

A Study of Textile Industry and its Different Aspects

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Abstract

The paper is concerned with textile industry. Many stages of this industry are explained in detail. The industry in 20th century and before, after it are explained in this paper. The textile regulatory standards are discussed in the paper. The Industrial revolution discussion is the center part of the paper.

Keywords: Natural Fibers, Textile, Cotton Stage, Industrial Revolution.

Introduction

The textile industry is primarily concerned with the production of yarn, and cloth and the subsequent design or manufacture of clothing and their distribution. The raw material may be natural or synthetic using products of the chemical industry.

Cotton is the world's most important natural fiber. In the year 2007, the global yield was 25 million tons from 35 million hectares cultivated in more than 50 countries. There are five stages

Cultivating and Harvesting

Preparatory Processes

Spinning- giving yarn

Weaving- giving fabrics

Finishing- giving textiles

Cotton manufacturing:

Synthetic fibers

Artificial fibers can be made by extruding a polymer, through a spinneret into a medium where it hardens. Wet spinning (rayon) uses a coagulating medium. In dry spinning (acetate and triacetate), the polymer is contained in a solvent that evaporates in the heated exit chamber. In melt spinning (nylons and polyesters) the extruded polymer is cooled in gas or air and then sets. All these fibers will be of great length, often kilometers long.

Artificial fibers can be processed as long fibers or batched and cut so they can be processed like a natural fiber.

Natural fibers

Natural fibers are either from animals (sheep, goat, rabbit, silk-worm) mineral (asbestos) or from plants (cotton, flax, sisal). These vegetable fibers can come from the seed (cotton), the stem (known as bast fibers: flax, Hemp, Jute) or the leaf (sisal). Without exception, many processes are needed before a clean even staple is obtained- each with a specific name. With the exception of silk, each of these fibres is short being only centimeters in length, and each has a rough surface that enables it to bond with similar staples.

History:

Cottage stage

There are some indications that weaving was already known in the Palaeolithic. An indistinct textile impression has been found at Pavlov, Moravia. Neolithic textiles are well known from finds in pile dwellings in Switzerland. One extant fragment from the Neolithic was found in Fayum at a site which dates to about 5000 BC. The key British industry at the beginning of the 18th century was the production of textiles made with wool from the large sheep-farming areas in the Midlands and across the country (created as a result of land-clearance and enclosure). This was a labor-intensive activity providing employment throughout Britain, with major centers being the West Country; Norwich and environs; and the West Riding of Yorkshire. The export trade in woollen goods accounted for more than a quarter of British exports during most of the 18th century, doubling between 1701 and 1770. Exports of the cotton industry – centered in Lancashire – had grown tenfold during this time, but still accounted for only a tenth of the value of the woollen trade. Prior to the 17th century, the manufacture of goods was performed on a limited scale by individual workers. This was usually on their own premises (such as weavers' cottages) – and goods were transported around the country. Clothiers visited the village with their trains of pack-horses. Some of the cloth was made into clothes for people living in the same area, and a large amount of cloth was exported. Rivers navigations were constructed, and some contour-following canals. In the early 18th century, artisans were inventing ways to become more productive. Silk, wool, fustian, and linen were being eclipsed by cotton, which was becoming the most important textile. This set the foundations for the changes.

In Roman times, wool, linen and leather clothed the European population, and silk, imported along the Silk Road from China, was an

extravagant luxury. The use of flax fiber in the manufacturing of cloth in Northern Europe dates back to Neolithic times.

During the late medieval period, cotton began to be imported into northern Europe. Without any knowledge of what it came from, other than that it was a plant, noting its similarities to wool, people in the region could only imagine that cotton must be produced by plant-borne sheep. John Mandeville, writing in 1350, stated as fact the now-preposterous belief: "There grew in India a wonderful tree which bore tiny lambs on the ends of its branches. These branches were so pliable that they bent down to allow the lambs to feed when they are hungry." This aspect is retained in the name for cotton in many European languages, such as German *Baumwolle*, which translates as "tree wool". By the end of the 16th century, cotton was cultivated throughout the warmer regions of Asia and the Americas.

The main steps in the production of cloth are producing the fibre, preparing it, converting it to yarn, converting yarn to cloth, and then finishing the cloth. The cloth is then taken to the manufacturer of garments. The preparation of the fibers differs the most, depending on the fiber used. Flax requires retting and dressing, while wool requires carding and washing. The spinning and weaving processes are very similar between fibers, however.

Spinning evolved from twisting the fibres by hand, to using a drop spindle, to using a spinning wheel. Spindles or parts of them have been found in archaeological sites and may represent one of the first pieces of technology available. They were invented in India between 500 and 1000 AD.

