



## MILLING OF WOOD AS A MODERN APPROACH OF TECHNOLOGY IN CHINA

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**Abstract.** . Before the age of twenty-first century. people, for the most part, have not lost that natural and primeval love trees as a natural, living and noble materials and production processes of the present day, we have outlined the new aspects of the approach to the shaping of utilitarian household items and furniture. One such aspect is the milling and solid modeling - a modern and efficient process, which allows a short time to solve many complex problems in formative design, particularly furniture products in China.

**Analysis of publications.** The sources, tend to have a regulatory technical focus. This article attempts to combine engineering and aesthetic components in the context of issues related to designing furniture and other wood products.

Is to consider the main issues and aspects of milling and wood and wooden materials, as well as in determining the place and role of these processes in a complex design furniture and wood products.

**The results of the study.** Modern wood art can not be imagined without milling. Designers and technologists using this technology made quite an extensive list of various products.

Services in milling are usually conducted in the following areas:

- Art processing of wood for furniture production (simple and complex facades lining the furniture, exclusive furniture items with intricate carving), carved symbols, logos volume of wood and elements and interior elements, bas-reliefs, chandeliers, staircase, carved cornices, wooden sculptures[4,321];

- Finish exterior wooden houses (curly trim on the doors and windows with continuous thread, decorative items for decoration of wooden houses, balusters for finishing porches, gazebos, etc.)

-Exclusive products (mirror frames, relief panels), the production of artistic parquet made of precious wood.

In addition, milling - is the main method for manufacturing fittings and accessories for furniture. Due to the advancement in the field of electronics and technology design and manufacture of high-tech steel products and fast. This, in turn, makes it possible to implement virtually any design-ideas.

Milling - the process of creating certain predetermined volume of the selected material forms using a milling machine. The use of modern high-precision CNC machine can make the workpiece material from virtually any arbitrarily complex shape and configuration of the minimum amount of time. Three-dimensional routing is widely used in the manufacture of tooling (matrix models, molds), layout, furniture manufacturing with curly slitting. Other words, milling - it is very accurate and fast method for manufacturing complex products in bulk and multi-position continuously.

Milling machine on flat, cylindrical, curved surfaces are also very common in a variety of design projects[ 3,217]. Keep in mind that wood carving 3D gives greater accuracy and identity in industrial replicating the original parts. The undeniable advantages of milling should include the fact that the surfaces are milled immediately "fair copy" and require little or no final revision before toning and varnishing.

Modern machines are designed for high-quality milling and engraving surfaces of parts and pieces for the and in the dimensional space . Wood is used both hard and soft rock, composite materials (particleboard, fiberboard.).

"On board" of these machines provides software for such kind of milling. For example, the new version of the program includes such convenient features as volume giving a flat image the function , making it possible to edit the volume model, the base of standard elements (facades, patterns, etc. . n.), allowing designers more creative approach to the reconstruction of a particular three-dimensional composition.

CNC calculates and sets the configuration of the workpiece cyclic motion of the cutter. This eliminates unnecessary movements on the desktop.

Selection of the cutting tool tilt in relation to the surface material occurs automatically. Additionally, the computer determines the speed and trajectory of the cutter along all axes.

In a modern design using the design of the high-tech and advanced equipment runs more and more models, which by their aesthetic and value aspects of the approach, and in some places, and superior products hand-made.

Of course, this technique of execution has its own language and expressive imagery and there is a limit of generalization, which is introduced as a designer in a specific project. But this is another line of research, which need to be addressed on the subject, because "... There is no limit to improve technologies and processes, but nothing beats a hand to do the design, do as people can only ..."

Come back to the essence of the process milling. Milling and engraving machines have one or more milling spindles, which are used for engraving, creating relief surfaces.

As a cutting tool using in different ways end mills of different sizes and configurations.

