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Influence of varnishing with acrilate resin on geometrical stability of furniture fronts veneered with African pterygota (*Pterygota bequaertii* De Wild.)

SYLWIA OLEŃSKA[1)], MICHAŁ WOŹNIAK[1)], MARIUSZ MAMIŃSKI[1)], PIOTR BEER[1)]

[1)] Department of Construction and Technology of Final Wood Products, Warsaw University of Life Sciences, Warsaw, Poland

Abstract: *Influence of varnishing with acrilate resin on geometrical stability of furniture fronts veneered with African pterygota (Pterygota bequaertii De Wild.)* The goal of the study was to verify deformations of asymmetrically veneered panels after process of varnishing with acrilate resin. All samples were veneered double-sidely with African pterygota on one side as a reference material. All studies of deflections were done on original stand. Obtain results show that varnishing does not have influence on geometrical deformations of samples.

Keywords: asymmetrically veneering, varnishing, wood-based panels, deformations

INTRODUCTION

In wood industry furniture is produced mainly using wood-based panels. There are used boards that are finished in many ways. Practically, the most popular as the common used method of finishing boards is veneering. In the aim of effecting strong and esthetical surface, veneers are varnished. Because of deformations caused by stress existing in components of wood-based panels, elements in furniture are veneered symmetrically. Asymmetrical veneering is defined as veneering in which one wide surface of the board is veneered with using natural veneer, when the parallel surface is veneered using material with other properties or it is not veneered at all [Ostrowski and Roszkowski, 2009]. Present studies refers to double-sidely asymmetrical veneering.

Nowadays, some companies try to veneer furniture elements asymmetrically. Unfortunately, it is made intuitively and it is not withstand on research. Studies showed that the one of the key to defining process of asymmetrical veneering is glue with flexible glue line [Oleńska at all. 2010]. It has been also found that shrinkage difference of veneers used on the opposite sides doesn't have influence on deflections of asymmetrically veneered boards [Oleńska at all. 2011]. Described project has to give answer what influence porosity difference of veneers used on opposite sides of chipboards had on deflections of boards asymmetrical veneered with using chosen elastic glue. It is known that industry has problem with deformations of wood-based boards after varnishing, especially, when both sides are varnished not the same time. The hypothesis is that in spite of time varnishing the elastic glues joint protects varnished elements against deformations.

The aim of the study was to verify deflections (that can be result of varnishing) of samples asymmetrically veneered with hardwoods of deferent porosity values. The referred veneer is African pterygota (*Pterygota bequaertii* De Wild.).

MATERIALS AND METHODS

The measurement stand composes of elements as shown in figure 1. Designed stand is for samples of dimensions 900x450x18mm. The reference plane of the stand is levelled. To defined plane there are fixed four pegs. Three of them have constant height (30mm). One of them is adjustable so it avoid deflections of sample. All pegs are fixed in the same distance from the edge of the. During measurements each sample is situated so her edges are distant

the same from each peg. In the distance of 100mm from the longer edge of the base and 125mm from the shorter one there are fixed higher brackets. They are base for the strip. It goes from one corner to the other one that is placed diagonally. The strip has constant position so it can't be moved. To described strip it is possible to fix correctly the depth gauge. Its precision is 0.01mm. There were assigned five areas on the surface of the measurement strip. In each area five measurements were made. In graphs, the comparative points are arithmetic means of the measurements from each area.

