RESEARCH ON SLEEP SUPPORT TEXTILE PRODUCTS

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İKSAD
Publishing House

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DOI: https://dx.doi.org/10.5281/zenodo.14582472

(The Licence Number of Publicator: 2014/31220)
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Iksad Publications – 2024©

ISBN: 978-625-378-135-4
Cover Design: İbrahim KAYA
December / 2024
Ankara / Türkiye
Size = 16x24 cm

PREFACE

Sleep is a vital physiological need in human life, essential for the rest, repair, and detoxification of the body and brain. Therefore, sleep quality is a critical factor that directly affects an individual's well-being, functionality, and overall quality of life. Sleep deprivation can weaken the immune system and lead to various health issues.

The need for covering oneself during sleep arises depending on the ambient temperature, providing both physical and psychological comfort. Covers help regulate body temperature, protect against external factors, and create a sense of security, facilitating the transition to sleep. Depending on climate and individual preferences, various covers such as bedspreads, blankets, or quilts are used. Traditional covers made from natural materials have become more functional through synthetic and blended fibers developed with modern technology. Features of sleep products such as body temperature regulation, moisture control, and physical comfort contribute positively to sleep quality and overall living standards.

This study reviews previous research on quilts and blankets, providing general information about their history, production techniques, materials used, and areas of application.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Sleep is a natural and regular state characterized by reduced consciousness, diminished responses to external stimuli, and the suspension of voluntary muscle activity. It serves as a critical phase for resting, repairing the body and brain, and removing toxins in both humans and animals. The absence or reduction of sleep can disrupt the immune system, leading to inflammation and various health problems (Mergen, 2024).

Unless the ambient temperature is excessively high, individuals often feel the need to cover themselves while transitioning to sleep. Covering during sleep holds significant importance for physical comfort and psychological tranquility. Suitable covers are used to regulate body temperature, find a comfortable sleeping position, and protect against external factors. By wrapping the body, a cover provides thermal insulation, which is essential to prevent the body from cooling or overheating during sleep. Additionally, covers evoke feelings of security and comfort, aiding mental relaxation and facilitating the transition to sleep. In essence, a cover is a crucial element that addresses both the physical and psychological needs of the sleep process, directly influencing sleep quality.

Covers vary according to climate and personal preferences, taking forms such as pique, blankets, or quilts. The characteristics individuals expect from these covers are of great importance. Textiles used for covering during sleep are designed for different seasonal conditions, with variations in fabric, yarn, and fiber types depending on their intended use, properties, and quality. Historically, covers made from natural materials (wool, cotton, down) have become more diverse and functional with the advent of synthetic and blended fibers through modern technologies. These sleep products, which directly affect sleep

quality, play a critical role in enhancing quality of life by regulating body temperature, balancing moisture, and providing physical comfort.

This study examines previous research on quilts and blankets, offering general insights into their history, production techniques, materials, and applications.

1. LITERATURE REVIEW

Studies on quilts and blankets have generally focused on topics such as materials, design, production technologies, health, and environmental impacts. These studies aim to measure and improve the comfort of use, physical properties, cost, and environmental sensitivity of the products.

In their study on the comfort and handling properties of blankets, Niwa and colleagues examined the relationship between subjectively measured comfort values and measurements conducted using testing devices. They compared the handling properties developed by Kawabata with the newly developed THV (Total Hand Value) method. For this purpose, they analyzed 78 blankets with different characteristics. The study investigated the compression under pressure, surface properties, structure, and thermal and moisture transmission properties of the blankets. In the newly developed handling test method, samples were scored on a scale from 1 to 5. The results indicated that the newly developed THV method provided results closest to objective measurements(Niwa et al., 1999).

Rowlands developed an apparatus for determining the thermal resistance of blankets. He examined the reliability and sensitivity of this apparatus, emphasizing its applicability for measuring water vapor transfer. Additionally, he investigated the changes in the properties of

blankets with different characteristics after repeated washing tests(Rowlands, 1963).

Değirmenci and colleagues examined the comfort and mechanical properties of blankets produced on a Raschel warp knitting machine using acrylic yarns of two different counts, three different types of softeners, and three different densities. In compliance with international standards, the structural properties, thermal comfort, handle, and durability of 18 samples were tested. The data obtained from the study were analyzed using both graphical representations and statistical methods. Subsequently, the best-performing blanket was selected using a statistical software package and optimization methods. The study concluded that there were no significant differences among the different types of softeners used. Furthermore, it was observed that yarn count and pile density had no effect on the fabric's strength properties. Based on the water vapor resistance results, it was suggested that thin blankets with low pile density, which cause less sweating, could be preferred. Consequently, blankets with medium pile density were determined to be the most suitable. (Değirmenci and Topalbekiroğlu, 2022).

Blankets, one of the most important textile products, constitute a traditional product group. Blankets made from various fiber and yarn types, with different patterns and structures, are preferred by consumers for a wide range of purposes. In recent years, the rapid increase in consumer demand has prompted manufacturers to innovate, incorporating not only natural resources but also new sustainable materials in blanket production.

As part of this effort, the use of recycled textile materials for blanket production has become more widespread. This study specifically examined the dimensional and color changes of blankets

made from recycled fibers after repeated washing. Experimental analyses revealed that blankets produced from recycled fibers showed minimal and insignificant changes in size and color following repeated washing. Consequently, it was concluded that recycled fibers can be utilized in blanket production without compromising quality (Gizem Celep et al., 2023).

Another study compared the thermophysiological properties of two blankets made from wool and acrylic-cotton blend materials. Both blankets were matched in terms of weight and fiber diameter to more clearly assess the effects of material type. Evaluations conducted using laboratory measurements and subjective tests in a climate chamber revealed that the wool blanket provided higher thermal insulation and had better moisture transport properties compared to the acrylic-cotton blend.

Additionally, the wool blanket was found to have superior moisture absorption capacity, which helped stabilize body temperatures and manage moisture more effectively. In climate chamber tests conducted in hot and humid conditions, participants preferred the wool blanket for its thermophysiological comfort.

These findings indicate that wool blankets offer better thermal insulation and moisture management, particularly in hot and humid environments, making them superior in terms of comfort. Overall, the wool blanket stands out as a more suitable option in such conditions due to its moisture control and heat retention capabilities (Umbach, 1986) .

A study on the effects of softener types and concentration levels on the properties of wool blankets investigated how softener treatments influence the tactile feel and reduce friction values of blanket fabrics. In this experimental research, the impact of softener type and

concentration level on the physical properties of wool blankets was analyzed.Blanket fabrics made from three different types of wool were treated using the exhaustion method with three types of softeners: cationic, amino silicone, and silicone. The treated fabrics were then tested for static and dynamic friction coefficients. It was found that, regardless of the softener type, the application of softeners reduced the dynamic friction coefficient. However, an increase in the oil content eventually led to a rise in friction coefficients rather than a reduction.Silicone softener demonstrated the lowest dynamic and static friction coefficients, and it was recommended that the softener be used at a concentration level of 1.0% to achieve optimal friction values (Shanmugam et al., 2019).