Something about key-cutting machines: they are designed to replicate carvings on wood. Such machines have up to 16 working spindles. Among the European leaders in the production of these machines can be called the company Lisao Bang, Taharata in China [1,35].

Workpiece secured by vacuum. The system vacuum fixation blanks allows quick change of products and provides a secure clamp parts during processing. On the carriage is moved manually, and mounted stylus. Working spindle which moves relative to the table in horizontal and vertical planes. Using the control panel software implemented the ability to download programs from hard media.

Due to the increased stability and rigidity of the frame is ensured high precision and high-speed slide movement of the spindle axes . In addition, high accuracy is achieved by high speed and high-power machines (7, 5 kW). High-precision positioning of the spindle (up to 0.0087 mm) provides independent actuators that are installed on each node to move along the coordinate axes . Importantly, the milling process occurs at fairly high speeds workpiece .

On many machines, prototyping scanning mode is provided by Matsushita Electric Company. Laser scanning device intended for scanning are already finished products in order to obtain a mathematical model for the copy milling of the product in different branches of China s industries.

The principle of operation is based on reading digital matrix reflected laser beam and converting it into a digital code. On the basis of this code, the software that comes with the machine creates volumetric model or bitmap to cut form that it is important to visualize the design. This mathematical model is stored in the standard format which opens in programs. . [3, 213].

As the scanning laser exposed prototype products, it can be made from almost any material (plaster, foam, clay sculpture, wood, MDF). Recently laser scanner is increasingly used in woodworking as a way of getting programs to complex products for milling machines. It is the creation of copies of handmade goods, vintage and antique items and their fragments, pieces of furniture with highly carved wooden panels, interior trim and more.

Scanning accuracy is 0.05 mm so that the model can be increased without loss of accuracy many times, creating a variety of artistic composition, combining a variety of models. Is the primary adjustment of models to the size, dimensions, change the height of the relief without loss of quality of the original model.

In the process of design engineering and execution of the model it is possible to increase, decrease and give details of mirror symmetry, which is a very important tool for shaping.

Of course, the approach to the design of various objects or developing design program a certain direction, we must take into account all the factors that may directly or indirectly affect the cost of manufacturing the object. The cost of services for milling affect primarily:

-quality of the processed material (wood of various breeds and hardness, quality MDF); Mechanical properties of the selected material, which is meant the ease or difficulty of machining;

- complexity products and the number of parts;
- size products;
- depth of production;
- one-level and multi-leveland products (for clichés and matrices)
- development layout and software support.

Thus, in China, at all stages of development and design of models work on products takes place at constant improvement relations between form and function, design and manufacturing technology. In this sense, modeling forms virtually no observable visual boundaries in the material world. His influence extends further into the area of the virtual.

New horizons in modeling outline the latest systems of upper level: , which raises the bar even higher simulation, because "... technology gives his art tools, serves as a visual idea and artistic idea" [1, p. 74]. The relationship of the designer and the particular technology as a tool today as relevant as ever and requires a comprehensive methodological and systematic study.

### **Conclusions.**

Milling process of wood is relevant and recent years have increasingly used in the design of furniture design in China, Japan, South Korea and Vietnam. High demands on the respective machines, the software allows to achieve meticulous detail the surface and deep study of the contours of the article which is not always possible for the manual handling. Performan milling machines in 18-25 times higher compared to the hand-carved, while maintaining consistently high quality products [2, p. 249], which leads to the attraction of this technology in the manufacturing process design objects and the use of constantly updated software for this technology opens up new horizons for research in this area.

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### **Аннотация**

## **ФРЕЗЕРОВАНИЕ ДРЕВЕСИНЫ В КАЧЕСТВЕ СОВРЕМЕННОГО ПОДХОД ТЕХНОЛОГИИ В КИТАЕ**

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*В статье рассматриваются ключевые аспекты развития мебельного производства в Китае, специфика инновационных технологий применительно к странам Дальневосточного региона.*