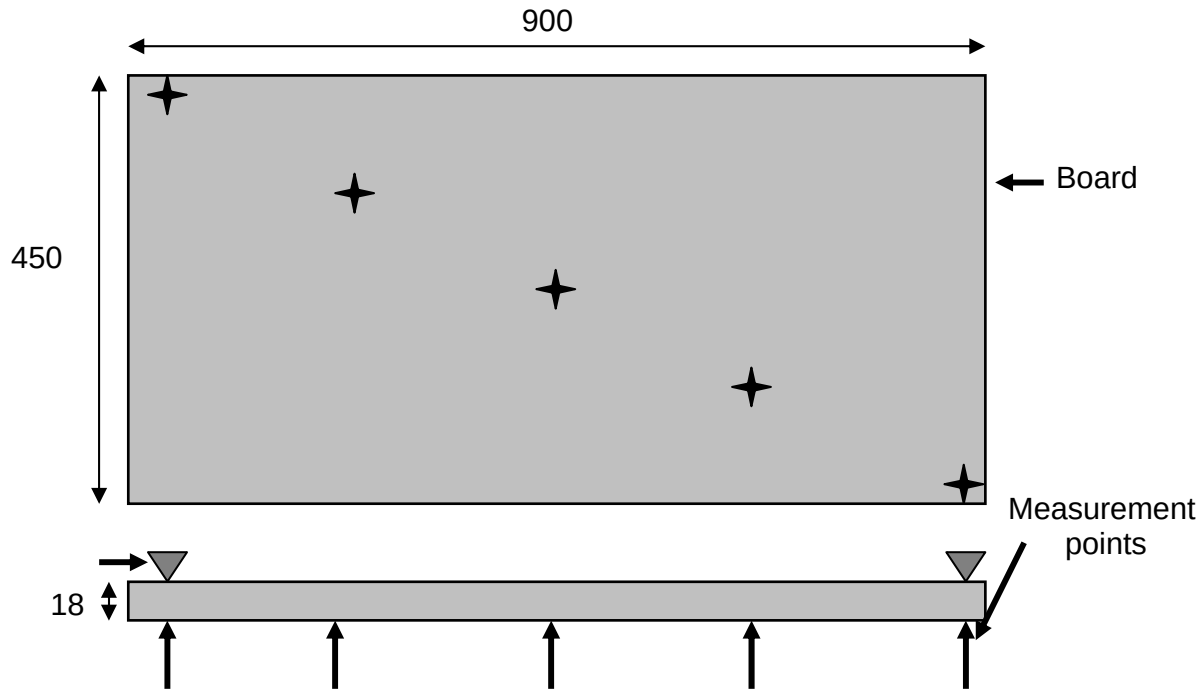



Fig.1.- Areas of measurements showed in graphs.

Samples were veneered at constant temperature 22˚C, pressure 1.0MPa and time 240min. All veneers were varnished with PUF resin. Varnishing of both sides of samples wasn't done in the same time (firstly, it was varnished unmeasured side and after drying it for two hours there was varnished opposite side of panel). After veneering samples have been conditioned for 5 days at temperature 22˚C and humidity 65%. In process of veneering there was used American mahogany (*Swietenia macrophylla* King) on one side, but on the opposite side there was African ebony (*Diospyros spp*. Hiern) and Macassar ebony (*Diospyros celebica* Bakh.) [EN 13556]. There were used pairs of veneers that have defined shrinkage and porosity difference. Paramethers of chosen veneers are presented in table 1.

Table 1. Properties of chosen hardwoods

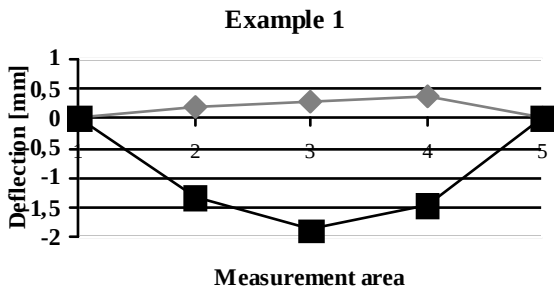
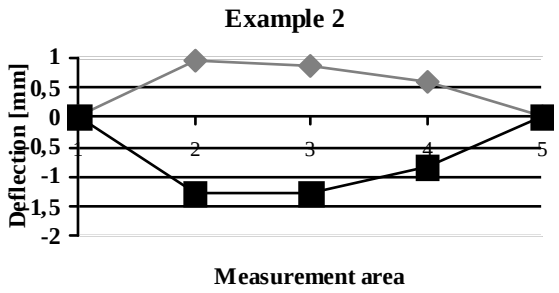
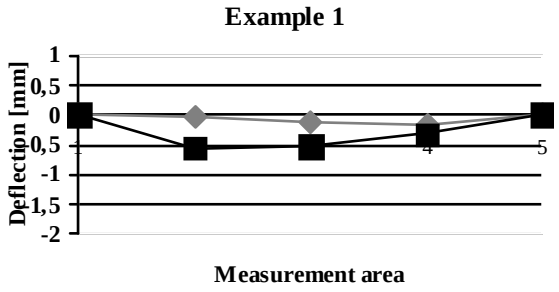
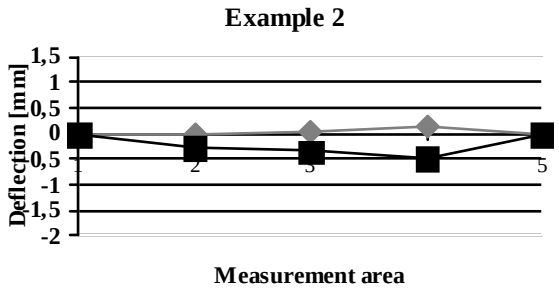
| Kind of veneer | Linear shrinkage | Porosity value |
|---|---|---|
| American mahogany (*Swietenia macrophylla* King) | 4,8% | 57% |
| African ebony (*Diospyros spp*. Hiern) | 12,8% | 20% |
| Macassar ebony (*Diospyros celebica* Bakh.) | 5,1% | 42% |

