

Textile Finishing in Pakistan

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The textile industry is one of the largest industries in the world spend around \$1.3 Trillion on textiles every year, most of it on clothes. With increased global competition, many sectors within the textile industry are increasing production efficiency. Research, innovations and development in technical textiles, yarn quality, clothing products, process performance, fabric finishing, coloration technology and marketing can bring significant advancement in textile sector and market supremacy.

In textile processing the concept of eco-friendly product and process had received significant appreciation all over the world; and the legislator public enforcement in developed countries are known for this purpose. Indirectly, such enforcement had partly resulted in the growth and development of conventional textile processing in developing countries where low-waged work force and reduced environment control are prevalent.

Fabric processing is the most critical stage of value addition in the entire value chain. Woven or knit fabric can either be dyed or printed depending upon the requirement of the customer who is the garment or made-ups manufacturer. The use of coloured cotton being unique and attractive has the potential to become a part of cotton fabric and apparel market.

Fabrics as they come from the weaving looms or knitting machines are not ready for consumer use. They are still rough, full of blemishes and impurities. Fabrics at this stage are called grey or greige goods. Before they can be ready for consumer use, they have to undergo different finishing processes.

A finish is defined as a process done to fabrics, sometimes to fibers and yarns, causing them to change in appearance, texture, and performance. There are different ways of classifying the finishes applied on fabrics. One of them is the extent to which they will stay on the fabrics, such as temporary, durable, and permanent finish.

A temporary finish lasts until the fabric is washed or dry cleaned. A durable finish lasts longer than temporary but it may become unsatisfactory with the passing of time. A permanent finish lasts until the garment if of service. Another classification of finishes is based on whether it is a general or special finish. The general finishes include those which affect the texture and appearance of the cloth. They are common finishes applied to the majority of fabrics produced. Special finishes include those which affect the performance of the cloth. They are also called functional finishes because they give the fabric special service features which improve its properties and functions. Dyeing and printing are examples of fabric finishes. However, these two finishes i.e. general and special finishes are discussed below:

General finishes

Beetling – Beetling is a common finishing process for linen. It gives the cloth a firm, flattened, lustrous appearance. In beetling, the fabric is hammered, and the yarns are flattened by the impact of wooden mallet. This process closes the weave and creates a heavy and compact appearance. Cotton fabrics can be made to simulate linen by beetling, as the process gives cotton the firm feel and lustrous appearance of linen. "Pinukpuk" is an example of a fabric from abaca which has undergone beetling.

Bleaching – Before the dyeing or printing processes many fabrics require to be bleached. Bleaching makes the fabric white and impurities are removed through the use of chemicals, such as peroxide or chlorine bleaching compounds. In bleaching the warp

sizing of the yarn, waxes and other foreign matters are dissolved. Bleaching is necessary to increase the fabrics ability to absorb dyestuff uniformly.

Calendering – A finishing process which makes the fabrics smooth and glossy. This is done by passing the fabric between highly heated steel rollers at a pressure of up to 2000 pounds per square inch. Special surface design effects (i.e., embossed, moiré, etc.) are also made possible by calendering.

Crabbing – A wool finishing process to prevent creases or other forms of uneven shrinkage in later stages of finishing. Essentially, it is a stretching process; the cloth passes over rollers in hot water or steam. The fabric is then put into cold water after which it is pressed.

Decating or Decatizing – This finishing process improves the appearance, enhances luster, and hand of the material. If the dry decating process is used (which is usually done on cotton, rayon or silk), the cloth is wound on a perforated drum, between layers of a blanket, then steam passes through from the inside to the outside layers. In the wet decating process, the cloth is wound on a roller and treated in a hot water or steam boiler which also has a vacuum system. This process may help overcome uneven or blotchy dyeing.

Fulling – An important finish applied to wool fabrics. Actually, it is a pre-shrinking process which involves the application of moisture, heat, friction and pressure. It results in the felting of wool and gives the fabric a fuller, more compact body.

Mergerizing – A very common finishing process for cotton. Fabrics are treated with strong caustic soda under tension. Mercerizing was discovered by John Mercer, an English scientist and chemist from whom the term was derived. Mercerizing gives the fabric luster, added strength and greater absorbency for dyes. Mercerization can also be done on the yarn stage. Modern technology uses anhydrous or liquid ammonia as mercerizing agent.

