

ANALYSIS OF THE TECHNOLOGY OF MAKING OF CHAIR IN THE PROCESS OF PRODUCTION OF COMPANIES IN MACEDONIA

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Abstract: By analyzing the technology of making chairs it is necessary to define the elements that affect the quality of production. The analysis of the materials, the structural elements, the perfecting of the production process, the improvement of the ergonomic characteristics, as part of the technological process, influence the quality of the making of the chairs. Through certain analyzes of the production process in domestic companies, can improve quality and increase production. Analyzes of specific data from companies contribute to improving the economic and architectural aspects of the production of chairs. According to the research, we can conclude a certain influence of the characteristics of the chairs present in the whole technological process, in the selection of materials, in the way of production, as well as in the presence of products in world trends and markets.

Keywords: *chair, construction, wood, colors, materials, ergonomics*

Introduction:

In the process of the technology of making tables in the production of companies, the most prevalent are the elements that are stylistically related to the Baroque style. The most important elements of the technique of baroque chairs refer to slightly distorted and rounded forms, wooden frame and the use of tapestry. The chair consists of a mixture of flat and slightly curved lines, with a rich carving. The backrest and seat are bent under a certain angle, as well as the legs with a slight curvature under a certain slope. Factories producing furniture in Eastern Macedonia

have been working for more than thirty years with great success and progress. The bulk of the technology on production relates to elements of curved shapes and wooden frames, products of optimum quality and comfortable fabric. The production of chairs, the application of certain characteristics and processing depends on market demand and interest. Thereby with simple material like the tree, they are made simple designs of chairs, improving the process by applying elements, and today there is a lower interest in the market and by the customers. (Miller 2006).

1. Analysis of research on materials and their application

The basic characteristics of the elements for the production of chairs in Macedonia began to be applied in the period from 1989 to 2016 year. The basic material used for making chairs is the beech wood with exclusive use of wooden construction and a combination of wood with metal, with or without the use of upholstery. The analysis of the use of characteristic elements for domestic production of chairs and materials used refers to several factories in which the research was carried out:

- DIK - Fagus (1993) Pehchevo, production of furniture, doors, windows, chairs.
- LTD - Leder (1989), Kocani, with production of wooden tables and chairs.
- Stolichara Jastreb (1992) Strumica, production of chairs, kitchen and club tables with high quality material.

Company	Dik Fagus	Leder	Stolichara Jastreb
Products	- chairs; - stool; - armchairs; - benches; - two-seater;	- chairs ; - armchairs ; - tables ; - two-seater ; - desks;	- chairs ; - kitchen tables; - club tables ;
Materials for making frame	- beech; - metal;	- natural materials; - beech; - beech and metal;	- natural materials; - beech; - mediapan; - oak;
Materials used	- furniture fabric ; - eco leatcher; - leatcher ;	- eco leatcher; - skins; - furniture fabric; - polyester;	- furniture fabric; - eco leatcher; - skins;
Market demand	- 70% foreign markets; - 30% of Macedonian markets;	- 50% foreign markets ; - 50% of Macedonian markets ;	- 40% natural materials; - 60% of Macedonian markets;

Table 1. Results of surveyed companies Furniture in Macedonia

In the recent period, companies have made attempts to create a chair of different composites for different effects. It is important that manufacturers furniture must first check the conditions for the final product and see if new composites can meet the requirements.

Ekelman (1987) states important properties which should have wooden composites for furniture production, bending strength, modulus of elasticity, rigidity, bonding strength, creep resistance and impact strength. (Jacoquemary 1867).

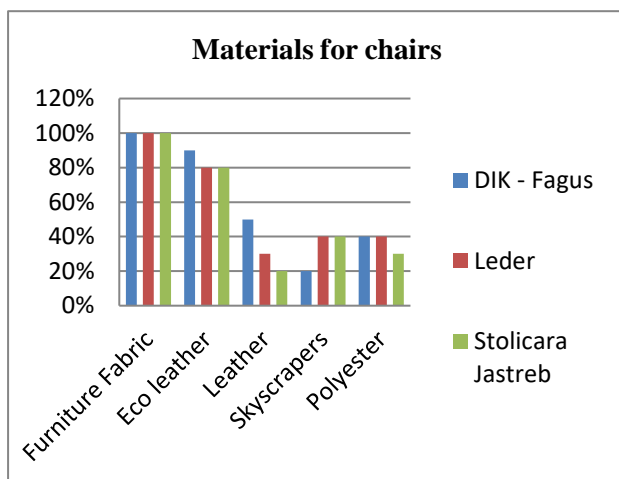


Chart 1. Drawing on materials for upholstery stools

The materials have a great application in our everyday life. The choice of materials is of great importance. It has a major impact on: the weight, humidity, price, temperature, density, resistance and elasticity of the material itself. (Ashby, Johnson Elsevier 2002).