Sessler and colleagues evaluated the mean skin temperature, skin heat loss, and perceived warmth in six volunteers covered with one or three cotton hospital blankets, either pre-warmed or unwarmed. The volunteers' body temperatures were continuously measured after being covered with pre-warmed or unwarmed blankets.The study found that increasing the number of blankets from one to three resulted in only a minimal reduction in heat loss. Similarly, pre-warming the blankets was relatively ineffective, with the benefits being short-lived. Even when three pre-warmed blankets were replaced at 10-minute intervals, the reduction in heat loss was minimal compared to currently available active heating systems(Sessler, 1993).

Parks and colleagues conducted a study to evaluate the difference in comfort levels between psychiatric patients who received warm blankets and those who did not, focusing on reducing anxiety in treated patients. In psychiatric settings, warm blankets are not routinely provided to patients as they are in other healthcare environments. Hospitals and heated blankets are not typically part of standard practice

but are sometimes offered to psychiatric patients in emergency departments.

The study suggested that interventions involving warm blankets could be assessed for their impact on patient comfort levels, potentially leading to increased patient satisfaction. It was further recommended that advanced nursing practices incorporating such interventions could be implemented in the future(Parks et al., 2017).

The total thermal insulation value of a bedding system significantly influences the thermal neutral temperature of sleep environments and is therefore an important variable in the "Comfort Equation" developed for sleep environments, as reported in a related study. This article reports on the measurement of total insulation values for a wide variety of bedding systems commonly used in subtropical regions, using a thermal manikin. These bedding systems include combinations of beds, bedding, the percentage of body coverage by bedding and pajamas, and different pajama types.

The total insulation values of the measured bedding systems vary significantly depending on the bedding, bed, mattress, pajama type, and the percentage of body surface area covered by the bedding and mattress. The use of traditional Chinese-style bedding, such as the Zongbang bed, may provide less insulation compared to the traditional beds commonly used in Hong Kong. Moreover, the use of materials marketed as "air-conditioning quilts" (summer quilts) does not significantly help reduce the total insulation value (Lina and Deng, 2008).

The sleep quality and thermal comfort of young individuals in unheated bedrooms in Eastern China were investigated under different quilt materials (white duck down, white goose down, and cotton) using subjective and physiological methods. Thermal comfort and sleep

quality were assessed before and after sleep, and the findings indicated that quilt materials have a significant impact on sleep quality.Subjective results showed that the goose down quilt was rated as the most comfortable in terms of overall sleep comfort and thermal sensation. Both subjective and objective results were consistent, demonstrating that sleep quality was highest when goose down material was used (He et al., 2017).

The comfortable indoor temperatures and thermal responses for individuals sleeping under different types of quilts were investigated. The experiment tested three different quilt types (goose down, silk, and polyester), each with six different filling weights.

Sixteen participants conducted overnight sleep trials to measure skin temperatures, bed temperatures, and thermal perception responses. The trials aimed to explore the upper and lower limits of comfortable indoor temperatures for sleep when using different quilt types (Zheng et al., 2022).

The thermal comfort properties of quilts with different characteristics and their effects on sleep quality were evaluated. For this purpose, the air and heat permeability of the quilts were measured using the TOG (Thermal Overall Grade) value.The measurements revealed the effects of the fiber type and thickness of the filling material in the quilt layers, as well as the fiber type and density of the fabrics and linings, on the TOG values. Based on whether the TOG value was high or low, the thermal resistance properties of the quilts were determined by the influence of layers, thickness, and materials.As a result of the study, the fabrics, linings, and filling materials in the quilt layers were standardized according to the obtained TOG values (Durmuş et al., 2022).

The study investigated the impact of filling materials on the total thermal insulation of a bedding system using a thermal manikin. The total and localized thermal insulation of six different down-filled bedding systems were analyzed under four different body sleep positions (Lu et al., 2021).

Weighted blankets and quilts have emerged as a potential non-pharmacological intervention to alleviate conditions such as insomnia and anxiety, prompting various studies on the subject.A study conducted at Uppsala University in Switzerland demonstrated that weighted blankets could increase melatonin secretion by 32% (Meth et al., 2023).

Insomnia is a common condition that can negatively impact physiological, psychological, and social well-being. The effects of a chain-weighted blanket on insomnia were investigated using both objective and subjective measures.

Objectively, the use of the weighted blanket was found to increase sleep duration and reduce participants' movements during sleep. Subjectively, participants reported enjoying sleeping with the blanket, finding it easier to fall asleep, experiencing better sleep quality, and feeling more refreshed in the morning (Ackerly et al., 2015).

Another study examined the effects of weighted quilts on parameters such as blood pressure, heart rate, and pulse oximetry. Preliminary evidence from the study suggests that the use of weighted quilts could be a promising non-pharmacological intervention for reducing anxiety in some adults (Mullen et al., 2008).

Another study aimed to evaluate the effects of chain-weighted blankets on insomnia and sleep-related daytime symptoms in patients

with major depressive disorder, bipolar disorder, generalized anxiety disorder, and attention-deficit hyperactivity disorder (ADHD).A total of 120 patients participated in the trial, using either a weighted metal chain blanket or a lightweight plastic chain blanket for four weeks. The results indicated that the use of weighted blankets significantly improved sleep maintenance, increased daytime activity levels, and reduced symptoms of daytime fatigue, depression, and anxiety (Ekholm et al., 2020).

Weighted blankets have been reported to have a clinically significant impact on insomnia and daytime functioning in patients simultaneously diagnosed with major depressive disorder, bipolar disorder, generalized anxiety disorder, and attention-deficit hyperactivity disorder (ADHD) (Rosenberg, 2021).

This observational registry study revealed a statistically significant association between the use of weighted blankets and a reduction in the use of common sleep medications, excluding melatonin (Steingrímsson et al., 2022).

This study demonstrated that weighted quilts have an impact on the health of elderly individuals in care homes, including improvements in quality of life, sleep, nutrition, cognitive function, activities of daily living (ADL), and medication use. Weighted quilts appear to be an effective and safe product for enhancing comfort and quality of life for elderly residents in care facilities (Hjort Telhede et al., 2022).

Overall, we demonstrate that the gentle pressure of a weighted blanket can reduce the severity of chronic pain, providing an accessible, home-usable tool for managing chronic pain (Baumgartner et al., 2022).

2. THE HISTORY OF THE QUILT

In the earliest ages, humans first learned to clothe themselves, using natural materials such as animal hides, large leaves, and feathers to protect their bodies from heat, cold, rain, snow, and sunlight. Initially, the term *yorgan* (quilt) referred to a type of clothing worn over the body. In some sources, a shepherd's cloak used for sleeping at night and a covering worn by women were also called *yorgan*. The making of quilts emerged from human necessities and became a tool for warmth and covering used across various cultures.