Industrial revolution

The textile industry grew out of the industrial revolution in the 18th Century as mass production of yarn and cloth became a mainstream industry.

In 1734 in Bury, Lancashire, John Kay invented the flying shuttle — one of the first of a series of inventions associated with the cotton industry. The flying shuttle increased the width of cotton cloth and speed of production of a single weaver at a loom. Resistance by workers to the perceived threat to jobs delayed the widespread introduction of this technology, even though the higher rate of production generated an increased demand for spun cotton.

In 1761, the Duke of Bridgewater's canal connected Manchester to the coal fields of Worsley and in 1762, Matthew Boulton opened the Soho Foundry engineering works in Handsworth, Birmingham. His partnership with Scottish engineer James Watt resulted, in 1775, in the commercial production of the more efficient Watt steam engine which used a separate condenser.

In 1764, James Hargreaves is credited as inventor of the spinning jenny which multiplied the spun thread production capacity of a single worker — initially eightfold and subsequently much further. Others credit the original invention to Thomas Highs. Industrial unrest and a failure to patent the invention until 1770 forced Hargreaves from Blackburn, but his lack of protection of the idea allowed the concept to be exploited by others. As a result, there were over 20,000 Spinning Jennies in use by the time of his death. Again in 1764, Thorp Mill, the first water-powered cotton mill in the world was constructed at Royton, Lancashire, England. It was used for carding cotton. With the spinning and weaving process now mechanized, cotton mills cropped up all over the North West of England.

19th century developments

With the Cartwright Loom, the Spinning Mule and the Boulton & Watt steam engine, the pieces were in place to build a mechanized textile industry. From this point there were no new inventions, but a continuous improvement in technology as the mill-owner strove to reduce cost and improve quality. Developments in the transport infrastructure; that is the canals and after 1831 the railways facilitated the import of raw materials and export of finished cloth.

Firstly, his use of water power to drive mills was supplemented by steam driven water pumps, and then superseded completely by the steam

engines. For example Samuel Greg joined his uncle's firm of textile merchants, and, on taking over the company in 1782, he sought out a site to establish a mill. Quarry Bank Mill was built on the River Bollin at Styal in Cheshire. It was initially powered by a water wheel, but installed steam engines in 1810. Quarry Bank Mill in Cheshire still exists as a well preserved museum, having been in use from its construction in 1784 until 1959. It also illustrates how the mill owners exploited child labor, taking orphans from nearby Manchester to work the cotton. It shows that these children were housed, clothed, fed and provided with some education. In 1830, the average power of a mill engine was 48 hp, but Quarry Bank mill installed an new 100 hp water wheel. William Fairbairn addressed the problem of line-shafting and was responsible for improving the efficiency of the mill. In 1815 he replaced the wooden turning shafts that drove the machines at 50rpm, to wrought iron shafting working at 250 rpm, these were a third of the weight of the previous ones and absorbed less power.

Secondly, in 1830, using a 1822 patent, Richard Roberts manufactured the first loom with a cast iron frame, the Roberts Loom.[8] In 1842 James Bullough and William Kenworthy, made the Lancashire Loom. It is a semi automatic power loom. Although it is self-acting, it has to be stopped to recharge empty shuttles. It was the mainstay of the Lancashire cotton industry for a century, when the [Originally, power looms were shuttle-operated but in the early part of the 20th century the faster and more efficient shuttleless loom came into use. Today, advances in technology have produced a variety of looms designed to maximize production for specific types of material. The most common of these are air-jet looms and water-jet looms. Industrial looms can weave at speeds of six rows per second and faster

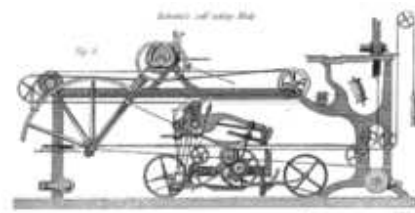


Figure 1: Roberts's self-acting mule with quadrant gearing

Thirdly, also in 1830, Richard Roberts patented the first self-acting mule. Stalybridge mule spinners strike was in 1824, this stimulated research into the problem of applying power to the winding stroke of the mule. The draw while spinning had been assisted by power, but the push of the wind had been done manually by the spinner; the mule could be operated by semiskilled labor. Before 1830, the spinner would operate a partially powered mule with a maximum of 400 spindles after, self-acting mules with up to 1300 spindles could be built

The industrial revolution changed the nature of work and society. The three key drivers in these changes were textile manufacturing, iron founding and steam power.[14][15][16][17] The geographical focus of textile manufacture in Britain was Manchester, England and the small towns of the Pennines and southern Lancashire.