Natural materials are materials that are obtained directly from nature. For preparation of a chair can be used natural or artificial materials. Based on the research of the materials and their use, I have done research in several Macedonian companies of production on furniture, as well as their use of materials.

2. Analysis of technology and production process

The production process for chairs is a complex process make up several stages that contain, organizing the warehouse, making and controlling the product are the key steps for achieving efficiency, reducing waste and high quality.

Furniture companies in Macedonia have full technological a process for the production of a kind of chair, which contain different processes and impact on the production stages. Careful selection of wood that is purchased from controlled macedonian forests, by making the construction, selecting materials and the final product. The basic ingredients of the interiors and chairs are beech wood, high-quality fabrics and exclusive processing, careful selection of materials, etc.

Selection of material	- procurement of wood (beech, oak); - from Macedonian suppliers; - use of waste products;
Drying	- drying in chambers; - mating for the destruction of fungi;
Processing of elements	- rough processing of materials - and parts of products;
Making a shape	- mechanical processing of compositions and parts of the product; - surface processing;
Compiling	- assembly of the compositions; - parts of the product; - final assembly; - getting a finished product;
Choice of color	- transparent and opaque varnishes; - glossy, semi-glossy, matt varnishes;
Painting	- electrostatic spraying; - pump of lacquering;
Upholstery	- cutting the sponge; - cutting out the fabric; - additional elements and glue;
Control of the chair	- technical control and - handover of the finished products;
Packing	- cardboard box; - bag with air bubbles;

Table 2. Description of the stages of the production process

The process of making the chair consists of several stages: selection of wood, processing of the structure, selection of materials, upholstery and final processing.

These basic phases are complemented by additional stages which contain the entire manufacturing process, for simpler and more flexible work.




	Dik Fagus	Leder	Stolicara Jastreb
Model on chair			
Methods of construction :	<ul style="list-style-type: none"> - wooden frame; - flat lines; - rounding of the elements; - coupling the elements with connections; 	<ul style="list-style-type: none"> - wooden frame; - slightly distorted and rounded forms; - assembling the elements with connections and screws; 	<ul style="list-style-type: none"> - wooden frame; - flat lines with slight curvature ; - products, coupling of the elements with connections, screws and glue;
Legs	<ul style="list-style-type: none"> - directly positioning the seat on the frame; - legs made of walnut; 	<ul style="list-style-type: none"> - directly positioning the seat on the frame; - feet from the beech, oak; 	<ul style="list-style-type: none"> - directly positioning the seat on the frame; - feet from the beech, oak;
Seat	<ul style="list-style-type: none"> - upholstered seat; - seat mounting directly on the frame; - chipboard, sponge, material; 	<ul style="list-style-type: none"> - upholstered seat; - mounting the seat with an additional center element; - plywood plate, sponge, material; 	<ul style="list-style-type: none"> - seat upholstery; - mounting the seat on the frame with screws; - plywood - plate, sponge, material;
Armrests	<ul style="list-style-type: none"> - with armrests; - without upholstery; 	<ul style="list-style-type: none"> - with armrests; - without upholstery; 	<ul style="list-style-type: none"> - with or without arm rests; - from oak, beech, sponge;
Backrest	<ul style="list-style-type: none"> - upholstered backrest; - inclined at an angle; - plywood plate, sponge, material; 	<ul style="list-style-type: none"> - backrest without upholstery; - slight backwardness; - oak backside; 	<ul style="list-style-type: none"> - with or without backrests; - leaning against a certain angle; - filled with plywood - plate, sponge, material, ornamental filaments;
Materials	<ul style="list-style-type: none"> - staining the frame in dark color; - without the use of carving; 	<ul style="list-style-type: none"> - staining the frame in white colors; - without the use of carving; 	<ul style="list-style-type: none"> - coloring the tree in a light brown, dark, and color of a walnut; - using carving - applying carving with natural flowers;