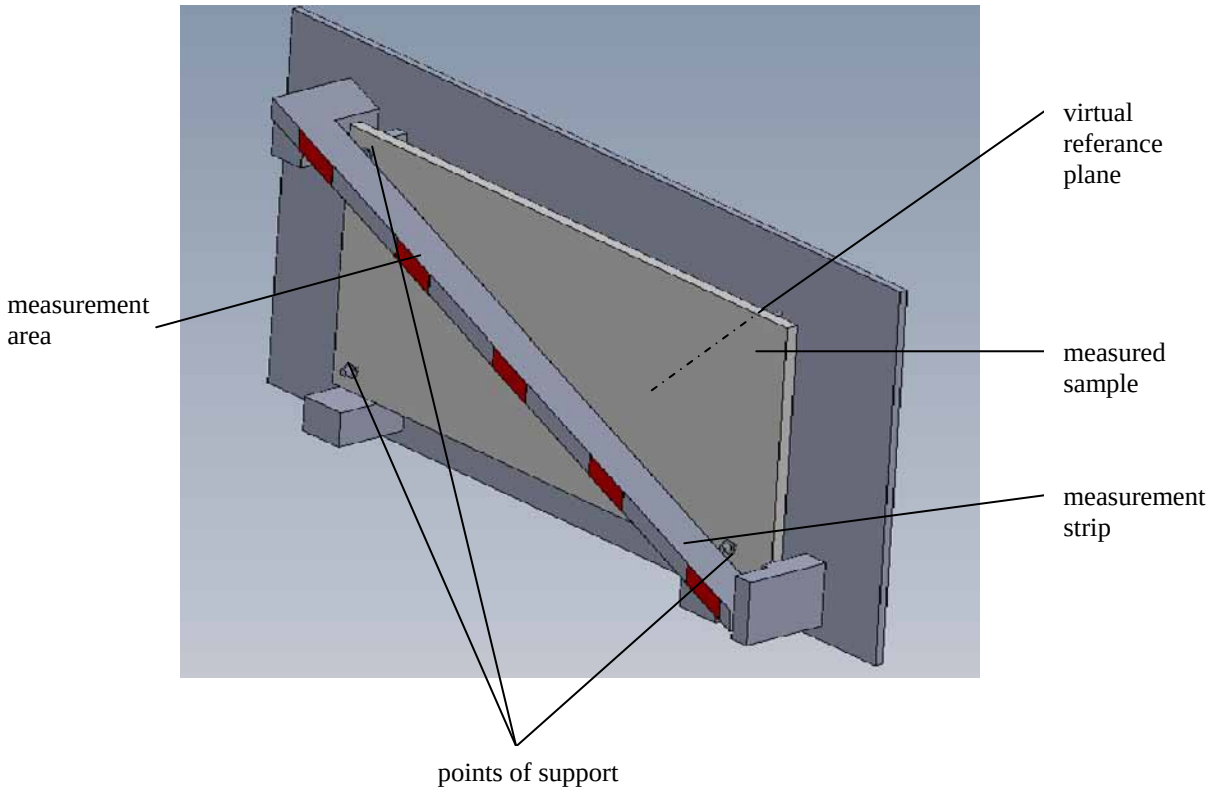


Fig. 1- Measurement stand with sample

In present part of studies there were compared samples veneered at constant temperature 120˚C, pressure 1.0MPa and time 180s. All veneers were varnished with water dissolved, acrilate resin. Varnishing of both sides of samples wasn't done in the same time (firstly, it was varnished unmeasured side and after drying it 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 African pterygota (*Pterygota bequaertii* De Wild.) on one side, but on the opposite side there was Sapele (*Entandrophragma cylindricum* Sprague) and European white birch (*Betula alba* L.)[EN 13556: 2003]. Kinds of veneers were chosen because of their physical properties. Veneers used on the opposite sides of boards had similar shrinkage difference, but were characterized with difference in porosity values. Properties of chosen hardwoods are subscribed in table 1.

Table 1. Properties of chosen veneers.

Kind of veneer	**Shrinkage**	**Porosity**
African pterygota	16,7%	61%
Sapele	14,1%	57%
European white birch	14,2%	51%

