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THE CONSOLIDATION OF THE WOOD PANELS OF TWO ICONS FROM XIXTH- XXTH CENTURY, USING REVERSIBILE TREATMENTS

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Abstract:

The paper presents the structural reintegration of the wood panels using compatible disperse systems based on natural and synthetic resins. Two icons from XIXth and XXth are the subject of the study, the first is named „God's Mother The Empress" and the second „Gabriel the Archangel" by anonymous painters. The painted panels are from a private collection and painted in oil technique. The supports are made from linden wood, by multiple boards linked together with animal glue, and with two crossbeams for planarity. The wood panels have different types of degradation and deterioration (separation, cracks, fractures, flight holes, missing cellulosic material, carbonization, embrittlement etc.). The consolidation is done using nondestructive treatments (beeswax and Paraloid B72), which don't affect the aesthetics of the icons. The study observes the behavior of various fillers and binders from the consolidation treatments.

Key words*: panel painting; decay; deterioration; cosolidanti; evolutionary effects.*

INTRODUCTION

The reintegration of old wood structural panels is a delicate matter because they require consistent treatment which must be different from case to case, depending on the wood used, the complexity of the panel, artistic technique, conservation status, age/patina, heritage etc. Current research takes into account a number of aggregated old wooden supports from artwork, different instances and types of intervention operations, but can not be applied to any situation, because the problems raised by the practice of preserving and restoring the wood should be differentiated by various species of wood, the structural morphology of pores and for the other morpho-anatomical elements, and developed effects that lead to an extent of degradation and damage (Sandu 2008, Lionetto and Frigione 2011).

The strengthening of the panel is essential when wood is very deteriorated, meaning that you can not ensure the integrity of the object, the last possible intervention would be the preserving the authentic elements (Wan and Schniewind 1985).

Structural consolidation is based on two stages: the impregnation part and the wood strengthening In the first part, degraded media is treated with a a solution, which is designed to fill the gaps in the structure. In the second part, the solution is able to solidificate weakened structures (Timar 2003).

Because of the boring insects, wood panels suffer an initial attack and subsequent damages due to enzymatic processes and to the galleries, which reduces the strength by embrittlement. This requires the application of consolidation treatments to eliminate the damage, and the physical, microbiological and climate factors must be improved. The brittle, spongy wood panels are impregnated with various disperse systems for strengthening.

There are known different processes of consolidation of the old wood from artwork, which are often much disputed by their outcome. Two of them are the impregnation with wax and with Paraliod B-72.

The mixture is applied hot on certain areas or allover the back of the panel, depending on its degradation and deterioration. Researchers in this area emphasized that the impregnation treatments with rosin, led to satisfactory results on maintaining the shape and size of the wood panel under the influence of moisture variations. This treatment beeing hydrophobic keeps the moisture retention in the wood, reduced (Giachi *et al*. 2011).

Paraloid B72 is used since 1960. It is colorless, making strong layers, transparent and flexible, stable and durable. It is dissolved in toluene, xylene and ethanol in different concentrations. Scientists demonstrated that Paraloid B72 shows a significant reduction in porosity having high molecular weight, tends to focus lumen thereby decreasing porosity, infuenting the degree of variation of the normal fluid balance. Consolidation with Paraloid shows better resistance in terms of insect and fungal protection, than other synthetic resins (Crisci *et al*. 2010).

These methods have the advantage that they can be considered retratabile operations. Retretrability and compatibility are defining the product requirements for consolidation.

The strengthening of the damaged wood is done in order to restore its structural integrity, by impregnating resin soluble in organic solvents. According to experts, this is the most viable method due to its physical and mechanical properties (Knut 2000). As an illustrative example is protective layering with Paraloid B 72 dissolved in ethyl acetate, afterword the treated surface beeing cover with insulation melinex foil. Strengthening the painted panel for an area slightly weakened, can be achieved in successive brushing to saturate the wood with Paraloid B72 in xylene 5/10/15/20/25%; Paraloid B72 (7 -10%), dissolved in nitro thinner or in other organic hydrocarbon solvents (Tuduce Trăistaru *et al*. 2013), Paraloid B-69 in an organic hydrocarbon solvent, Paraloid B-66 (8%) dissolved in xylene, alone or mixed with a concentrated solution of permethrin as a biocide (Knut 2000).

This intervention consists in filling the pores of the wood or gluing the loose, cracked parts, thus improving the mechanical structure of the wood.

