

## Techniques for Creating Wool Carpets and Some Methods of Improving the Quality of Decorative Wool Mats

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### Abstract:

*Carpets are one of those items that appeared very early and have a certain place in life. The history of the development of Carpet products shows that this type of product is initially done manually then the mechanized step-by-step machining equipment advances to automatic. However, the general process is almost unchanged, what has been changed is the processing technique, forming measures as well as finishing methods that have become more and more complete, making carpet products more and more diverse, close but not reducing the artistic value as well as the use value of the product.*

**Keywords:** Woolen carpet, wool mat.

### 1. Introduction to woolen carpets

The production of carpets from animal hairs was recorded very early (about 3000 years ago). Already in the years around 500 BC, the period of King Agamemnon, ancient Greece had records referring to carpet weaving. The trade in tapestries is believed to have come from nomadic shepherds and by the 3rd century BC carpets were traded along the Silk Road and technology has since been spread. The oldest tapestry was excavated from a tomb in Pazyryk near the border beyond Mongolia in 1953 and is estimated to be 2400 years old [1]. Subsequently, carpet products as well as carpet weaving technology developed widely to the west, spreading to Spain, Italy and France and England. Along with the development of the technique, the patterns and colors of carpets are also increasingly diverse. In order to weave tapestries with living structures and colors, the weaver has to perform a lot of work from material selection, cleaning, se fear, staining combined with decorative techniques, bright patterns and knitting and weaving techniques. In Vietnam, Vietnamese woolen carpet making first appeared in Hang Canal – Hai Phong around 1929[04]. The color, pattern, layout, decorative view of Hang Canal woolen carpet at that time was almost Chinese woolen carpet. Also during this time two French bourgeoisies, Fenies and Guilloie, established in Hai Phong a workshop specializing in the production of hand-woven woolen carpets at Hang Canal Road and took the name "Tapis Hang Canal", because the product characteristics are produced entirely by hand and have thermal insulation properties, sound insulation, beautiful decoration. In addition to "Tapis Hang kenh" Vietnam also has dozens of other manual as well as automatic carpet production facilities. The common features of Vietnamese carpet products are: most of them are handmade carpets, with a combination of cotton and fleece wool, and the carpet is highly decorative. This research study will present the technological methods of processing raw materials to create traditional carpet products, advances at each stage and especially present on shaping methods that enhance aesthetic value while offering technological solutions to enhance the use value of products.

### 2. Traditional carpet processing technology

Traditionally, carpets are usually made from fleece, goat hair, camel hair or from plant fibers such as Jute, Thorn. Recently, when there are many types of synthetic fibers and the demand for carpets at many prices has also increased, manufacturers have also used fibers such as: All fibers, if used to make carpets, must be processed through the following stages

The raw materials for making woolen carpets can be wool (sheep's hair, goat's hair, exotic hair), Libe fiber (jute fiber, spikes) or synthetic fibers (nylon, olefin, polypropylene, acrylic, polyester). With animal wool fiber, the

process of growth, development and harvesting has caused them to be covered with grease (more precisely, wool wax), sweat (coughing up dead cell tubers) dirt, feces and other plant episodes. To remove these impurities, wool fibers must undergo preliminary cleaning by cooking "scouring".[3]

### 2.1. Spinning technology

The process of spinning from fibers is the process of astringent - creating twists to create fibers. It is possible to spin yarn on industrial line systems or traditionally pull yarn manually. If the yarn is pulled manually: the fiber after being cleaned and dried will be combed into a film then stretched and erased and then wrapped on the yarn roll. Wool yarns are created on industrial equipment systems divided into two basic types with their own method of preparation and pulling techniques, respectively, creating two types of fibers : Woolen and Worsted. Woolen and Worsted have their own distinctive properties and textures, so when weaving carpets also give different properties on carpets

| Woolen Woolen Yarn                                                                                                                                                           | Worsted Wool Yarn                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                             |                                                                               |
| Suitable for the use of short wool fibers with low or medium slenderness.<br>Coarse, porous, irregular fibers, glutinous holding ability and low physico-mechanical strength | Suitable for the use of long wool fibers, high slenderness.<br>The yarn is thin, smooth, even, able to hold folds and has high mechanical and physical strength |

Yarn used to weave carpets after being formed is usually colored by dyeing. It is possible to stain fibers with synthetic dyes - for diverse, bright colors or dye with natural pigments for warm and intimate color gamuts.

