

Thermo resistance of wall panels on the base of LDF boards wrapping with artificial veneers and various HM adhesives

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Abstract: *Thermo resistance of wall panels on the base of LDF boards wrapping with artificial veneers and various HM adhesives.* Determined thermo resistance of glue lines in tests of raised temperatures and in a check cold test procedure (- 20 /+ 50°C) and effect of steam action. On the basis of results of carried out experiments, it was stated among others that the highest thermo resistance of glue lines was in the panels from HM adhesive based on polyolefine polymers - PO (120°C), while the least which based on EVA copolymers with fillers (50°C), and somewhat larger the values for EVA adhesives without fillers. Kind of artificial veneers do not have an influence on level of the thermo resistance. Moreover it was proved that the most profitable resistance on effect of steam action for the glue lines from PO adhesives, while the least thermo resistance of glue lines from HM adhesive, which based on EVA copolymers with fillers.

Keywords: wall panel, LDF board, HM adhesive, artificial veneer, glue line, thermo resistance, steam action

INTRODUCTION

The one of the most important criterions of estimate of quality and utility features of wall panels is resistance of raised temperatures on effect of conventions, which they are connected with raised humidity of the air (Han & Shivaishi 1991, Krajaks et al. 2009, Malysheva & Bodrykh 2011, Proszyk, Krystofiak & Lis 2012). In these conditions the effects may appear and to cause a reduction properties of the final products, as a result of the processes of thermal dissociation as well as the susceptibility to hydrolysis disintegration. Moreover it can appear different kind of deformations which are caused of shrinkage and hydro – thermal tensions (Zenkter 1996). The arised these tensions result, among others that from difference modulus and the coefficients of linear expansion of the adhesives as well as wood based materials and artificial veneers too. Assume that the one of main reasons of appearance stratifications of joints are internal tensions in the glue lines (Cagle 1977). From the analysis of industrial data connected with production of paneling follows that to individual artificial veneers are required the specialist HM adhesives, which based on EVA copolymers with fillers or without fillers and polyolefine polymers (PO) in the technological processes of LDF boards wrapping. Kind of used HM adhesives may have an influence on thermal resistance of paneling.

METHODS

For experiments used the wall panels produced in industrial conditions using LDF boards (thickness 7 mm, density 650 kg/m³, MC 6%), wrapping with 6 artificial veneers in various decorative versions) with the aid 3 kind of HM adhesives (based on EVA copolymers with fillers and without fillers and PO product). Analyzing procedure determined of thermo resistance of glue lines from thermoplastic adhesives (Proszyk & Pajdosz 1995), written following the studying methods which were described below: tests of raised temperature, a procedure check cold tests and resistance of steam action. The samples of wall panels (150x150 mm), placed in the laboratory dryer with forced ventilation and the samples were warmed for 1 h at a temp. 50°C. In case of not statement of any changes by visual method, the temperature of warmed was raised at 10°C. The level of thermo resistance of testing paneling was the highest temperature in which the changes did not appear in glue lines

as well as on the surface of veneers. Then the designation of resistance of wall panels in a procedure check cold tests used the samples (150x150 mm), and then exposed these samples to effect of series of check cold tests acc.to PN-88/F-06100/07 standard. Carried out 9 cycles and the single one consist of from following operations: samples was warmed in the laboratory dryer with forced ventilation (at a temp. $+50\pm 1^{\circ}\text{C}$ and RH $15\div 20\%$) for 1 h, next the frozen in the refrigerator (at a temp. $-20\pm 1^{\circ}\text{C}$) for 1 h and 15 min air-conditioned in appropriate parameters $20\pm 2^{\circ}\text{C}/65\pm 5\%$. After the every cycle, addition made the menstruations of length of deformation glue lines, stating the average results exact to a 10 mm. Resistance of wall panels on effect of steam action used the samples (70x70 mm), acc. to PN-88/F-06100/06 standard was determined. The results of investigations stated by the time, in which the samples have proved of full resistance on effect of steam.