Second part of studies was pull-off test done in accordance [EN ISO 4624]. In tests cylinders of diameter 20mm were used. Samples were studied on representative American mahogany side.

RESULTS

In table 2 there are presented examples of results of studies that refers to testing what influence on deflection of samples varnishing with acrilate resin have had. Graphs shows dimensional difference between measures of unvarnished board and varnished ones. All measurements were done accurate to 0,02mm.

Table 2. Analise of materials and results of studies of deformations

| Kinds of veneers | Shrinkage difference [% points] | Porosity difference [% points] | Graph |
|---|---|---|---|
| African ebony-American mahogany | 8,0 | 37 |  |
| | | |  |
| Macassar ebony-American mahogany | 0,3 | 15 |  |
| | | |  |

Used significant: ♦ - dimensional difference between unveneered board and veneered, unvarnished board, ■ - dimensional difference between veneered, unvarnished board and veneered, varnished board

Obtain results show that shrinkage difference between used veneers have no influence on casting of wood-based panels. Deformations are below 0.5 mm. However, the optimal process parameters have to be restrictedly fallowed, because otherwise deformations are up to

2 mm. It is also checked that porosity difference between used veneers has no influence on geometrical stability of varnished asymmetrically veneered panels for the porosity deference of 15%. If the porosity deference makes 37% deformations are very significant. It is possible to avoid them by using insulator before process of appropriate varnishing with using PUF resin. It is also noticed that varnishing leads to higher deformations of boards than veneering them.

Pull-off test done for all boards proved quality of glue-line used in presented studies. Results of studies are shown in figure no 2.

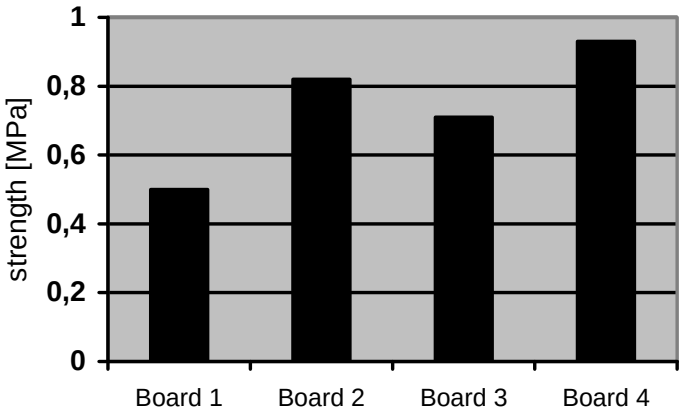



Fig.2- Results of pull-off tests

All samples veneered with chosen polyisocyanate glue were destroyed in chipboard. It can be said that if sample were destroyed inside board, glue has higher strength than board. Results of pull-off test show that experimental glue creates glue line that has good enough strength like industrial glues.

## CONCLUSIONS

Conducted research shows that there is a general tendency that lower shrinkage difference between veneers leads to decreasing deformations of panels. While porosity difference has influence on values of geometrical stability of varnishing boards. Summarizing results, varnishing effects more on wrapping wood-based panels than veneering them.

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**Streszczenie:** *Płyty wiórowe okleinowane w temperaturze pokojowej różnymi gatunkami liściastymi.* Celem pracy była analiza deformacji płyt okleinowanych asymetrycznie z użyciem mahoniu amerykańskiego (*Swietenia macrophylla* King) po jednej stronie. Wyboru mahoniu amerykańskiego dokonano ze względu na niską wartość skurczu liniowego i dużą wartość porowatości. Zniekształcenia płyt mierzone były na specjalnie zaprojektowanym stanowisku. Dodatkowo sprawdzono jakość spoiny klejowej, wykonując test odrywalności. Udowodnił on, że sprawdzany klej ma zbliżoną wytrzymałość do klejów stosowanych standardowo w przemyśle. Otrzymane wyniki pokazały, że warunki okleinowania asymetrycznego wymagają doboru różnicy optymalnej wartości skurczu liniowego i porowatości.



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