The word *yorgan* in Old Turkic means "to cover, wrap, enclose, or surround." Over time, it evolved from the root word *yör* into forms like *yör-gen*, *yörgen*, and finally *yorgan*. According to Kaşgarlı Mahmut's *Divan-ı Lügat-it Türk*, the term *yorgan* is derived from the phrase "yoğur kan." By the late 13th and early 14th centuries, in works such as *İbnü Mühenna Lügati* and *Abu Heyyan Lügati*, the word appeared in its current written form(Ertalay, 2013).

Today, a quilt is defined as a large covering used on beds, made by placing filling materials such as wool, cotton, or down feathers between two layers of fabric: a top layer (decorative) and a bottom layer (lining). Quilts are either stitched with patterns or left plain and are designed for warmth and comfort (Ertalay, 2013). With the Industrial Revolution, the widespread use of sewing machines and other textile machinery led to the replacement of handmade quilts with machine-made quilts, which were produced more quickly and in greater quantities.

2.1. The Historical Development of Quilts Worldwide

The origin of quilts is rooted in the history of blankets and coverings. In ancient times, civilizations such as Egypt, Greece, and Rome used blankets and coverings that can be considered the ancestors of modern quilts. One of the oldest known examples of a quilt was discovered in Egypt. The ancient Egyptians created layered fabrics to make coverings that provided warmth.

Additionally, a quilt dating back to the 13th century was discovered in a tomb in Sicily. This quilt, which was stuffed and stitched between two layers of fabric, closely resembles the construction of modern quilts. During that period, quilts were more commonly found in the homes of wealthy families and the noble class.

However, quilt-like blankets and coverings were also used in Asia, particularly in China, as early as the 3rd century BCE, with examples made from silk. Through the influence of the Silk Road, such coverings spread to different cultures, contributing to the evolution of quilt-making techniques worldwide (MacDowell et al.,2010).

Figure 1. Tristan Quilt (Sicily, Italy, 1400) (MacDowell et al.,2010).

2.2. The Development of Quilts in Turkish History

Due to the Turkish people's nomadic and warrior lifestyle, the earliest examples of quilts are believed to have been coverings made with the appliqué technique using animal hides and felts created by compressing wool. Turkish communities gradually transitioned to a sedentary lifestyle over time, with the Uyghurs being the first major group to settle. With the adoption of agriculture, cotton cultivation began, and the art of weaving developed. Over time, cotton became widely used in quilts, especially as a top covering material.

In Turkish culture, particularly after settling in Anatolia, the craft of quilt-making evolved significantly during the Seljuk and Ottoman periods. In the Ottoman period, as in other arts, embroidery experienced significant advancements. During the 16th and 17th centuries, fabrics such as velvet, satin, silk, and linen were commonly used as quilt covers. These fabrics were adorned with gold or silver threads, precious stones, and sequins, making quilts important elements for special ceremonies and rituals (Okca et al., 2020).

Patterns in traditional Turkish quilts are often laden with meaning and symbolism. They reflect cultural, regional, and aesthetic elements, offering a rich diversity. These patterns typically form striking compositions on the quilt's surface and are personalized through the artisan's creativity. Common motifs include floral, geometric, animal, and symbolic designs. While handmade quilts feature more intricate and unique motifs, modern machine-made quilts tend to have standardized patterns.

Figure 2. Quilt pattern examples (Ertalay, 2013)

Figure 3. 19th Century Ottoman Palace Work “Sandık Çıkması” Sultani Quilt (https://www.arthill.com.tr/urun/4805826/osmanli-19-yuzyil-saray-isi-sandik-cikmasi-sultani-yorgan-19-yuzyil-osmanli)

By the mid-20th century, quilt production in Turkey began to adopt an industrial scale. With increasing urbanization and industrialization, quilt production became more streamlined. The widespread use of synthetic filling materials accelerated production and made quilts more cost-effective. During this period, cotton and wool-filled quilts started to be replaced by those made with synthetic materials such as fiber and polyester. Modern production techniques also introduced variations in quilt patterns and stitching; however, quilts crafted with traditional handmade techniques continue to be highly valued.

2.3. Traditional Quilt Sewing Stages

The process of sewing a traditional quilt begins with selecting fabrics and linings in colors suitable for the quilt's desired characteristics. Before starting the sewing process, the filling material-whether wool, cotton, or fiber—needs to be fluffed. This step separates the fibers, ensuring easier stitching and a neat appearance.

Quilt sewing starts by stitching three sides of the lining, leaving one short side open. The filling material is then inserted through the open side, and it is sealed using hand-stitching techniques. To ensure the even distribution of the filling material, the quilt is first worked from the underside and then from the top using a wool rod to achieve the proper form.

Once the filling is evenly distributed, the quilt is prepared for patterning. To draw the design, the center of the quilt is located, and patterns are sketched onto the surface. The sewing process is then completed by stitching along the drawn patterns, finalizing the quilt (Özcan et al., 2021).

Figure 4. Handmade quilt sewing

3. FILLING MATERIALS USED IN QUILTS

Quilts are produced for various purposes, including summer, winter, and seasonal use. The types of fabric, thread, and fiber used in quilts vary depending on their intended purpose, specific features, and quality (Megep, Makinede Yorgan Üretimi, 2015).

In quilts, the material used inside is referred to as the filling material. Quilt fillings offer a wide variety, incorporating both natural and synthetic materials. While natural fibers provide superior performance characteristics, the increasing population has necessitated the widespread use of synthetic fibers to meet demand. Synthetic fibers, particularly polyester, are frequently used in quilts due to their diverse properties.

Synthetic fibers are highly effective in thermal insulation, allowing them to retain warmth effectively. Their wrinkle resistance, high durability against light exposure, and lightweight nature make them a popular choice. Additionally, synthetic fibers exhibit excellent resistance to wear and tear, superior durability, and high color fastness

Beyond these properties, synthetic fibers are cost-effective and require less maintenance compared to natural fibers. Their affordability, ease of care, and resistance to detergents and washing have played a significant role in their preference as filling materials for quilts (Türkoğlu et al., 2019).

Each type of filling material has unique characteristics that determine a quilt's warmth, breathability, softness, durability, and usability. Selecting the appropriate filling material is a fundamental step for achieving a comfortable sleep, taking into account factors such as sleep habits, allergy conditions, and the climatic conditions of the

region. Therefore, understanding the different types of filling materials and their distinctions is essential for making the right product choice.

3.1. Types and Characteristics of Fibers

Fibers are fundamentally classified into two main categories: natural fibers and chemical fibers. Natural fibers are entirely derived from nature and can be further divided into three primary groups based on their origin. Plant-based fibers, which are cellulose-based, include materials such as wood fibers, sisal, kenaf, coconut, bamboo, banana, hemp, flax, and jute. Animal-based fibers, primarily composed of proteins, include examples such as cocoon silk, chicken feathers, wool, and spider silk. Lastly, mineral-based fibers are predominantly composed of asbestos (Olcay, 2021).

