EVALUATION OF OLD WOODEN DOORS IN THE FURNITURE INDUSTRY

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Eco-design, Furniture, Recycle, Wood door, Wood finishing.

Abstract

A solution for recycling and capitalization of the recovered old door frames should be obtained with minimum intervention by the possible refinishing of them. For this study a 60 year old wooden door was selected. Due to its damaged surface aspect, the following objectives were derived: colorant paint produced from the ink for the recovered furniture design and methods of protection occupying special effects with minimal energy consumption. In this study the special effects finish on recovered furniture design by a colorant paint produced from the ink and wood preservative was considered. Modern tables were designed and manufactured from 60 year old doors. A new field was created with the evaluation of waste wood door and window frames. This eco-design shows that the refinishing of recovered old door wood with a colorant paint and wood preservative obtained by techniques adopted from interior design can be a sustainable way to recycle and reuse them.

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1. INTRODUCTION

The biodegradable fractions in wastes like paper and wood are important sources of biomass for the renewable-energy production through thermal and biological conversion (Heo et al. 2010). With such a large industry, the demand for producing furniture in a sustainable fashion, free from harmful chemicals is one of the utmost important factors (Anderson and Koyumdzhieva 2012).

Recycling represents the process of reusing old materials and developing new products, which as a result reduces the emission of greenhouse gases, the energy consumption required for the extraction of raw materials, and the waste disposal. Recycling is actually the basic process of an eco-design strategy for extending the life of materials (Deak 2013).

Figure 1 gives a broad outline of the wood furniture value chain. Raw materials such as seed inputs, chemicals, equipment and water feed into the forestry sector.

For LCA, the primary way that environmental physics will be applied is by the use of the life-Cycle assessment (LCA). The four phases used in the LCA are material, production, distribution and use. Material describes what energy is actually used in the production and creation of the furniture. Distribution tallies the amount of energy used in the shipping to the consumer. Use is the handling of the final product by the customers. For the case of furniture, this entails repair and maintenance that may be neglected. End of life takes the energy consumed/recovered during the final stage of the product’s life. This would mean such things as recycling, reuse and depositing it in a landfill (Calabrase 2012).

The second way the furniture shall be analyzed is through the economic lense of life cycle costing. The life cycle costs (LCC) are analyzed and evaluated in three parts from the consumer’s point of view. The three parts of the LCC used in the study are the purchase price, use phase cost and end of life cost (Calabrave 2012).

Cherry et al. carried out an investigation to enlarge the environmental aspects and discovered applications such as Life Cycle Assessment, and the sustainable development criteria depending on two additional dimensions: the economic and social ones (Chery et al. 2007).

This paper aims to investigate how product design recycling has been practiced within the furniture industry. Furthermore, to investigate how the recycling of product design can reduce the current negative impact on the environment.

Figure 1. Wood furniture value system (Kaplinsky et al. 2009).
2. EXPERIMENTAL METHODS

Three grand wooden doors with a length of 300 cm, a width of 100 cm and thickness of 5 cm obtained from a 60 year old house ruin in the Trabzon Province in Turkey are used throughout this study. Primarily nearly 3 cm of the length of the doors are cut and the decomposed wood parts are removed. The remaining decompositions at the door edges and surfaces are closed through puttying up. Then the door surfaces are machine grinded using sandpaper #240. Aidol Induline SW 400, which has a wood preservative effect, is applied onto the wooden surfaces with a brush. The doors with applied Aidol SW 900 are left for drying at room conditions for 48 hours and later patina dye is applied with a fabric as the surface coating. The doors with applied patina dye are once again left for 48 hours for drying under room conditions. The doors are manually grinded until smooth using sandpaper #240 by applying a pattern in order to provide an aged look. For the final layer, a preservative and shiny look effect is provided again with Aidol Induline SW 400. The images of the doors before and after the surface treatment are given in Figure 2. Later, metal feet are mounted to the tables as the supporting structure. The metal feet are dyed with humidified temperature resistant black metal dye.

![Figure 2. Images of the doors before to and after treatment.](image)

Two varieties of tables are manufactured. One of the tables consist of two doors, assembled together with screws. The other, oriental spruce (*Picea orientalis* L.) timber is mounted to both lengthwise edges of the door with screws without being peeled. The preservation and upper surface treatment applied to the doors is also applied to these timbers in the same manner. Finally, glass is embedded into the window patterned inner spaces of the doors in order to provide an ergonomic usage.

3. RESULTS AND DISCUSSIONS

There are different studies to be found in the literature on the recycling of wooden products (Heo 2012, Chery et al. 2007, Calabrase 2012). Recycling in the furniture industry is defined as “Life Cycle Assessment (LCA)” in the ISO 14041 standard (Deak 2013).

During recent years buildings are more frequently being demolished in many provinces of Turkey pursuant to the urban transformation directive based on the Code No. 6306. Many window and door joineries remain unexploited during these demolitions. The doors used throughout this study are obtained from these wastes.
As to be seen in Figure 3 and 4, a rather modern office type table is manufactured from these unexploited doors. Whilst the table in Figure 3 was designed as a work table, the one in Figure 4 was designed as a meeting table.

Figure 3. Table type with oriental spruce timber assembled to its edges.

Figure 4. Table type, where two tables are assembled together.

At present these tables are a rather popular design for furniture. These popular table types are obtained in our study using unexploited products and the low cost of treatment applications. Also, the metals used for the feet of the table have increased the bearing capacity of the table.
4. CONCLUSIONS

Relatively easy, economic and environmentally friendly methods are used in this study. It is thought that these methods will encourage the production of new projects regarding the utilization of unexploited wood joineries which incur within the scope of the urban transformation of the furniture industry. Additionally, similar recycling works are targeted for the furniture industry in the upcoming future.

References

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