Table 3. Similarities and differences on chairs with baroque elements produced in Macedonia

Chairs produced in domestic production use light wood mostly beech, oak as the main material for making the frame of the chair . Wood bending is performed on special machines under high voltage, with a certain curvature, and are assembled on special machines for assembly and gluing elements. As the basic material for making the frame of the chair is used oak, beech, walnut, mediapan, and for the seat is placed veneer, plywood plate, chipboard and cardboard. They usually retain the natural color of the tree and the texture, but according to the client's desire and desire, it can be faded in the desired color. In relation to armrests, there are chairs with or without backrests, and most often used and used are stools with armrests without upholstery.

The chairs had high backs and were primarily rectangular. (Trajkovska 2013). The joining of the elements is made with clutches, wooden additional elements, screws and glue.

The inspiration of baroque chairs is primarily with natural ornaments of engraved natural flowers, leaves, and twigs.

They are characterized by the rich wood-carving, gilded with a high gloss, and a material for upholstery with motifs of flowers and natural forms.

In Stolichara Jastreb in Strumica, they are made mostly simple chairs, where are less demanded on the market are chairs with rich carving and natural wood with preserved natural colors that are inspiration from the baroque chairs. Today, such chairs are almost rarely made and are not demanded on the market.

3. Construction and processing of constituent elements

The technological process of table production is a precisely determined step in the production of a product or intermediate that constantly modifies its shape or chemical properties to be obtained ready or semi-manufactured. (Bartashevich 2003). The technological process consists of individual technological works designed with production that represent quality according to a certain dimension, structure and shape. With the appearance of the various processes can meet different technological processes that form different products. The process consists of: the structure of the chair / frame, legs, armrests, backrest, seat and additional leg supports.

The production of chairs in the Republic of Macedonia includes exceptional use of beech wood, as a basic material from which the construction of the chair or frame is made, but also a combination of wood with metal is made. The frame of the chairs is usually made of pure wood-beech, while the seat and backrest are made of veneered plate, sponge and furniture fabrics.

The production of the chair begins by cutting the elements of wood into the necessary dimensions of the machine (short cut). For finishing the elements from which the chair is made they use special machines such as CNC cutting machine for precise dimensions. (Gordic 2011).

The constructive connections of the chair are mostly with oval plugs and openings or additionally with screws and glue. The oval plugs are made of machine bolts or CAF machine for making plugs. To fasten the chair, use a mounting for chairs, or with hand tools. (Gordic 2011).

The final processing of the chair includes smoothing and polishing of special machines (sandblasting) and electrostatic spraying with special varnish and colors. The final processing is done throughout the entire construction process of the corresponding elements and assemblies.

The packing of the finished chair is done in special cardboard boxes for easier and safe transport.

The production of chairs can be made in two stages: chairs with armrests or without backrests, but most often on the market are required chairs with armrests without upholstery. Materials used for upholstery are: a sponge with more thicknesses, leather, skyscrapers, eco-leather, furniture-fabrics, polyester. (James 2004).

4. Ergonomics

The table analyzes three types of chairs with dimensions produced in domestic Macedonian factories shown in dimensions and similarities.

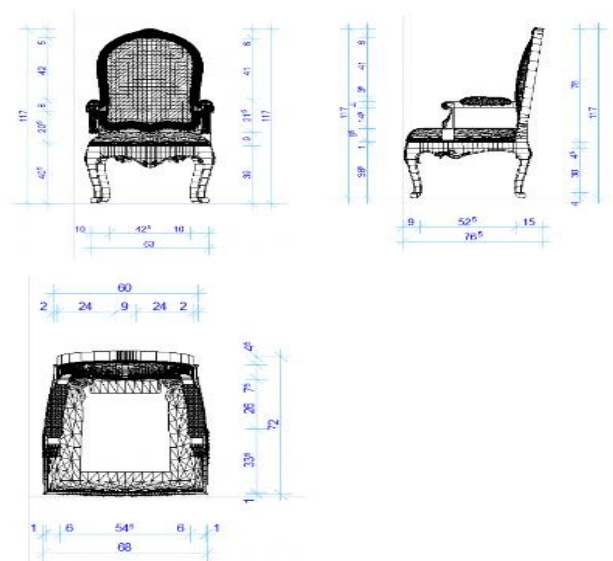


Figure 1. Technical drawing of the chair produced in Stolichara Jastreb (Strumica)