Chemical fibers, on the other hand, represent fibers that are not found in nature; however, their raw materials can be derived from natural sources (Okur, 2006).

The physical, mechanical, and chemical properties of textile fibers are among the most critical factors determining the characteristics of the yarn, woven fabric, or knitted surface produced from these fibers. For a textile fiber to have commercial value, it must possess certain fundamental qualities, such as spinnability, strength, durability, length, and fineness, as well as attributes like flexibility, softness, moisture absorption, availability, and cost-effectiveness, all at acceptable levels. The primary types of fibers used in modern quilt production are described below.

3.1.1. Cotton

Cotton is one of the most widely used and essential materials in the textile industry. It is frequently utilized as a filling material in home

textile products, particularly in quilts. One of the reasons cotton fibers are preferred is their excellent moisture retention capability, allowing them to absorb moisture easily and provide effective breathability (Liu et al., 2012). This property of cotton fibers enables air to circulate freely, effectively regulating temperature. Cotton fibers can absorb factors like water, moisture, and sweat without creating a wet sensation. Due to their ability to absorb moisture and wick it away from the body, cotton fibers are particularly favored in hot weather conditions.

Additionally, cotton's hygienic properties, its gentle contact with the body, and the absence of discomfort contribute to its widespread use. Cotton fibers are also highly durable, which allows for repeated washing without significant degradation in quilt quality, ensuring a long product lifespan.

3.1.2. Kapok

Kapok fibers are a type of seed fiber found inside the capsule-shaped fruit of the kapok tree, characterized by their soft and silky texture. They are distinct from other cellulosic fibers due to their hollow, tubular structure. When the waxy coating on the surface of kapok fibers is removed, the unique hollow structure increases the fiber's specific surface area, enhancing its superior moisture-wicking ability. The waxy surface also provides a natural stain-resistant property.

Kapok fibers are highly flexible and retain their shape after use, making them ideal for filling pillows and quilts, where they contribute to a high level of comfort. Their hollow structure traps air, giving them excellent thermal insulation properties. Unlike synthetic fibers, which often require hollow structures to be artificially created during production, the hollow structure of kapok fibers is an inherent

characteristic. This, combined with their natural properties, makes kapok fibers an eco-friendly alternative to synthetic fibers.

However, kapok fibers are thinner and more brittle compared to cotton, making them challenging to convert into textile surfaces like yarns and fabrics. To address this, they are often blended with other fibers to create textile surfaces. Lightweight and hypoallergenic, kapok fibers are well-suited as a filling material for products such as quilts, pillows, and toys. Their water-resistant, hypoallergenic, and antimicrobial properties make kapok fibers a popular choice in the catalog of natural organic products.

In addition to their environmental benefits, kapok fibers also provide advantages in moisture management and comfort, making them suitable for alternative applications. When blended with other fiber types, kapok fibers are used as a filling material in quilts, offering ideal support for sleep products and promoting a comfortable sleeping experience (Türkoğlu et al., 2019).

Figure 5. Kapok fiber

(https://tekstilsayfasi.blogspot.com/2013/01/kapok-lifleri.html)

3.1.3. Wool

Wool fibers are protein-based, primarily composed of keratin, and contain 20 different amino acids. The unique physical and chemical structure of wool makes it a highly valuable fiber for textile applications. Some of the key properties that make wool indispensable include its thermal properties, breathability, ability to absorb and retain moisture, flexibility, odor absorption capability, softness, flame resistance, biodegradability, and recyclability. These characteristics contribute to wool's enduring importance and versatility in textile production (Süpüren Mengüç, 2012).

Wool has been widely used as a natural filling material in quilts for many years. The reasons for its preference include its soft texture, excellent moisture absorption properties, and its low thermal conductivity due to felting over time, which helps retain warm air within the quilt. The crimped structure of wool fibers provides effective thermal insulation by trapping air, ensuring warmth without excessive weight.

Despite its moisture-absorbing properties, wool gives a dry sensation to the touch, making it comfortable to use in various climatic conditions. The texture and properties of wool fibers make them especially suitable for quilts designed for colder environments.

3.1.4. Goose Down

Goose Downs are structures that cover the bodies of waterfowl such as geese and ducks. These feathers have a voluminous structure and a high resilience to deformation. With low thermal conductivity and excellent thermal insulation properties, down feathers are considered a superior and luxurious filling material, particularly in cold climates (Oral and Dirgar, 2017). Their lightweight, softness, and

exceptional heat insulation make them ideal for use in a variety of home textile products, jackets, and sleeping bags, providing a high level of comfort.

However, it has been observed that the performance of down feathers decreases in humid environments. As a result, they are not recommended for individuals prone to sweating or for use in high-humidity conditions.

3.1.5. Bamboo

Bamboo is a plant that grows primarily in tropical regions and reaches maturity in a relatively short period, typically 3 to 4 years. Bamboo fiber was recently developed as a regenerated cellulosic fiber by a chemical fiber manufacturing company (Özdoğan, 2023).

Bamboo fiber has become a highly significant material due to its eco-friendly attributes, such as being environmentally sustainable during production and biodegradable in nature. It also offers antibacterial and hypoallergenic properties, durability, UV protection, a silky appearance, softness, breathability, and excellent moisture absorption. These characteristics enable it to quickly absorb perspiration from the body, providing a cooling sensation and enhancing comfort (Ünal and Kutgi, 2024).

High moisture absorption, softness, and antibacterial properties make bamboo fiber an ideal material for use in home textile products.

3.1.6. Silk

Silk is a natural protein fiber produced by the larva of the *Bombyx mori*, commonly known as the silkworm (Wang et al., 2023). It is a fine, durable monofilament fiber characterized by its high sheen and

strength. Silk fibers possess a unique chemical and physical structure, making them exceptionally special.

Silk fibers exhibit various properties, including biodegradability, elasticity, strength, UV resistance, and washing durability. The elastic and soft structure of silk fibers provides quilts with a gentle and comfortable feel on the skin. The smooth texture of silk minimizes skin irritation and promotes a peaceful sleep experience. Silk fibers effectively insulate heat, balance body temperature, and create a comfortable sleeping environment.

Thanks to these qualities, silk quilts offer appropriate warmth in both hot and cold weather conditions. Additionally, silk fibers have a high moisture absorption capacity. This feature helps silk quilts maintain moisture balance and minimizes discomfort caused by sweating or dampness. These properties play a significant role in ensuring a restful and comfortable sleep experience provided by silk quilts.