The main objective in the process of consolidation is to ensure the stability, integrity and security in the use of an object. Consolidation is a major intervention that can be applied differently in each case. Treatment depends on the nature of the object type and functional requirements of the subject (Kucerova 2012). In accordance with the restoration principles, the long-term stability and developmental effects are the most important. It is necessary for the consolidant not to deteriorate itself at a faster rate than the object and the treatment should not alter the appearance of the object. It must be taken into account that in the solidification process, the consolidant should not be very rigid as to harm the object. These pressures caused by rigidity, could inflict internal fractures and severe distortions of the object. Besides these aspects we should note that while resistance of materials used in objects reintegration, is a very important quality (Timar 2003).

This paper presents a comparative study of icons XIX-XX century with weakened support. The purpose of this paper is to investigate some aspects of wood impregnation technique with a mixture of wax, rosin and Paraliod B72.

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MATERIALS AND METHODS

In this paper is used as study material, two wooden panel paintings, icons of the XIXth century (**Fig. 1**), made by anonymous painters, in oil technique, from private collections. Both panels are degradated and deteriorated by xylophagous attack, the wood has a spongy apperance, particularly weakened and sensitive at handling.

Fig. 1
Two icons of the XIXth century: a – first case treated, b – second case treated.

The first icons panel is heavily damaged and degrated by the xylophagous attack the wood has a spongy apperance and weakened (**Fig. 2**).

Fig. 2
Damage and degradation of the back panel.

For this wood panel, the consolidation process was made by beeswax and rosin in 60:40 ratio. The two products are separately melted and then mixed together pouring wax over the rosin. The wax and rosin mixture penetrates deeper in tunnels and holes from the woodboring insects.

In this case, the concentrated dispersion was poured over the problem area and with a heat source as the Hot air gun, Stern Austria Model: HG 2000ACN, becouse the melting point of wax and rosin exceed 85 degrees. The penetration in the volume phase was eased by using the spatula to keep the mixture liquid (**Fig. 3a**) for filling the insect holes. The impregnation ceased when the wood was oversaturated with consolidant (**Fig. 3b**). The operation was completed by coating the entire panel with the same mixture and then polished with a dry cloth.

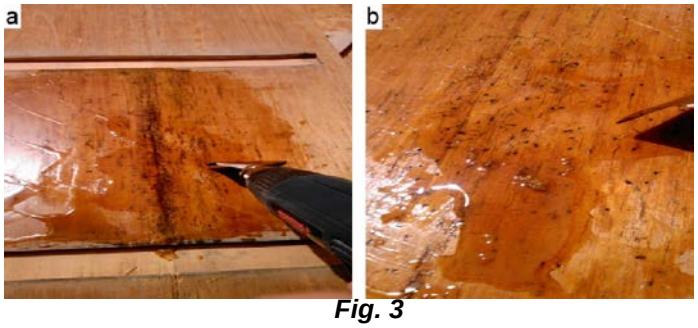

Fig. 3
Impregnation process of the back panel: a - Impregnation with wax and rosin, b - finishing the impregnation.

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The second panel painting was impregnated with Paraloid B72 dissolved in xylene (**Fig. 4**). The impregnation process was performed by brushing the reverse and injecting with a syringe the panel edges. The dissolution of Paraloid B 72 granules in xylene was done in a water bath. Xylene is used as solvent for plastic materials, so as in the paper (Knut 2000) xylene is used in consolidation treatments.

Fig. 4
Degradation and damage of the reverse panel.

The brushing was done repeatedly, using concentrations of 5%, 10%, 15%, only on the extremely fragile areas (**Fig. 5a**). Towards the end, after the complete evaporation of the solvent and the resin hardening, the panel was impregnated with a mixture of melted beeswax and rosin in 60:40 ratio (**Fig. 5b**). The fluid mixture was poured on the treated area, facilitating the penetration with the same heat source, until saturation where the wood has no longer absorption capacity. In the visible areas, badly weakened and with and loss of wood, in the liquid mixture was added chalk dust, in concentration of 20%, to give strength and endurance (**Fig. 6a**). In this case the system was applied by pouring the melt. Finally, after cooling and finishing, the light colored ground is covered with wood stain (**Fig. 6b**).

The operation was completed by coating the panel with a solution of the same mixture and polishing the surface with a cloth.

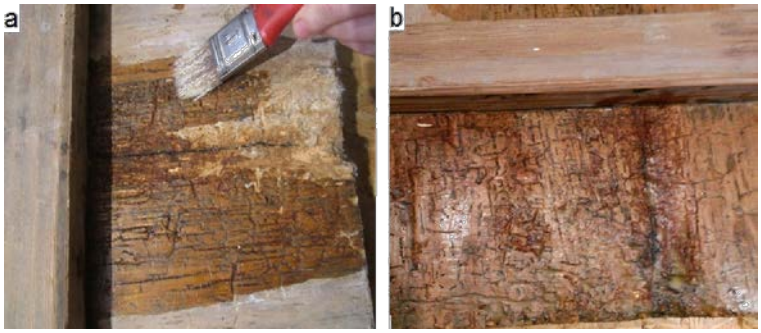

Fig. 5
Impregnation of the panel: a - brushing over the weakened area with Paraloid B72 in xylene; b – impregation with a mixture of beeswax and rosin.