Singeing or Gassing – The finishing process is applied to fabrics for the purpose of removing the fuzz of protruding fibers. This is accomplished by passing quickly the fabric over jets, flames, or white-hot metal plates. To prevent the cloth from catching fire, the cloth is immediately immersed in water. Singeing makes the fabric surface smooth.

Sizing or Dressing – These are other terms for starching. The cloth is filled with starch to increase strength, smoothness, stiffness, or weight.

Tentering or Stentering or Heat-Setting – Fabrics, as they go through the other processes, tend to pull out of shape and become irregular in width. Tentering straightens and restores the cloth to its proper dimensions. Along each side of the tentering machine are continuous chains equipped with tenter clips. These clips grasp the cloth at the selvages and stretch it to shape. The cloth is passed through a hot-air drying chamber. The drying of the cloth under tension will be heat-set the weave to its proper width.

Special finishes

Antiseptic Finish – This is a chemical treatment designed to make fabrics bacteria-resistant. It imparts a self-sterilizing quality to a fabric by inhibiting the growth of a broad spectrum of bacteria, including odour-causing germs. The chemicals used are usually surface reactants, thus the appearance and feel of the fabrics are unchanged and no chemical odour remains. Sanitized of

Sanitized, Inc. is a familiar trade name in the market today for an antiseptic finish on fabrics and ready-to-wear clothing items.

Anti-static finish – This is a chemical treatment applied mostly to synthetic fabrics to prevent the accumulation of static electricity. Synthetic fabrics, due to their hydrophobic nature, tend to accumulate static electricity. The static electricity generated in the fabric makes it cling to the wearer or to other garments and gives it the power to attract and hold soil. The anti-static finish adds a water-attracting chemical to the fabric which will carry off the electric charges.

Crease-resistant finish – Crease resistant finishes are applied mostly on fabrics from such fibers as cotton, linen, ramie and rayon. They do not have the natural quality of elasticity found in silk and wool that make them resistant to wrinkling or creasing.

Treating the fabrics with synthetic resins makes them crease resistant. It gives the fabrics quick recovery from creases and wrinkles. The synthetic resins also fill up the porous openings in the fibers, thus making them smoother. Moisture is still absorbed by the fabric but swelling is prevented, thus making it quick drying. Crease resistant fabrics tend to smooth out when properly hung after wearing. Some of the more known trade names for this type of finish in the United States are: Wrinkle-Shed (Permanent Crease-resistant finish for cotton fabrics) of Dan River Mills, Tebilized (crease-resistance for linens, cottons, spun rayon) of Tootal, T. B. Lee Co., and Umidure (permanent wrinkle resistance) of United Piece Dye Works. In Pakistan Hang Ten® and Bonanza are doing crease resistant finishes.

Flame Retardant finish – Only mineral, asbestos, glass or metal substances are really fireproof. Textile fabrics cannot be made absolutely fireproof, but they can be chemically treated to retard inflammability. Fabrics so treated will not catch flame or burn actively. Most fire-retardant fabrics lose the finish after being washed or dry-cleaned. It can also cause the fabric to lose its softness and flexibility. Fire retardant compounds can be purchased commercially. They can be applied directly to the fabric to give it a fire-retarding quality. Among the most effective flame-proofing compounds is one that uses ammonium sulphionate. It makes a fabric fire-resistant without imparting a harsh finish.

Glazed finish – Glazed surfaces may be obtained through chemical and mechanical means. Resin-treated fabrics have greater durability than mechanically achieved glazed surfaces. Durability of these finishes can be prolonged by care in laundry and dry-cleaning.

Heat-reflectant finish – This is also called Insulated Finish. This type of finish makes a fabric suitable for either hot or cold weather. Metallic particles are bonded to a drapery or garment lining fabric of various types of construction. They provide selective radiation. In cold weather when the treated surface is used facing the body, it will reflect its radiated heat back to the body rather than away, thus making the fabric warm. In hot weather, the same material with the treated surface outward will reflect the outside heat away from the body. Heat reflectant fabrics are suitable for reversible vests and blazers.

Mildew-resistant finish – This is a chemical finish given mostly to rayon, cotton and linen fabrics which are most susceptible to attack by mildew in moist humid conditions or climates. The finish is applied to a fabric to prevent the growth of mildew and mold.

Moth-resistant finish – Sometimes referred to as moth-proofing finish. It is a chemical finish specially for wool fabrics to make them resistant to attack by moths and carpet beetles. Differences exist among the processes used for this finish that determines the length of time they are effective and their resistance to laundering and dry-cleaning.