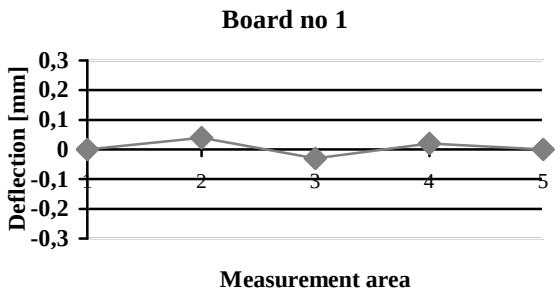
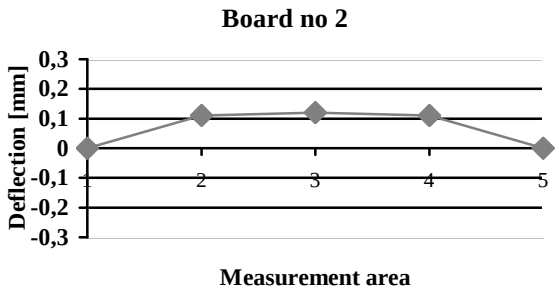
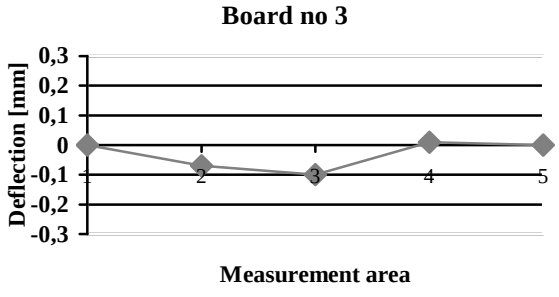
To bond veneers with chipboards there was used glue with flexible glue line that is polyisocyanate glue. Its properties are viscosity 2.5 Pas, density 0.80 g/cm^3 and spread 150 g/m^2.

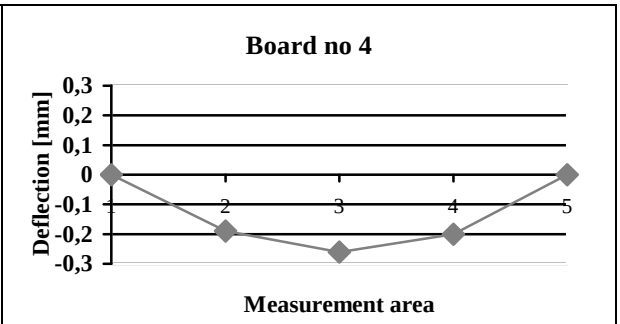
All boards were measured in two states, as follows: veneered, unvarnished and varnished. Boards deflections after veneering were subtracted with values of untreated boards.

RESULTS AND DISCUSSION

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

Table 2. Description of samples and results of studies: each point represents difference between veneered, unvarnished board and veneered, varnished board

Kinds of veneers	Shrinkage difference	Porosity difference	Graph
African pterygota-Sapele African pterygota-Sapele	2,6%	4%	 
European white birch- African pterygota European white birch- African pterygota	2,5%	10%	

Obtain results show that it is no deformation of asymmetrical veneered wood-based boards after process of varnishing. The most deformed sample after varnishing was warped to 0,25mm in critical point (it was board veneered with European white birch and African Pterygota). It is also noticed that samples veneered with using hardwoods with higher porosity difference were more deflected than samples with lower porosity difference.

CONCLUSIONS

Conducted research shows that there is a general tendency that samples asymmetrically veneered using chosen flexible glue, after varnishing them, save their shape. It was found that porosity difference (up to 10%), between veneers used in opposite sides of asymmetrically veneered panels, has low influence on dimension's stability of samples.

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Streszczenie: *Wpływ lakierowania żywicą akrylową na stabilność wymiarową elementów meblarskich okleinowanych koto (Pterygota bequaerii De Wild.).* Celem pracy była analiza deformacji płyt okleinowanych asymetrycznie, wynikających z procesów lakierowania żywicą akrylową. Wszystkie próbki okleinowane były dwustronnie z użyciem koto po jednej stronie płyty. Zniekształcenia płyt mierzone były na specjalnie zaprojektowanym stanowisku. Prezentowane wyniki wykazały, że lakierowanie nie ma wpływu na deformacje geometryczne próbek.

Corresponding authors:

Sylwia Oleńska, Michał Woźniak, Mariusz Mamiński, Piotr Beer,
Department of Construction and Technology of Final Wood Products,
Warsaw University of Life Sciences,
Nowoursynowska 159,
02-776 Warsaw, Poland
e-mail: piotr_beer@sggw.pl