### 2.1. Carpet creation technique

Carpet creation techniques by the weaving method: There are a few basic weaving methods for creating carpets and corresponding types of looms, respectively. However, basically woven carpets according to the weaving method are created according to the general principle: knitting the warp system perpendicular to the weft system together according to the designed weaving styles. In it, the warp can have 1 or 2.3 types of fibers with the functions of creating a background and creating fiber rings, weft threads perform the task of mounting, floralizing and styling.



Woven carpet structure

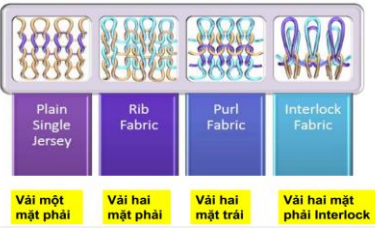


Carpet looms according to the weaving method



Weaving carpets by manual method

Carpet creation technique by knitting method: According to the knitting method, carpets are created thanks to the alignment of fiber rings according to the law of ringing of a knitted needle system that holds the previous fiber ring while new fiber rings are formed in front of the old rings. The old fiber rings are then nested through the ring of new fibers to form the fabric. These fiber rings are created thanks to the mechanism of movement that lifts, lowers and combines the needle opening and closing of the knitted needle and cam systems on the knitting machine. The structure of knitted carpets consists of horizontal rows called ring rows (course) and vertical columns called ring columns (Wale). The fiber ring structure makes knitted carpets elastic and porous and has completely different technical characteristics than woven carpets.

|                                                                                                                   |                                                                                   |                                                                                     |
|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <p><b>Dệt kim đan ngang</b></p>  |  |  |
| Woven carpet structure                                                                                            | Carpet looms according to the weaving method                                      | Weaving carpets by manual method                                                    |

Carpet creation technique by nonwoven method: Nonwoven carpets are usually carried out through the needle-piercing method, giving the parameter a sustainable mechanical bond and still retaining the required thickness and porosity. The principle of nonwoven carpeting is, brushing a thick fibrous film or fibrous cushion, the needle-piercing bond is based on the rear-orientation arrangement of a part of the fiber that is lying horizontally in the fibrous padding layers that turn to five in a vertical direction perpendicular to the fibrous buffer tank. The impact of the needle with the prongs of pure movement up and down causes the outer fibrous ends to penetrate the fibrous layer inside the fibrous cushion and vice versa. When the needle penetrates the fibrous cushion, the shyness of the needle pulls a moving fibrous part. A fibrous fiber can be pushed down, pulled up with one or more different needles to tightly squeeze the fibrous cushion and tightly bind the fibers together.



Non-woven carpets

### 3. Carpet surface structure and some forming methods

#### 3.1. Some common forms of surface structures

| Name                               | Surface structure                                                                  | Property                                                                                                                                                                                                                           |
|------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Pile loop level</i>             |   | Floating rings of the same height, giving the product uniform thickness, high porosity, good elasticity                                                                                                                            |
| <i>Multi-level Loop Pile</i>       |   | Floating rings of different heights are divided into 2-3 levels, in this way the created carpet has a simple and durable 3D effect.                                                                                                |
| <i>Saxony</i>                      |   | Saxony carpets are cut-off that reveal hard, hunting threads. This type of carpet does not show elegance on the carpet surface, but it is suitable for floor coverings to keep warm and stable high foam                           |
| <i>Friezé</i>                      |   | The fibers used in this method have a very high hunting rate, after cutting, giving the carpet a large twisted surface, the ability to break the crease is reduced, so that traces are not saved when there is a mechanical impact |
| <i>Cutting and repeating piles</i> |  | It is the type of carpet whose surface is created by a combination of fiber rings and cut fiber rings. This type of carpet goes well with floor coverings.                                                                         |