3.1.7. Polyester

Polyester fiber, a synthetic-based material, is widely preferred in textiles due to its numerous advantageous properties. These include favorable processability, lightweight nature, hydrophobic characteristics, quick-drying capability, excellent colorfastness, low production costs, recyclability, customizability, and ease of maintenance. These features make polyester a highly practical choice in various textile applications (Bilgin Çakır, 2024). As a synthetic material, polyester fiber has certain limitations compared to natural fibers in terms of air permeability, moisture transmission, and thermal properties. However, its production technology, good performance characteristics, and cost-effectiveness make polyester fibers one of the

most important materials used across a wide range of applications (Yıldız, 2019).

Polyester fiber is one of the most commonly used filling materials in quilt production. With its economical, lightweight, and durable structure, polyester-filled quilts appeal to a broad consumer base.

3.1.8. Lyocell

Lyocell fibers are produced by dissolving cellulose raw material in an NMMO solvent, which can be fully recovered after processing. As a result, lyocell fibers are more environmentally friendly in their production method compared to other regenerated cellulose fibers and are completely biodegradable (Kayseri et al., 2010).

Lyocell fibers, considered the third generation of regenerated cellulose fibers, not only boast eco-friendly production methods but also offer advantageous mechanical properties. Their smooth texture, breathability, superior moisture management, and hygienic features make Lyocell a preferred fiber in the textile industry.

While single-fiber quilts were common in earlier years, contemporary quilt production often involves the use of fiber blends. Combining different fibers as filling material aims to merge the advantages of natural and synthetic fibers, resulting in more balanced properties. Using a mixture of fibers in specific proportions provides cost-effective and comfortable solutions tailored to user needs.

4. FIBER FILLING RATIOS BY QUILT TYPES

The ratio of filling material used in quilt production is a critical factor determining the quilt's quality and intended use. The filling ratio can vary depending on the material used, design, season, customer expectations, and other factors. These ratios significantly affect the

quilt's thermal properties, weight, feel, and overall comfort. Commonly used filling material ratios for different quilt types are as follows (Megep, Makinede Yorgan Üretimi, 2015):

- Seasonal Quilt: 300 g/m²
- Summer Quilt: 250 g/m²
- Winter Quilt: 380 g/m²

5. FABRICS USED IN QUILT PRODUCTION

The fabrics used in quilt production are critical factors that influence both the user's comfort and the quilt's durability. Each type of fabric offers distinct advantages depending on seasonal conditions and user needs. Fabrics with properties such as softness, breathability, moisture management, heat retention, water resistance, antibacterial features, ease of cleaning, quick drying, durability, and cost-effectiveness are selected based on their suitability for different requirements.

6. QUILT SIZE

When selecting a quilt size, it is essential to consider the bed dimensions and the user's needs. Factors such as sleep habits, climate and seasonal conditions, aesthetic preferences, physical characteristics, and comfort expectations should be taken into account. Determining the correct quilt size is crucial for creating a comfortable sleep environment. Standard quilt sizes used in production are classified as follows:

Single: Designed for individual use on small beds. These quilts are produced with a width of 155 cm and a length of 215 cm.

Double: Suitable for two people and larger beds. These quilts are produced with a width of 195 cm and a length of 215 cm.

Baby: Designed for baby and toddler beds. These quilts are produced with a width of 95 cm and a length of 145 cm.

King: Custom-sized quilts tailored to the measurements provided by customers. They are typically produced with a width of 215 cm and a length of 235 cm or larger.

In addition to standard sizes, quilts can also be manufactured in various dimensions based on customer requests.

7. QUILT PRODUCTION

Quilt production can be carried out using both handcrafted and industrial methods. It involves several stages, from preparing the filling materials to packaging. The process begins with the selection of the outer fabric (cotton, polyester, microfiber) and filling material (wool, cotton, down, fiber), followed by determining the quilted pattern, dimensions, and design details. Once the materials and patterns are selected during the design and planning phase, the preparation of the outer fabric and filling material is completed.

Below are the steps involved in quilt production along with the machines used in these processes.

7.1. Fiber Preparation

Raw fiber arrives at manufacturers in bales. These bales undergo opening and carding processes, during which the fibers are processed by machines into the desired weight, making them ready for production. Regardless of the type of fiber used in quilts, the procedures remain the same. However, the fiber opening and carding machines may vary depending on the specific requirements of the manufacturer (Megep, Makinede Yorgan Üretimi, 2015).

In quilt production, fibers are processed through opening and carding machines. Once this process is complete, the fibers are rolled into sheets.

Figure 6.Fiber opening machine

(https://www.turksanmakina.com/service/elyaf-acma-makinesi/)

7.2. Quilt Feeding Unit

The quilt feeding unit eliminates traditional manual methods, enabling the uniform filling of quilts for consistent production. This ensures that the entire quilt receives an equal distribution of filling, preventing any irregularities or deformations. As a result, the quilts produced are more durable and offer a longer lifespan.

Figure 7. Quilt feeding unit

(https://www.turksanmakina.com/service/yorgan-besleme-unitesi/)

7.3. Quilting Process

Quilting is one of the versatile and easily applicable sewing techniques that has been utilized across various domains from past to present. The term “quilt” originates from the Latin word *culcita*, meaning a mattress, cushion, or pillow filled with wool and other fibers, used for warmth. Quilting is defined as “a technique of combining or embellishing fabric pieces by placing materials such as cotton, fiber, or rubber between two textile surfaces, using hand or machine stitching to create a composition or free pattern”.

Quilting involves creating a surface by stitching layers of fabric with a filling material in between, which can be natural fibers or synthetic alternatives. Quilted products, commonly referred to as quilts, are seen as functional items worldwide. Historically, in addition to their primary function of providing warmth, people used quilts as bedspreads or hung them on doors and windows to shield against dust and winter cold. This usage also served decorative purposes, showcasing the dual functionality of quilting as both practical and ornamental (Tümer, 2024).

Quilting stitch is a sewing method used to join two or more layers of fabric. This technique can be performed using both hand stitching and machine stitching. Quilting patterns are designed to enhance the aesthetic appearance of the fabric, consisting of various lines and geometric shapes. The concept of quilting is simple: an inner layer of fiber insulation provides warmth, much like the insulation between the inner and outer walls of a house. Quilting or stitching between the layers is essential to prevent the insulation fibers from shifting or clumping when garments or quilts are used or washed(Tümer, 2024). Figure 8 illustrates the layers of quilted fabric.

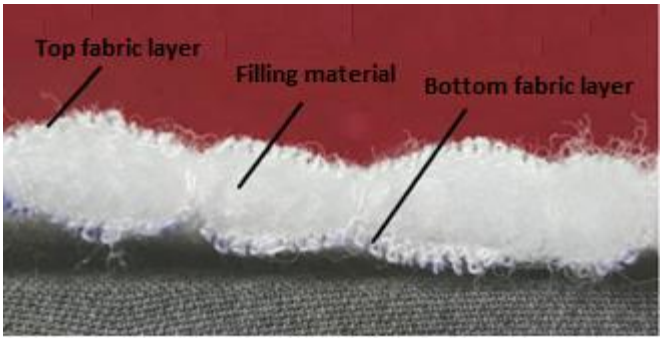

Figure 8. Cross-section view of quilted fabrics(Tokgöz, 2020)

Quilted surfaces often showcase a harmonious blend of various figures and patterns with geometric shapes. The different stitching techniques and materials used in designs contribute to the quality and variety of quilts. Quilted patterns in quilts can be chosen in various dimensions and shapes, balancing both aesthetic appeal and functionality.