Napping – It is a mechanical finish of subjecting the surface of a fabric to a brushing process to raise the fiber ends thus creating a surface fuzziness. It creates a soft fabric handle and provides warmth because of the insulative air cells in the nap. Flannel is a typical example of a napped fabric. Fabrics may be napped on one side only or both sides which gives greater surface density, increased firmness, and greater warmth.

Shrink-resistant finish (Mechanical Method) – In the textile mill, relaxation shrinkage is eliminated by overfeeding a fabric onto a dyeing frame and applying stretch in the crosswise direction of the fabric or applying controlled compression forces parallel to the surface on the fabric, pushing together the warp yarns, thus releasing the weaving strains. Fabrics so treated may have less than 2% shrinkage in the warp and filling directions.

A Sanforized (Cluett, Peabody) label or mark applied to cotton or linen fabrics indicates a mechanical shrink-resistance finish that has met standards of less than 1% shrinkage.

Slip – resistant finish – This finish is given to loosely constructed fabrics or fabrics with low thread count. It prevents the warp yarns from slipping along the filling yarns. Constant wear and strain can cause the yarns of the fabric to slip. Permanent firmness can be given to the fabric by immersing it in synthetic resins. It is then stretched and dried under tension.

Soil and Stain resistant finish – These are chemical finishes usually given to rug and upholstery fabrics to repel soil and stains. Silicone is the compound used for this type of finish. The treated water becomes water-repellent such that water-borne stains cannot penetrate. Recently, a group of repellents were developed to repel not only water-borne but also oil-borne stains through the use of fluorocarbon compounds. They can be purchased in cans and sprayed directly on the fabric. A popular trade name for this type of stain repeller is Scotchguard of 3M.

Wash and wear finish or Mini care finish – This finish is also referred to as the drip-dry finish. It is of the same type as the crease resistant finish. Wash and wear fabrics will dry smoothly and need little or no ironing after washing. They have a good, soft hand and neat appearance. There are many trade names for wash and wear finish and its effectiveness depends on the particular process used.

Water - repellent finish – A chemical finish which makes a fabric resistant to wetting but not waterproof. A water repellent finish permits a fabric to breathe, allowing passage of air, water vapour perspiration through it. They are more comfortable to wear than waterproofed fabrics. One added advantage of water repellent fabric is that it is also spot-resistant. Water-borne stains are prevented from seeping through.

Waterproof finish – Unlike repellence, waterproofing totally coats the fabric thus closing the pores and enabling it to shed water under all pressures. These fabrics do not breathe. Rubber, lacquer, linseed oil compounds or synthetic resin is applied on the fabric to achieve this finish.

Technology option

Pakistan textile sector is by far the most important sector of the economy contributing 67% to export earnings and engaging 35% of labour force. The entire value chain represents production of cotton, ginning, spinning, weaving, dyeing, printing and finally garments manufacturing. Pakistan has emerged as one of the major cotton textile product suppliers in the world with a market share of about 8% in world cotton cloth trade.

The exact number of factories, having high-speed rotary textile printing and processing units, is not known. However, most of the available units working on Hi-Tec machines are owned by big

industrial and commercial cartels. According to the estimates, textile finishing industry embraces almost 731 units, the majority of which independent and complimentary to the weaving industry. About 650 independent processing units are working in and around Faisalabad, Gujranwala and Karachi, in which about 50 integrated units have complete finishing facilities. The preferred technology for a new finishing unit in Pakistan is recounted below:

Roller Flat bed Printing: This technology has width and colour limitations and has now been largely overtaken by rotary printing.

Rotary Screen Printing: Technologically the most advanced form of printing and also the most highly productive (in terms of printing speed and productivity). Relatively the most economical method of printing (low unit cost) rotary machines are preferred globally owing to their ability to print all colours (upto 32 colour machines now available) without design limitations (as in other machines/processes). High speed and precision machines for associated processes (bleaching, equalizing, screen engraving, curing, stenters, calendaring, etc.) have made this technology comparatively most advanced and internationally acceptable.

