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APPLICATION OF LAMINATED HALF FINISHED PRODUCTS IN THE PRODUCTION OF CHAIRS

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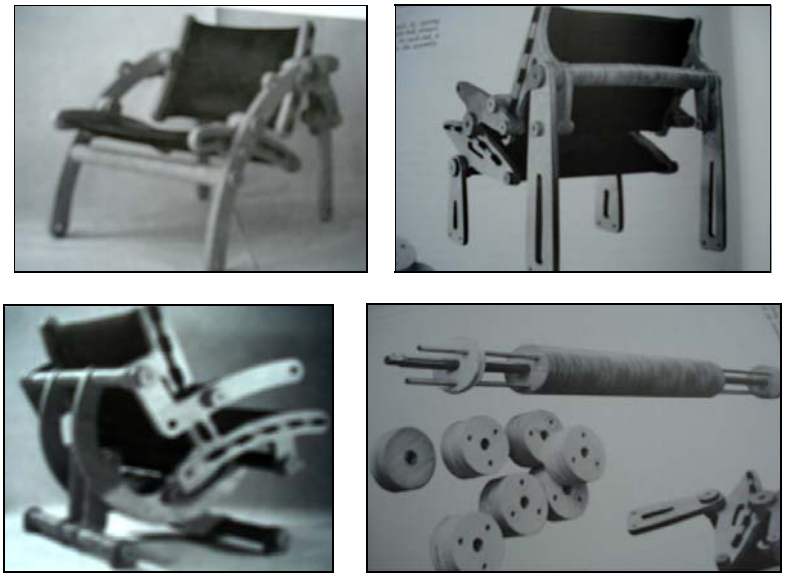
ABSTRACT
The laminated elements of furniture are very rational solution for chair production. The new technologies of chair production integrated the laminated furniture elements maximal in their process of production as well as design. The European application and North American applicators are differently related to chair construction. In this paper we will hold only application of laminated elements and represent it.
Keywords: Laminated half finished veneer elements, chair production, integrated elements.

1. INTRODUCTION
The history of chair production from ancient Egyptian, Greek and Roman times till modern times shows that the chair making had changed a little which indicate that the construction of chairs are limited. Basic construction details of chairs found in Tutankhamen's tomb, such as the pinned mortise and tendon are exactly the same as mortise and tendon joints which are used today. Today's designers and producers are confronted with the added challenge of being original in competition with a vast and rich global design heritage as well as with new materials in the market. On the other side, now we have the TC 136 furniture standards, regulations and recommendation of ISO 7173 (1989) for chairs and tools which is used in industry as well as in design of chairs to define all necessary factors needed to produce a chair.
The designers and chair producers especially chairs from solid wood or combination of solid wood and laminated curved elements are confronted with several major problems that must all be solved equally well for the sake of being wholly successful. The design of the chair must be esthetically and technically pleasing, well executed and fit the body of human being as well as possible. The chair must also function in the area for which it was designed. It is also expected to be durable, safe to sit in and fresh in appearance. All these are not easy to achieve. [1]
The component or the chair elements are very important to fulfill all the expectations and regulations which are defined for it. The rationalization of wood exploitation as natural material leads to new production of wood based material as veneer, plywood and the laminated curved and non-curved products. [2]
The production of curved veneer elements which is produced from veneer is a very successful industry which developed into a very high quality of products and design. They satisfy all needed mechanical and physical properties of the solid wood, so they are massively used in chair laminated half finished or finished elements or products.

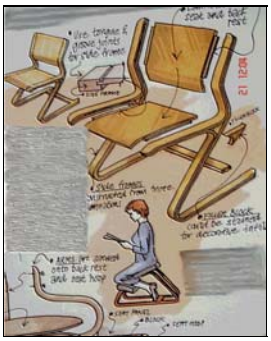
2. THE CHAIR PRODUCTION
The history of modern chair production, chairs like Whitley rocker, Chariot chair, Side chair, Game table, Mariabronn chair, Singley's Wainscot chair, Cheshire chair, Windsor chair, Brewster chair,

Queen Anne chair, Veleta's chair, Sawyer's chair, Chippendale, Bretsubl, Chariot chair, Elm chair are mostly constructed and produced from massive solid wood.
Different types of chairs from plywood were later showed like the one designed by Kenneth Smythe. The designs are based on a large vocabulary of modular shapes and are supported by a goodly number of non-traditional connectors and locking devices appropriate to the material selected like plywood or similar [3]. The design philosophy is based on a concept that is called "integrated fragmentation", which provides both variety in design and economy in the use of material as you see in picture no.1.



Picture 1. Kenneth Smythe chair from plywood.