Popular options include geometric patterns like squares, rectangles, and triangles; natural motifs such as leaves and flowers; unique artistic designs; classic patterns; and combination styles. Smaller patterns are often used in dense or aesthetically focused products, medium-sized patterns are common in everyday quilts, and larger patterns are preferred for oversized or decorative quilts. Special machines allow for the customization of pattern sizes and spacing.

Larger patterns offer a modern look, while smaller patterns provide intricate details. The design can vary based on the machine used, the purpose of the quilt, and customer expectations. Below are example visuals of quilted patterns and applications commonly used in quilts.

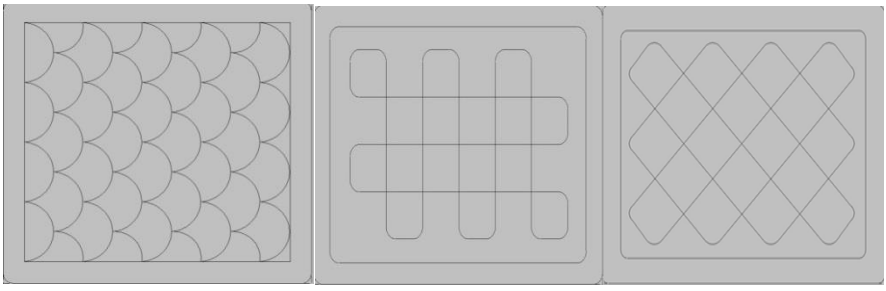

Figure 9. Quilting patterns in quilt production

(https://idilyorgan.com.tr/Desenler.html)

Figure 10. Quilting applications in quilt production

(https://www.doquhome.com.tr/urun/white-line-microfiber-yorgan-cift kisilik-beyaz,https://www.doquhome.com.tr/urun/pamuk-yorgan, https://www.yatasbedding.com.tr/, https://www.ikea.com.tr/urun/fjallbracka-beyaz-hafif-sicak-tutar-cift-kisilik-yorgan-90456849 https://bvlbore.en.made-in-china.com/product/vZHfrNgYZuWk/China-King-Size-Cheap-Price-Polyester-Hollow-Fiber-Quilt-for-Hotel.html, https://www.trendyol.com/karaca-home/heavy-cam-kurecikli-agir-saten-beyaz-yorgan-cift-kisilik-140x200-cm-p-751611371)

7.4. Quilting Machines

Various types of quilting machines, such as single-head, double-head, multi-needle, and ultrasonic quilting machines, can be used in quilt production. The choice of quilting machine depends on the production scale, budget, and desired quilt quality. These machines are

designed to secure fabric and filling materials together while creating patterns, enhancing production speed, and delivering uniform, aesthetically pleasing results.

Quilting machines offer options ranging from simple geometric patterns to intricate designs. The quilt sizes produced can vary based on the machine's capacity, with industrial models providing high speed and precision. Regular maintenance is essential to ensure consistent quality.

Below are examples of different types of quilting machines used in quilt production.

Single-Head and Double-Head Machines

The fiber, fabric, and interlining are cut to pre-determined dimensions. On tables mounted on rails, the materials are layered in the following sequence: fabric (with the back side of the first fabric layer facing upward), interlining, fiber, interlining, and another fabric layer. These layers are then placed into the frame and secured at the edges with clamps.

In some machines, this process involves attaching the materials to hooks located on the frame edges. In other machines, the fiber is simply laid in place without being secured with hooks or clamps(Megep, Makinede Yorgan Üretimi, 2015).

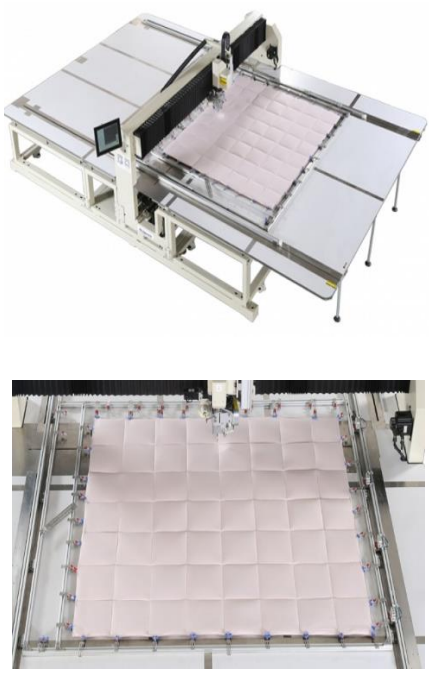

Figure 11. Single-head quilting machine

(https://sahmakmakina.com/makinalar/richpeace-doner-baslikli-hassas kapitone-makinesi-yorgan-ozel-makinesi/)

Multi-Head Quilting Machines

Multi-head quilting machines operate with multiple needles simultaneously, offering high production capacity. They are primarily used in industrial and mass production settings. These machines provide virtually unlimited options for quilting patterns.

The fabric, interlining, fiber, and fabric rolls are placed in the appropriate sections of the machine. Quilting patterns are selected based on the specific requirements of the quilts to be produced. Once the pattern is chosen, the quilting machine stitches it automatically, ensuring efficiency and precision in production.

Figure 12. Multi-needle quilting machine

(https://www.richpeace.com/multi_needle_quilting-show-255.html)

The edges of quilts with quilted stitching are finished with binding (strips), providing both an aesthetic and protective covering.

Figure 13. Tape binding machine

(https://www.richpeace.com/4-side_hemming_machines-show-823.html)

After the sewing process is completed, the stitching, quilting patterns, and the uniformity of the filling material in the quilts are inspected. Dust and loose threads on the quilts are cleaned, completing the quality control procedures. The quilts are then folded and packaged according to their features (including details such as the company name, product specifications, and usage instructions). This final packaging process prepares the quilts for sale.

The steps in quilt production can vary depending on the materials and methods used. While traditional handmade quilts require more labor and craftsmanship, industrial production leverages machines to accelerate the process and provide consistent quality.

Figure 14. Packaging machine

(https://www.makinaturkiye.com/tam-otomatik-pnomatik-yastik-yorgan-paketleme-makinasi-p-137120)

8. CARE AND STORAGE CONDITIONS FOR QUILTS

Proper care, storage, and cleaning methods are essential to keep quilts long-lasting and hygienic.