An analysis was made of three types of chairs with baroque elements produced in Macedonian companies with dimensions. The dimensions of the domestic chairs are almost approximately from normal chairs with a 10- 15 cm difference. While the height of the chairs is about 5 cm high from the everyday chairs. What is characteristic of these three types of chairs in regarding to width and height, the width is the same in both chairs, while in Stolichara Jastreb it is larger by 15 cm. (Panero, Zelnik 1990).

The frames of the chairs usually made exclusively of pure wood. For the fabrication of frames are used oak, beech, and walnut wood. The bending of the elements is performed on special machines for bending and shaping the tree in the desired shape and form. The joining of the elements in these chairs is most often done with screws, wooden elements, clamps, glue.(Bird 2003). Usually the natural color of the tree is retained, but it can be painted in bright and dark shades of chestnut, plating and a rich woodcarving construction, armrests and woodcutting in the desired color with the highest percentage in all three factories.

Types of dimensions :	DIK Fagus:	Leder:	Jastreb:
Height of the chair	110	115	117
Height of the seat	45	50	50
Depth of the seat	50	50	62
Seat width	45	45	55
Width chair	55	55	70

Table 4. Dimensions of three characteristic types of chairs

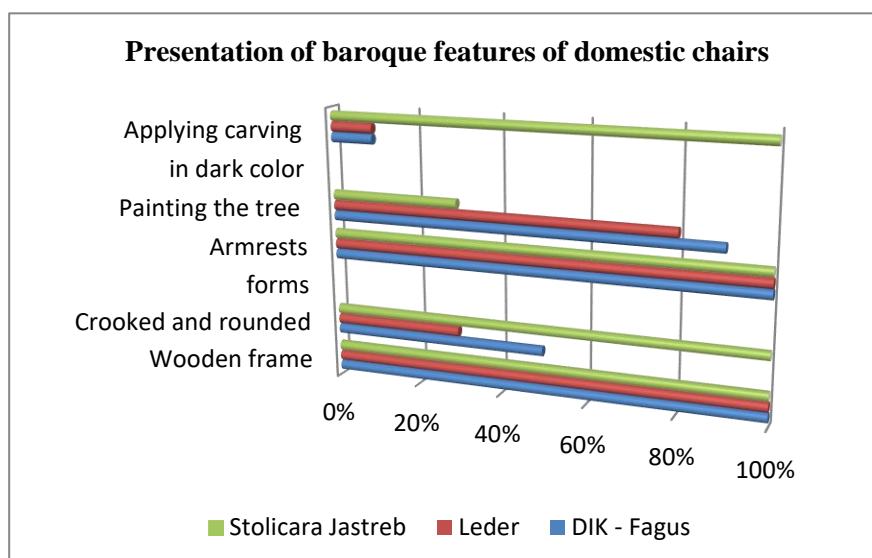


Chart 2. Representation of characteristic chairs (with elements of baroque) in production

From the analysis made, the baroque elements of the chairs shown on the graphic display can be analyzed that in the factory DIK-Fagus and Leder have a similar percentage of application of the baroque elements, while in the factory Yastreb,

the percentage of baroque elements is much larger. Also from this analysis it can be seen that: wooden construction, armrests and woodcutting in the desired color are the highest percentage in all three factories.