#### 3.2. New forming technology in carpet production

##### Pattern design on computer software

Fabric design software allows producers to make creations of patterns and textile styles to produce valuable carpet paintings quickly and accurately. With the support of CAD software, fabric design software allows accurate simulation of carpet images from materials, patterns to surface effects, helping designers quickly choose products suitable for the scope of use without having to spend time trying production. It is also thanks to the combination of software that allows designers more flexibility in changing the color of the product on top of 1 pattern, thereby increasing the variety of designs and designs of carpets. Thanks to that, digitized models make carpet sales more flexible. The products once selected will be made on the Jacquar looms. In general, the introduction of digital into carpet design, production and sales allows carpet production to be expanded in quantity, quality and design, breaking all the limits of space, time in and design in the carpet manufacturing industry.

##### 3D trimming for carpets

With handmade carpet products, the rug after finishing weaving is unloaded from the loom, trimming is the final stage before bringing the rug to the user. At this stage, the coarse woven rug is spread out onto a flat floor; the trimmer uses scissors, knives and a specialized scraping table to trim the carpet to create a floating pattern for the carpet. All patterns woven on the rug are trimmed to form sunken lines around the motifs so that when the observer enters the pattern, they will see the patterns rise above the surface of the tapestry. The carpet buttons are cut manually (woven cut style) so the thickness of the carpet fiber may not be the same, but when the trimmer uses a specialized scraping and scissors table to repair it, it ensures that the carpet fiber thickness is equal or the surface of the carpet must be relatively flat. Depending on the complexity of the motifs, the

trimming process requires the dexterity of the trimmer and the time to complete the carpet trimming. When the trimmer finished his work at this time the new wool rug really became a commercial supply to the market.

#### **4. Some technological measures to improve carpet quality**

##### **4.1. Durable surge treatment for carpets**

One of the measures that increase the bonding capacity for woven carpets, especially with carpets with a ring float or thread-cut effect is to give the carpet a layer of masonry. The commonly used substrate layer is a polymer film that is easily melted and cured so that after implanting the ring fiber, fiber piles can melt and solidify the film layer to fix the ring legs and fiber legs on the carpet surface. The commonly used polymer of choice is PVC. It is also possible to introduce 5-10% of the added bisexual polyester bonding fibers into the woolen walls. These polyester fibers do not bind wool socks, but once the shell of low-melting polyester is melted, the polyester fibers stick together forming a bonding base that binds them and binds the wool fibers next to them. This technology is a breakthrough that enhances the durability of carpets this breakthrough not only enhances the performance in the styles of Saxony and Frieze, greatly increases the mechanical strength of nonwoven carpets according to the Needle punching method.

##### **4.2. Carpet anti-fouling treatment**

One of the top concerns for carpet products is the carpet's ability to clean dirt and color fastness under the influence of dirt as well as cleaning measures. To limit this, anti-fouling treatment is a treatment method that enhances the quality of carpets used very early. This technology uses fluorochemical spraying in place to protect carpet fibers. Chemical substances slow down the process of staining and staining by coating chemical carpet fibers with low surface energy and a film-forming polymer layer. This coating makes the carpet waterproof and catches small dusts contained in the water. Fluorochemicals work by not allowing the soil to stick to the fiber surface. Therefore, during use, carpet cleaning measures can be used to remove soil dust from the surface easily. Fluorochemicals are used in low concentrations to build only enough to build a barrier to protect the material without causing any significant changes to the feeling of touching the shine, light and color of the product.

#### **5. Conclusions**

The wool carpet industry has a long period of market contraction as well as the scale of production, especially compared to the strong development of the Textile technology industry. However, the demand for high-quality carpets, especially used in the field of decorative furniture, has always existed and has tended to grow strongly in recent years. Research and development has almost revolutionized the production of machine-made carpets with significant innovations and cost reductions in all areas of the production chain from raw materials to finished carpets. In addition, improving the aesthetic quality and use quality of carpets are also factors stimulating the demand for carpets of the market.

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