RESULTS

In Fig. 1 showed typing the results of investigations of thermo resistance of glue lines, which were received in warmed procedure of wall panels in the raised temperatures. General analysis these date stated, that the highest thermo resistance of adhesive joints in the paneling is HM adhesive based on PO polymer. In this case on the samples of paneling there were some visual changes of glue lines in the form of stratifications of artificial veneers from the surface LDF boards. Among mentioned above veneers the most profitable values of thermo resistance of adhesive joints were for oak natural (130°). The similar results were for the other kind of veneers and their level of thermo resistance was about 120°C . However, the least thermo resistance of glue lines from HM adhesives, which based on EVA copolymers with fillers. For this joint there was very intensive, almost complete stratifications of testing joint, for veneers ash mountain, marble cararra, pine antic and pine natural (50°C). However, for oak natural and pine the level of thermo resistance of glue lines was at a temperature 80°C .

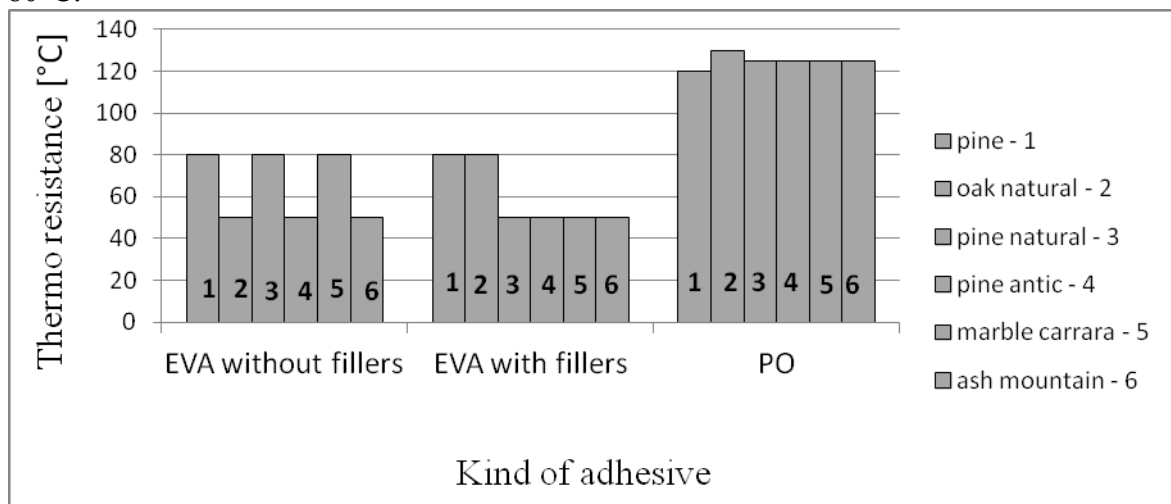


Fig. 1 The comparison results of investigations of thermo resistance of glue lines in wall panels from various HM adhesives and artificial veneers

Somewhat more profitable results were for EVA adhesives without fillers, namely for veneers ash mountain, marble cararra and oak natural, the level of thermo resistance was at a temperature 50°C , while for pine, marble cararra and pine natural were at a temperature 80°C . On the basis of results investigations of resistance of paneling in a procedure check cold tests, it was proved similarly just like above, that the least resistance of glue lines was for the samples from HM adhesives, which based on EVA copolymers with fillers. Taking the size of stratifications of veneers from LDF boards among the samples all kind of veneers into

consideration, observed that the stratifications appeared mainly in the range of values 30 ÷ 40 mm for appropriate ash mountain and pine natural veneers after 6 cycles. However, for pine natural and marble carrara registered after 3 cycles, the stratifications in range of values 20 ÷ 30 mm. Then the least stratifications were for pine and oak natural (10÷20 mm) after 9 cycles. Somewhat larger resistance in a procedure check cold tests characterized the samples for EVA adhesives without fillers. Analyzing size of stratifications among the samples all kind of veneers, it was stated that the highest stratifications were for pine antic on whole surface. More profitable results of values were for the samples of veneers for oak natural, pine natural and ash mountain (10÷20 mm) after 6 cycles. However, the least stratifications were for pine (10÷20 mm) and for marble carrara (20÷30 mm) only after 9 cycles. Definitely the highest resistance in a procedure check cold tests characterized the wall panels from PO adhesives, this resistance did not show any stratifications, even after 9 cycles.

Results of investigations of resistance of adhesive joints in the paneling on effect of steam action showed in Fig. 2. Analyzing data you may say that the least resistance of glue lines was for the samples from HM adhesives, which based on EVA copolymers with fillers.