Textile production in England peaked in 1926, and as mills were decommissioned, many of the scrapped mules and looms were bought up and reinstated in India. The demographic change made by World War I, had made the labor-intensive industry unprofitable in England, but in India and later China it was an aid to development.

20th century

Major changes came to the textile industry during the 20th century, with continuing technological innovations in machinery, synthetic fiber, logistics, and globalization of the business. The business model that had dominated the industry for centuries was to change radically. Cotton and wool producers were not the only source for fibres, as chemical companies created new synthetic fibres that had superior qualities for many uses, such as rayon, invented in 1910, and DuPont's nylon, invented in 1935 as an inexpensive silk substitute, and used for products ranging from women's stockings to tooth brushes and military parachutes.

The variety of synthetic fibres used in manufacturing fibre grew steadily throughout the 20th century. In the 1920s, acetate was invented; in the 1940s, acetate, modacrylic, metal fibres, and saran were developed; acrylic, polyester, and spandex were introduced in the 1950s. Polyester became hugely popular in the apparel market, and by the late 1970s, more polyester was sold in the United States than cotton.

By the early 20th century, the industry in the developed world often involved immigrants in "sweat shops", which were usually legal but were sometimes illegally operated. They employed people in crowded conditions, working manual sewing machines, and being paid less than a living wage. This trend worsened due to attempts to protect existing industries which were being challenged by developing countries in South East Asia, the Indian subcontinent and Central America. Although globalization saw the manufacturing largely outsourced to overseas labor markets, there has been a trend for the areas historically associated with the trade to shift focus to the more white collar associated industries of fashion design, fashion modeling and retail. Areas historically involved heavily in the "rag trade" include London and Milan in Europe, and the SoHo district in New York City.

By the late 1980s, the apparel segment was no longer the largest market for fibre products, with industrial and home furnishings together representing a larger proportion of the fibre market. Industry integration and global manufacturing led to many small firms closing for good during the 1970s and 1980s in the United States; during those decades, 95 percent of the looms in North Carolina, South Carolina and Georgia shut down, and Alabama and Virginia also saw many factories close.

In 2002, textiles and apparel manufacturing accounted for \$400 billion in global exports, representing 6% of world trade and 8% of world trade in manufactured goods. In the early years of the 21st century, the largest importing and exporting countries were developed countries, including the European Union, the United States, Canada and Japan. The countries with the largest share of their exports being textiles and apparel were as follows (2002).

21st century

Bangladesh: 85.9%

Macau: 84.4%

Cambodia: 72.5%

Pakistan: 72.1%

El Salvador: 60.2%

Mauritius: 56.6%

Sri Lanka: 54.3%

Dominican Republic: 50.9%

Nepal: 48.7%

Tunisia: 42.4%

Commerce and Regulation

The Multi Fiber Arrangement (MFA) governed the world trade in textiles and garments from 1974 through 2004, imposing quotas on the amount developing countries could export to developed countries. It expired on 1 January 2005.

The MFA was introduced in 1974 as a short-term measure intended to allow developed countries to adjust to imports from the developing world. Developing countries have a natural advantage in textile production because it is labor intensive and they have low labor costs. According to a World Bank/International Monetary Fund (IMF) study, the system has cost the developing world 27 million jobs and \$40 billion a year in lost exports.

However, the Arrangement was not negative for all developing countries. For example the European Union (EU) imposed no restrictions or duties on imports from the very poorest countries, such as Bangladesh, leading to a massive expansion of the industry there.

Regulatory Standards

For textiles, like for many other products, there are certain national and international standards and regulations that need to be complied with to ensure quality, safety and sustainability.

The following standards amongst others apply to textiles:

CPSIA, e.g. Standard for the Flammability of Clothing Textiles

ASTM Textile Standards

REACH Regulations for Textiles

China Product Standard for Textiles

Conclusion

At the General Agreement on Tariffs and Trade (GATT) Uruguay Round, it was decided to bring the textile trade under the jurisdiction of

the World Trade Organization (WTO). The WTO Agreement on Textiles and Clothing provided for the gradual dismantling of the quotas that existed under the MFA. This process was completed on 1 January 2005. However, large tariffs remain in place on many textile products.

Many countries were expected to suffer the most from the ending of the MFA, as it was expected to face more competition, particularly from China. However, this was not the case. It turns out that even in the face of other economic giants; many countries' labor is "cheaper than anywhere else in the world." While some smaller factories were documented making pay cuts and layoffs, most downsizing was essentially speculative – the orders for goods kept coming even after the MFA expired. In fact, Bangladesh's exports increased in value by about \$500 million in 2006.

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