Care Conditions

- **Regular Airing:** Quilts should be frequently aired during use. Especially, natural-filled quilts (cotton, wool, down feathers) can be left in the sun for a few hours to remove moisture.
- **Using Protective Covers:** Quilts can be covered with bedspreads or quilt covers to protect the filling and surface. Quilt covers offer several advantages:They shield the quilt surface from sweat, body oils, dust, and dirt, preventing the filling from becoming soiled.Cleaning a quilt can be challenging and time-consuming, but quilt covers can be easily removed and machine-washed.They delay the wear and tear of the quilt fabric, extending its lifespan.The filling is better protected from external factors such as moisture and stains. Quilt covers in various designs and colors provide a practical way to change bedroom decor. Using quilt covers enhances both the aesthetic and functional aspects of quilts, making them more hygienic, durable, and long-lasting.
- **Avoid Heavy Loads:**Avoid placing heavy items on quilts, as this can disrupt the even distribution of the filling.

Cleaning Conditions

The cleaning method depends on the type of filling and fabric. Quilts should be cleaned in accordance with washing instructions, either by hand or machine.

- **Machine-Washable Quilts:**

Temperature: Wash at 30-40°C using a gentle cycle as per the care label.

Detergent: Use a detergent for delicate fabrics and avoid fabric softeners.

Spin Cycle: Low-speed spin preserves the structure of the filling.

Drying: Instead of direct sunlight, dry in a well-ventilated area. For tumble drying, use low heat.

- **Hand Washing:**Delicate quilts can be hand-washed in a large tub with lukewarm water and detergent, gently squeezed, and air-dried.
- **Dry Cleaning:**Professional dry cleaning is recommended for wool and down-filled quilts or quilts not suitable for machine washing according to care instructions.
- **Spot Cleaning:**For localized stains, gently clean with a damp cloth and a small amount of detergent**.**

Storage Conditions

- **Dry and Cool Environment:** Quilts should be stored in a dry, cool, and well-ventilated area. Humid environments can cause deformation.
- **Breathable Bags:** Instead of plastic bags, use breathable fabric bags or vacuum storage bags.
- **Proper Folding:** Avoid tightly folding quilts to prevent compression of the filling. Store them in a spacious manner.

Proper care and cleaning according to the material composition and usage instructions not only protect the user's health but also ensure the longevity of the quilt.

9. FACTORS DETERMINING QUILT QUALITY

Several key factors determine the quality of a quilt. These factors are rooted in the properties of the materials used, production process considerations, and the quilt's physical and comfort features.

Filling Material

The filling material inside the quilt is one of the most critical elements that determine its characteristics, such as warmth, comfort, breathability, durability, and intended use. It directly impacts the quilt's quality.

- **Natural Filling Materials:** Materials such as down feathers, wool, and cotton are natural and breathable. Down feathers, in particular, excel in terms of lightweight properties and thermal insulation.
- **Synthetic Filling Materials:** Materials like microfibers or siliconized fibers are typically lightweight, economical, and hypoallergenic. However, they ar**e generally less breathable compared to natural materials.**

Outer Fabric Quality

The outer fabric of the quilt is essential for both durability and sleep comfort. 100% Cotton Fabrics offer breathability and softness. Microfiber fabrics provide lightweight and durable options.

Stitching and Craftsmanship

The stitching of a quilt must be strong and orderly. Compartmentalized stitching ensures even distribution of the filling and prevents the quilt from losing its shape.

Hypoallergenic Features

Hypoallergenic and anti-bacterial quilts are suitable for individuals with allergies. These features are typically found in certified products.

Air Permeability

A high-quality quilt should be breathable. This feature prevents sweating during sleep and enhances overall comfort.

Thermal Insulation

The quilt's ability to retain heat depends on the features of the filling material and its density. Winter quilts contain thicker, higher-density fillings (300-400 g/m²), while summer quilts use lightweight, thinner materials.

Determining the Warmth Level of a Quilt

The TOG unit is a measure of thermal resistance used in quilts, blankets, and outerwear designed to provide protection against the cold. The TOG value indicates how warm a quilt is and how much insulation it provides during sleep. Therefore, it is essential to determine the appropriate TOG value based on an individual's body temperature or the season. Choosing a quilt with an unsuitable TOG value can lead to discomfort, such as overheating and sweating, or feeling cold during sleep, resulting in poor sleep quality. A quilt should be selected with a TOG value that meets the individual's desired level of warmth.

Some quilt manufacturers specify the TOG value of their products, enabling individuals to select quilts with a heating level that meets their expectations. The appropriate TOG value may vary not only

from person to person but also based on the heating system and its efficiency in the bedroom.

The TOG rating scale ranges from 1.5 TOG, which is considered cool, to 15 TOG, which is very warm. Essentially, the higher the TOG rating, the warmer the quilt.

Different TOG values are used for quilts depending on the season. For lightweight summer quilts, TOG values between 3 and 7.5 (with an average of 4.5) are preferred. For products suitable for spring, TOG values range from 9 to 10.5, while for harsh winter conditions, TOG values between 12 and 15 (with an average of 13.5) are appropriate. The TOG values required for quilts at various temperature levels are illustrated in Figure 15 (Durmuş et al., 2022).

Figure 15. TOG values of quilts versus temperature

Durability

A high-quality quilt should be long-lasting, ensured by the durability of its filling material and outer fabric. Reliable brands and quality certifications indicate that the quilt is free from harmful chemicals and meets established quality standards. By considering these factors, one can select a quilt that suits their needs and budget.

10. BLANKET PRODUCTION

Blankets are a fundamental necessity in every household and are essential in all countries experiencing four seasons. In Turkey, while blanket production holds a significant place in the textile sector, scientific studies on this subject remain quite limited.

When it comes to blanket production, Uşak province in Turkey stands out as the first location that comes to mind. Blanket exports are primarily made to European and Balkan countries, where temperatures are generally low.

Uşak has become the center of blanket production in Turkey, housing 46 blanket production facilities. These factories have an annual production capacity of 3 million plush blankets. The production in Uşak caters to both domestic and international markets. The Uşak Chamber of Commerce and Industry states that they meet 85% of Turkey's blanket production capacity. Uşak, as a traditional blanket production hub, produces approximately 14 million blankets annually in about 34 facilities for both domestic and international markets (https://www.sonvakithaber.com/ekonomi/usakta-battaniye-sektoru-yillik-14-milyon-uretim-gerceklestiriyor-38018.html). It has been noted that urbanization has led to changes in blanket usage preferences. While blankets were once a fundamental necessity due to the use of stoves for heating, today people prefer products catering to different needs, such as lightweight and natural sleep blankets or TV blankets (Yılmaz, 2007).

Blankets are produced using knitting and weaving fabric production methods. First, the type of yarn suitable for the desired blanket features must be determined.