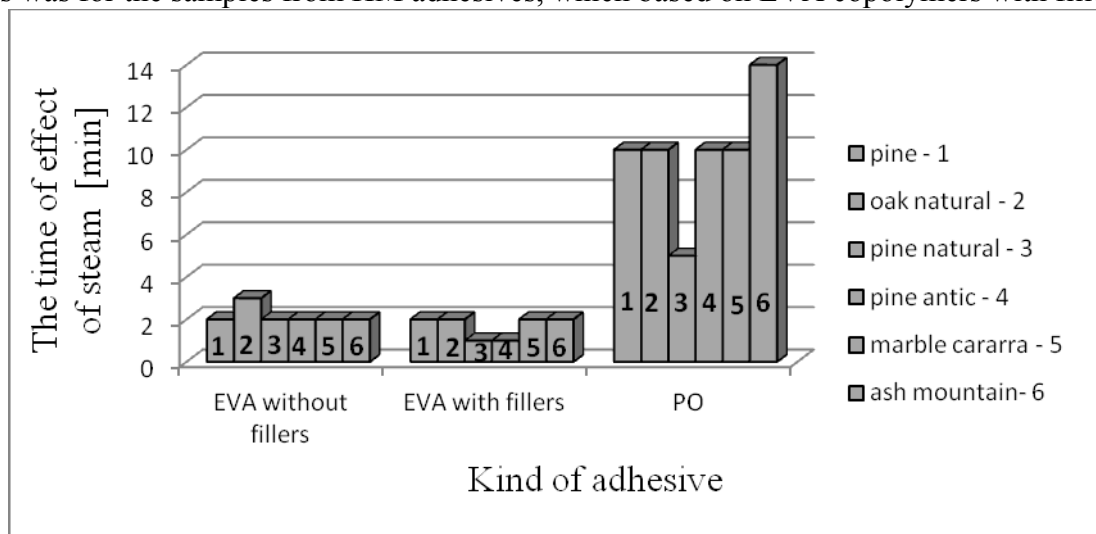


Fig. 2 The comparison results of investigations of resistance of wall panels on effect of steam action for glue lines from various HM adhesives and artificial veneers

The samples with veneers ash mountain and marble carrara had large changes on the surface of veneers as well as in structure of glue joint at the time 1 min. However, for the other samples it was stated some visible changes at the time 2 min. The similar values were for EVA adhesives without fillers, namely for veneers pine, ash mountain, pine natural, marble carrara, pine antic (2 min), while for oak natural (3 min). By far the best resistance on effect of steam was for the samples of paneling from PO adhesives, kind of artificial veneers have an influence on this resistance. The changes of structure of surface for veneers pine appeared after a 5 min. The other veneers, namely pine natural, oak natural, ash mountain and marble carrara showed the resistance on level 10 min, while pine antic even 14 min.

CONCLUSIONS

1. The highest thermo resistance of adhesive joints in the paneling from PO adhesives (120°C), while the least thermo resistance of glue lines from HM adhesives, which based on EVA copolymers with fillers (50°C), and somewhat larger the values for EVA adhesives without fillers.

2. The highest resistance of paneling for thermal aging in a procedure check cold tests for the glue lines from Po adhesives. Kind of artificial veneers have an influence on this resistance, the most profitable values were for pine and oak natural.
3. The highest resistance on effect of steam for the glue lines from PO adhesives, while the least thermo resistance of glue lines from HM adhesives, which based on EVA copolymers with fillers.

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Streszczenie: *Termoodporność paneli ściennych z płyt LDF opłaszczowanych okleinami sztucznymi na nośniku papierowym przy zastosowaniu różnych klejów HM.* Przedstawiono wyniki badań termoodporności paneli ściennych, które wytworzono przy zastosowaniu 3 systemów klejowych HM z wykorzystaniem 6 różnorodnych oklein sztucznych na nośniku papierowym. W badaniach określano odporność paneli ściennych na działanie podwyższonych i zmiennych temperatur oraz pary wodnej. Na podstawie rezultatów przeprowadzonych badań, m. in. Stwierdzono, że najwyższą termoodporność spoin w panelach ściennych, wykazał klej HM na bazie PO (120°C), zaś najniższą EVA wypełniony (50°C), a nieco tylko wyższe wartości odnotowano dla kleju EVA niewypełnionego.

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