The textile printing and processing units in Pakistan have classified into three categories:

- ❖ Those integrated units, which process complete finishing facilities i.e. bleaching mercerizing, dyeing, calendaring and printing. They procure cloth and market, thereafter, under their own brand names. They also occasionally outsource finishing facilities to the traders.
- ❖ Units in this grouping directly compete with the products of integrated units. In terms of quality, design and colours, their product is of same quality as integrated mills, and similar to those integrated units, they also sell their fabrics to the wholesale market.
- ❖ Such units, which do not have complete finishing facilities, fall in this assemblage. They are engaged in bleaching and dyeing and perform more work on job order basis. They also produce cloth from the market place and sell thereafter under their own brand names.

Import of Machinery

At present Pakistan's textile sector has made considerable advances in production capacity and capability in the last five years. Over the last five years this sector has invested \$ 6.0 billion in modernization and higher value addition.

As the current trend is for the establishment of air-jet looms units, open-width processing units, and in printing major strength is of 'rotary' screen printing machines, further investment made for the import of latest machinery for bleaching, dyeing, printing and finishing. Import of textile printing and finishing machines decreased from Rs3.90 billion in 2004-05 to Rs 1.36 billion in 2006-07, thus showing decline of 65%. Import of textile finishing machinery is given in Table-1.

Eco-friendly processing

Textile industries use different chemicals in different processes like, dyeing, finishing, scouring, bleaching, softening, washing etc. The textile chemicals and dyeing industry consume large quantities of water and produces large volumes of wastewater from different steps in the various processes. Wastewater from textile processing and dyeing containing residues requires appropriate treatment before being released into the environment. Interest in eco-friendly processing in textile industry has increased in the current scenario because of increased awareness of environmental issues. Enormous amounts of water and energy are consumed in the production and care of textiles in addition to the transportation of the goods.

The processing sector seems to be mostly affected for there is no adequate disposal of industrial chemical waste the absence of which can adversely impact the textile industry. The processing hence has a vital task ahead for establishment of treatment plants. They need to devise programs to reduce chemical consumption via recycling and use of more concentrated dyes and/or effective chemical formulations will limit volume. At present, the far most important factor is consideration is the carcinogenic effects of the chemicals, which are used for manufacturing dyes and intermediates. These hazardous compounds either directly or indirectly related with acute of the molecule. Some of the very serious diseases like cancer, tumors of the urinary bladder and certain skin diseases has got a connection with these chemicals. Azo dyes are toxic only after reduction and cleavage of the linkage to give aromatic amines. Azo dyes with structures containing free aromatic amines can be metabolically oxidized without Azo reduction.

Colorants and related auxiliaries will remain by far the largest product segment, accounting for almost half of overall total sale. Growth in demand for these products will rebound considerably due to improved pricing and a shift toward more expensive dyes and auxiliaries which provide environmental and/or productivity benefits. Pakistan should also pursue use of these higher value dyes and chemicals to meet standards in key export markets.

Production of cloth

The weaving and made-up sectors have three different sub-sectors in weaving viz. integrated, independent weaving units and power loom sector. Cloth is being produced in both mill and non-mill sectors. Pakistan fabrics range from course to superfine varieties, with coarse and medium varieties consumed locally. The use of coloured cotton being unique and attractive has the potential to become a part of cotton fabric and apparel market but there are some limitations to it. The natural coloured cotton is low in yield usually short staple and weaker in strength. Such a fibre has high maturity as compared to white. There are a large number of vertically integrated units, where production is controlled from fibre to the end product, and then marketed abroad directly.

Table - 1: Import of Textile Finishing Machines

Machines	(Rs. in Million)			
	2003-04	2004-05	2005-06	2006-07
Drying Machines	188	457	511	244
Bleaching Machines	96	957	583	231
Dyeing Machines	1,974	2,260	1,499	672
Dressing finishing machines	137	209	361	152
Coating or Impregnating Machines	157	15	77	59
Total	2,552	3,898	3,031	1,358

Source: Federal Bureau of Statistics, Government of Pakistan.

Production of cloth (mill sector) increased from 568 million sq. meters in 2001-02 to 965 million sq. meters in 2006-07, thus showing an average 12% per annum. Out of total production of 965 million sq. meters cloth during 2006-07 in mill sector, 56% produced in grey form, 30% dyed and printed, 15% blended and 6% bleached. The common complaints about Pakistani fabrics are uneven colours/shades; and the dye bleeds out in the first washing. Category-wise production of cloth (mill-sector) is given in Table-2.