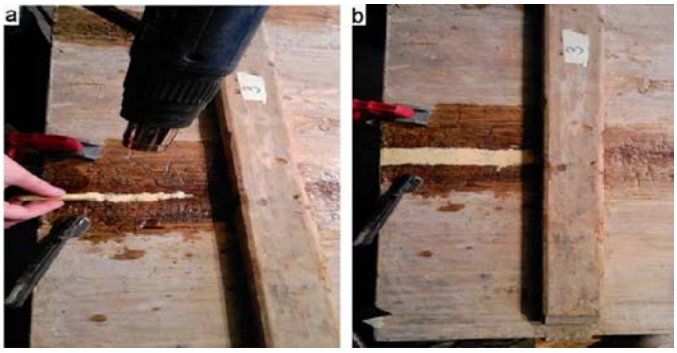

Fig. 6
Filling the gaps in the wood panel: a - Adding mix of wax, rosin and chalk dust; b - Completed impregnation process of the weakened area.

RESULTS AND DISCUSSION

In the first panel, impregnated with wax and rosin, penetration in holes and galleries was done very easily. The operation was repeated until the wood was saturated and the holes were visible filled. Theexcess consolidant was removed with a spatula at high temperature. Rosin wax mixture was easy to apply, proving a good capacity of penetration in the volume phase of the support. After the consolidation was done and the panel cooled the heavily weakened area became strong, compact and uniform.

The waterproof ability was tested by dripping a few drops of distilled water from a pipette on the wood surfare, and the drops remained on the surface of the without being diffused. The adhesion capacity was tested aswell by putting talcum powder on the wood surface. If talcum was easily removed by vacuuming.

At the second wood panel which was worst affected by the boring insects attack, the consolidation was differentily done by using two systems: Paraloid B72 in xylene at concentrations of 5, 10 and 15% and the wax/ rosin mixture in 60:40 ratio. First the Paraloid B72 in xylene 5% solution was used over the strongly weakened area, which penetrated deep into wood fibers without filling the holes, then further treated with Paraloid B72 10% in xylene dispersion which wasn't able to obstruct all the holes. When the 15% Paraloid B72 was used, the rasin film covered the fiber, and most holes weren't filld neither. For these reasons the consolidation was done in two stages: first timber was impregnated gradually by using the three dispersions of 5, 10 and 15% Paraloid B72 every concentration staying for approximative 3 to 7 minutes, followed by impregnation with melted wax-rosin mixture, which was spread on the surface and into the holes with a spatula.

At the consolidation in two stages some observation were made: the dispersion based on Paraloid B72 at three different concentrations was rapidly spread over the surface and easily penetrated, in a short period of time, without filling the gaps and holes, covering the wood fibers, the solution of 20% concentration was tested but the high viscosity made the solution very difficult to penetrate. After the total evaporation of the solvent and the hardening of the resin, the treated areas were much stronger and transparent films formed at the surface. After the second stage of hot impregnation using melted mixture of wax and rosin, it was observed that in the process, close to the filling of the holes, the mixture evacuated in some areas a dark brown residue. Before the impregnation process, the back of the panel painting was cleaned mechanically, removing a multiple layers of paint.

The panel consolidation has ended by covering the entire panel with the was mixture and then polished.

CONCLUSIONS

The consolidation of a wood panel strongly weekend by boring insects attack is influenced by the type of the consolidant and by its penetration capacity and waterproofing. It must be very resistent in time, non-degradable, colorless, reversible, allowing consolidation of the cracks, filling holes, and not to disturb the natural variation of the hydric balance. It must allow the use of insecticide, of fire retardants, and waterproofing. The consolidation process varies by wood type, conservation state, age and others.

The consolidation is made by injectioning and covering the surface of the wood, using traditional animal or vegetable substances, and the ones of mineral origin are responsible for many of the requirements of their application. On these grounds, the experiments in this study, were based on consolidating with Paraloid B72 dispersed in xylene and a mixture of wax and rosin.

The consolidation results involving two panel painting icons, very affected by the attack xylophagous, are clear and enlightening. In both cases, the systems tested were well impregnated during a volume stage of the panel, fllight gaps and holes untill th complete saturation, enhancing internal and external cracks, reinforcing the strong elements weaken and covering the wood fiber. The choice of direct application of the system was made in consolidating stage by observing the behavior of the penetration. Hence the finding that the same process can't be used universally for optimal consolidation, becaouse it differs from case to case, and in this fiels "the patient is important and not the disease."

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