All existing yarn types differ significantly in their properties. Therefore, before selecting a yarn for a blanket, the production method must be determined. For blankets prioritizing softness, fibers like cotton, bamboo, and viscose are typically used. For products where warmth is a priority, fibers like wool and alpaca are preferred.

In blanket production, primarily knitted and woven fabrics are used. In knitted fabric blanket production, circular knitting machines are utilized. The fabrics produced with yarns fed in accordance with the system count are then subjected to a series of processes.

Tablo 1. Stages of blanket production

Stage	Description
1. Yarn Production for Blankets	Synthetic yarns are used for producing polar fabrics. Yarn properties are determined based on the weight and size of the blanket.
2. Knitting/Woven Fabric Production	The selected yarn is knitted into a continuous fabric tube using a circular knitting machine, which can be hundreds of meters long.
3. Intermediate Quality Control	The quality characteristics of raw materials are evaluated.
4. Napping	The fabric undergoes a napping process to bring the yarns in its structure to the surface.
5. Brushing	This process aligns unevenly plucked blanket fibers on the fabric surface and removes broken fibers.
6. Shearing	The napped blanket fibers are trimmed to specific lengths to achieve a smoother surface.
7. Stitching and Edge Finishing	Polar blankets are stitched with sewing machines, cleaned at the edges, and reinforced with overlock stitching.
8. Quality Control	Blankets are inspected for defects such as length, width, dirt, stains, and holes.
9. Labeling and Packaging	Blankets are labeled per customer requirements, with options such as hanging tags or band labels, and are packaged accordingly.

10.1. Yarn Production

To produce blanket yarn, the appropriate fibers are selected. In Turkey, commonly used fibers include natural cotton and wool, and

synthetic acrylic, polyester, and polyamide. The warp and weft yarns used in blanket production differ in their number and fiber characteristics. Weft yarns are typically produced using a carded system, while warp yarns generally utilize open-end spinning.

Machines required for producing blanket yarn include a blending and opening machine, carding machine, drawing machine, thick or thin spinning machine, and a winding machine.

10.2. Fabric Production for Blankets

- **Knitted Fabric Production**

Knitting involves forming loops with needles and connecting these loops to create a fabric surface. Knitting is categorized into weft and warp knitting. Due to the thick yarns used in blankets, weft knitting is more suitable. In weft knitting, the rows and columns are placed perpendicularly, forming horizontal surfaces of loops.

In plain knitting, patterns are first created using specialized design software. These patterns are then transmitted to the machines via Bluetooth or USB using electronic control panels. After ensuring the necessary adjustments, spools are placed in the creel on the machine. The yarn from the spools passes through various tension controllers and is guided to the knitting area.

The yarn undergoes checks for defects such as thick spots or knots that could cause faulty products. Any issues trigger a warning light, enabling the operator to identify the affected spool easily. Proper tension controllers ensure the yarn is fed to the knitting area at a consistent tension. The resulting fabric is inspected for its structure, loop density, and desired width before being rolled off for further processing.

- **Woven Fabric Production**

During weaving preparation, warp yarns are processed through a drafting operation aligned with the blanket's pattern and are wound onto the warp beam. The warp yarns, after passing through reed spaces and heald wires, are ready for weaving.

The appropriate loom is selected based on the blanket type. Looms such as dobby, shuttle, air-jet, and jacquard looms can be used for weaving blankets.

10.3. Intermediate Quality Control

Raw blankets undergo visual inspection for weaving defects and corrections using tools such as tweezers. Blanket rolls pass through a well-lit quality control table or an inclined surface for inspection. Errors like thread buckling, pilling, and runs are corrected at this stage. Wool blankets differ from synthetic ones as they undergo a fringing process after this inspection, followed by washing and drying.

10.4. Napping

In the blanket industry, the napping machine plays a crucial role, particularly for products designed to retain warmth. This machine is used to soften, fluff, and nap the surface of fabrics, making it especially important in the production of textured fabrics such as polar fleece.

The napping machine processes the fabric’s surface fibers and yarns in a specific way, resulting in a smooth, soft, and fluffy texture. It applies pressure to the fabric using metal or toothed brushes, which gently lift the fibers on the surface. This process enhances the fabric’s texture, making it softer and aesthetically pleasing.

Napping machines are widely used for processing various types of fabrics, including wool and cotton, and are instrumental in increasing both the aesthetic and functional quality of fabrics designed for warmth. This process is essential for creating fabrics that are not only comfortable but also visually appealing.

Advantages of Fabrics:

- **Thermal Insulation:** Polar fabric provides excellent thermal insulation, keeping the body warm. This is a significant advantage, especially in cold weather conditions.

- **Lightweight:** Despite its thick structure, polar fabric is extremely lightweight, offering freedom of movement and reducing fatigue for the wearer.

- **Breathability:** Polar fabric is breathable, allowing moisture to escape from the body's surface, ensuring comfort during use.

- **Easy Maintenance:** Polar fabric is machine washable and dries quickly, offering great convenience to users.

After the napping process, brushing is performed using the "Tiger machine" named after the machine itself. This machine aligns the unevenly plucked fibers on the surface of blanket fabrics and removes any broken fibers. The removed fibers can be recycled for yarn production. Additionally, the brushing process enhances the surface brightness of the blanket fabric, giving it a more polished and visually appealing appearance (Sevim, 2007).

10.5. Brushing

After the napping process, brushing is performed using the "Tiger machine”. This machine straightens unevenly plucked blanket fibers on the fabric surface and removes broken fibers. The removed fibers can be recycled for yarn production. Additionally, brushing enhances the fabric's surface, giving it a brighter and more polished appearance (Sevim, 2007).

10.6. Shearing

Napped blanket fibers are passed through a shearing machine to trim them to specific lengths, creating a clearer and smoother surface. Fibers trimmed to the desired length are prepared for binding on the edges. If the desired length is not achieved, the shearing process is repeated. The fibers cut from the blanket surface are collected in the waste compartment of the machine and are reused in home textile products such as quilts and mattresses (Sevim, 2007).

10.7. Edge Finishing, Quality Control and Packaging

After shearing, the blanket roll is stitched along its two edges. In large facilities, this process is performed automatically using chain or zigzag sewing machines. In smaller setups, industrial chain or zigzag sewing machines are used manually.

Typically, thick bands are applied to the other two edges of the blanket using zigzag or single-thread chain stitching, which is done manually. The corners of the blanket are folded diagonally and stitched using a straight-stitch machine. This step is referred to as "corner band finishing”.After trimming any loose threads, a final quality check is conducted.

Blankets may be classified as second quality due to defects during weaving and stitching. Blankets meeting customer specifications are packaged, while lower-quality ones are repaired and packaged if possible. Defective blankets are separated for domestic sale as second-quality products (Sevim, 2007).

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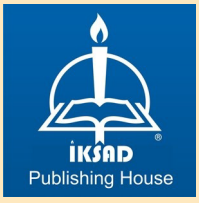

ISBN: 978-625-378-135-4