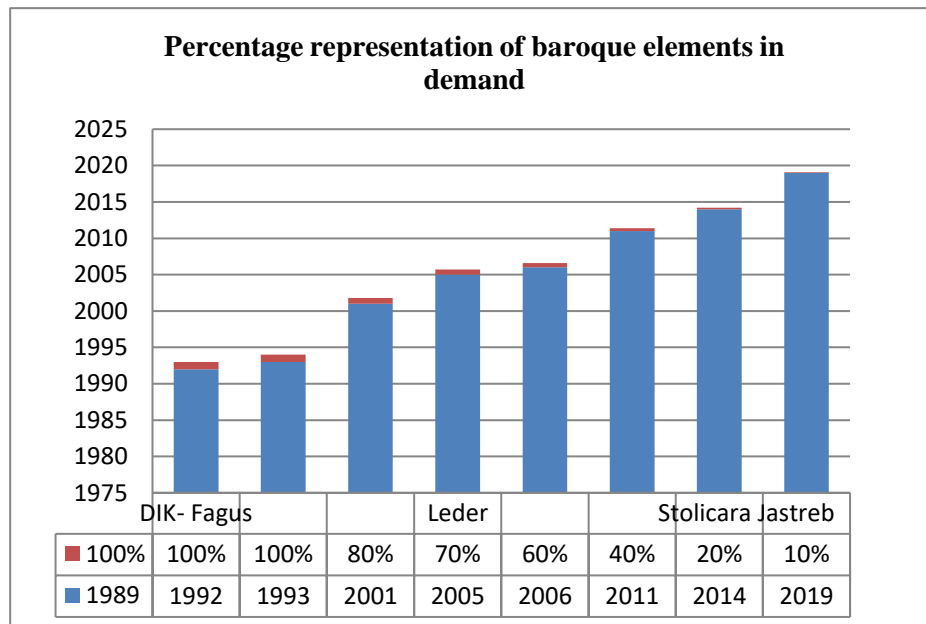


Chart 3. Analysis of percentage representation of baroque elements in demand

From the graphic display we can see the percentage representation of the baroque elements in the production of domestic chairs in certain companies, in each company separately, and it can be noted how big is the presence of baroque chairs in domestic production and on the market. According to the graphic survey of the percentage representation of the five baroque features, the Fagus and Leder plants have the lowest percentage of representation of the baroque characteristics, while the Jastarb factory in Strumica has the highest percentage of application of those specific characteristics.

According to the made percentage analysis shown in the graph with the representation of baroque elements in domestic demand and on the market, in the Macedonian companies for the production of chairs today, much less sought after the chairs with baroque characteristics.

From the graphic display it can be seen that in the three companies in the period from 1989 to 1993 there was a high demand, while from 1993 to 2019 demand declined and almost rarely required chairs with baroque features.

5. Technology

During the research on the impact of technological processing on the production process, we can conclude that in Eastern Macedonia there is a complete technological process for the production of chairs, that is, the production of rounded forms of wood, quality fabric and processing with high standards and quality. According to the analysis of the research material, it refers to the presence of the Baroque design in the production of chairs in domestic companies, that is, the influence of the material on the chair, the characteristics of similar elements of the design, as well as the process and technology of production. Application of the characteristics of style - baroque, which are related to the design and the way of production of the chair, change at different times depending on the demand and the interest of the market.

Conclusion

Based on the analysis of the research we can conclude that period the production of the chairs were made exclusively of noble wood, plating and combined with precious textile material. During the formation of Baroque furniture, the right angles were replaced with curved profiles, and as a technique of finishing, polish was used to achieve high gloss. There are features with slightly curved lines, dark colored wood, natural ornaments for carving and upholstered elements.

The numerous analyzes for production of chairs in Eastern Macedonia with the use of baroque features, including: design and comparison of chairs, analysis material, process on production, construction and processing of components as well as ergonomics can be concluded the following:

- The most commonly used characteristics for producing chairs in domestic factories (a certain effect on the characteristics of style-baroque) are:

The technological processes of production use a variety of modern materials, which are divided into: basic materials (wood, plates and veneer), and auxiliary materials (adhesives, varnishes, sanders, polishers, thinners) that increase the quality of the product. (Gordić 2011).

With improved ergonomic features, as part of the technological process affect the quality of the processing of chairs. Through the complete analyzes of the process of production of chairs in Macedonia, products with higher quality and higher demand for products on the market can be obtained.

Construction of wooden frame, slightly distorted forms and application on material with high quality.

- The most common is the application of these characteristic elements in the production of chairs in the factory Jastreb (Strumica), while less are applied in other factories (DIK-Fagus and Leder).

The most sought after models of chairs, according to the analysis done in the last period in the factories in Eastern Macedonia, are in percentage value about 40% - 60% with the use of baroque characteristics. Based on the complete analyzes, we can conclude some influence on the characteristics taken from the baroque design in the development and production in the factories in Eastern Macedonia. According to the research, the influence of the characteristics is present throughout the technological process, the choice of materials, the way of production, and the presence of products in world trends and markets.

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