After the chair production which started to implement the introduction of different materials in the production of chairs like metal, aluminum, plywood and laminated veneer curved or not curved; now we have new types of chairs.
The chair elements or as technically described the chair components are: back upright (back legs), front legs, seat rail, seat pad, stretchers, top rail, splat (back rest) and crest rail. The production of any type of chair with any kind of integrated materials should respect the basic recommendation for chair production based on standards and regulations [1].
The machines which are specialized in wood processing or wood based material for the production of wood elements or elements from laminated veneer or similar can process all these materials with high quality processing or production [5]. For higher quality of processing usually the producers use specialized tools for routing, mortising, boring and all the necessary operations needed. The specialized CNC machines centers for chair components and similar items stands out for operations requiring multi axis of interpolation, are also processing solid wood and wood based materials in the same quality. In the following two pictures number 2 and number 3, we represent several types of chairs where we can see chairs produced, constructed from adequate elements, components and frames from laminated veneer. They are strong and resilient structure.
The production of these types of chairs is mostly prepared in the veneer laminated curved elements and they are finished and assembled into a chair final phase of production.
First, they produce side-frame components, seat and back rest separately, then they glue together laminated components to make side frames and insert filler blocks with glue. Rout grooves in side frames and tongues on seat and back rest. The last assembling phase is gluing seat, back rest and rail between side frames. Before that they have to be well sanded and cleaned from all the residues so the gluing process continues and finish properly.



Pictures 2 and 3. Laminated chairs and kneeling chairs.

The production of the special type of chairs the "Kneeling chair" is different where the components are specially designed and produced to assure the function of the chair. With a "kneeling chair" the weight of the body is thrown forward onto the knees in order to improve posture and relieve pressure on the lower back of the body. Therefore the components of the chair from curved laminated veneer are possibly calculated and dimensioned for such pressure and special function [4].

3. PRODUCTION OF LAMINATED HALF FINISHED PRODUCTS

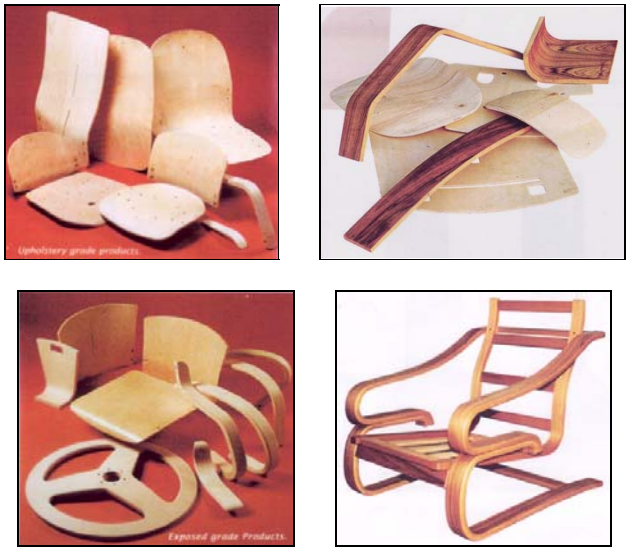
The industry of laminated products started to develop a long time ago as an opportunity upgrading the basic raw material of veneer. Basically it is a very simple production where the veneer is laid on the other one according to certain rules. The veneer as an input raw material is selected separately for the outside layers and the veneer for the inside layers. The veneer glued with special glue prepared for this purpose. Then it is placed on the mould (pattern) which will be put in a hot pressing system with certain program. This type of production involves many problems, the design and construction forms must be carefully solved in order to assure quality and make the structure safe and economically feasible [5].

Curved laminated veneer is now infiltrated in most furniture products especially in chair production. The production of curved laminated veneer is very well organized after the designer defines the shape of the curve element which will be a certain component or element for a certain chair. It is specially organized in the needed shape in big pieces and then later sliced with certain width as at the chair design. To achieve the required strength, durability, stability, ergonomic function, intended conditions of use as well as manufacture cost, curved products (parts) should be very well constructed with the usage of adequate veneer [6].

The finished phase, of half finished products, of curved laminated elements in their processing with machine for final technical phase, mostly CNC machines, where the needed design and state of finishing is previously transferred to the software are available. In the next pictures we will first show in picture no.4 the two basic grades of such products which are upholstery grade products and exposed grade products.

Picture 4. Two basic styles (grades) of products.

In the upholstery grade they are mostly seats, backs, shells and arms to be upholstered. In the exposed grades where mostly exposed parts are made up of frame components as well as compound curved seats, back, shells and arms as you can see in picture no.5.



Picture 5. Laminated half finished and finished products

4. CONCLUSION

We can conclude from the material represented above which connected the application of laminated half finished products in the production of chairs as follows:

1. The history of chair production from ancient times shows that the chair producers used laminated products in different shapes and quality.
2. The technology of curved veneer laminated products developed to a very high level that it makes their production very good and possible to implement as an upgrading of veneer production.
3. The chair construction and their design concerning the integration in the components from veneer laminated elements showed a high level of flexibility in using various elements in various types of design successfully.
4. The laminated veneer curved products successfully assured various new types of chair design especially where the traditional use of laminated products is extended widely to other area of usage.

5. REFERENCES

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