Table-2: Production of Cloth : Category-wise (Mill Sector)
Qty. in '000' sq. Mtrs

Year	Blended	Grey	Bleached	Dyed & Printed	Total
1989-90	47,223	174,565	19,442	53,609	294,839
1990-91	57,534	160,935	16,613	57,829	292,911
1991-92	66,256	158,790	18,345	64,542	307,933
1992-93	67,344	163,213	20,363	74,476	325,396
1993-94	59,835	170,032	15,482	69,565	314,914
1994-95	51,907	180,810	12,008	77,116	321,841
1995-96	61,293	191,492	13,110	61,086	326,981
1996-97	57,198	194,420	11,935	69,942	333,495
1997-98	56,478	206,254	13,032	64,516	340,280
1998-99	64,799	195,687	25,722	98,353	384,561
1999-00	60,607	263,593	11,064	101,926	437,190
2000-01	67,474	277,931	19,939	124,820	490,164
2001-02	77,039	317,247	18,281	155,869	568,436
2002-03	92,612	295,791	32,227	161,515	582,145
2003-04	101,687	332,361	43,841	205,503	683,392
2004-05	82,381	498,095	51,453	292,743	924,672
2005-06	504,899	52,273	78354	279,730	915,256
2006-07	540,675	54,180	80,145	290,350	965,350

Source: Textile Commissioner's Organization, Government of Pakistan.

Exports

The global trade in woven fabric can be classified into two broad categories, cotton and blended fabrics and synthetic and artificial fabric, commonly referred to as man-made fabric. Asia is fast emerging as major source of exports, especially of textiles, to the USA, EC and other countries of the world. Pakistan has emerged as one of the major cotton textile product suppliers in the world market. Pakistan's textile products have become less competitive in the international market during the current fiscal year owing to tough competition from Bangladesh, India and China.

Pakistan export of textile manufactures were US \$ 10 billion during 2006-07, which is 67% of the total exports. Export of cotton fabrics increased from 1.57 billion sq meters worth US \$1.10 billion in 1999-00 to 2.0 billion sq meters worth US \$ 2.03 billion in 2006-07, thus showing an average increase of 14% per annum in terms of value. Export of cotton fabrics from Pakistan is given in Table-3.

The major markets for Pakistan's fabrics are USA, Turkey, Hong Kong, Italy, UK, Bangladesh, Spain and Dubai. Country-wise export of cotton fabrics from Pakistan is given in Table-4.

Table - 3: Export of Cotton Cloth

Year	Quantity (Million sq. meters)	Value (US\$ Million)	Average (\$ sq. Meter)
1999-00	1,575	1,096	0.71
2000-01	1,736	1,035	0.60
2001-02	1,957	1,133	0.58
2002-03	2,036	1,346	0.66
2003-04	2,409	1,711	0.71
2004-05	2,399	1,863	0.78
2005-06	2,634	2,108	0.80
2006-07	2,211	2,026	0.90

Source: Export Promotion Bureau, Government of Pakistan.

Table-4: Country-wise Export of Cotton Cloth (Value US \$ 000)

Country	2003-04	2004-05	2005-06	2006-07
USA	333328	292,185	305,894	192,780
Turkey	117559	143386	172,508	216,468
Hong Kong	108920	109832	124,656	97,296
U.A.E	62935	96817	77,752	58,675
Italy	83121	93987	119,509	131,609
Bangladesh	68067	71080	113,451	119,155
Spain	61848	66096	75,377	77,953
United Kingdom	82815	66615	73,560	57,268
Sri Lanka	42013	54729	87,549	106,646
China	52531	52057	46,822	49,972
Belgium	39531	50508	50,760	60,983
Germany	53928	50488	67,009	70,981
South Africa	39664	50339	67,341	55,315
Saudi Arabia	26410	39895	38,287	25,892
Greece	30696	38356	33,216	32,844
Portugal	25898	30907	29,171	42,353
Canada	20912	24723	23,566	14,005
The Netherlands	15763	18947	25,159	30,046
Iran	7769	18897	6,918	5,555
India	7858	18623	33,945	50,160
Kenya	11447	15334	11,496	14,945
Poland	12526	14887	21,047	19,135
USSR	5676	13814	17,009	33,413
Australia	21,889	18,249	17,180	14,028
Indonesia	5287	7213	13,623	11,226
Kuwait	6523	7130	5,298	4,931
Finland	3444	5934	13,479	12,235
France	17,252	15,912	15,683	10,042
Philippines	4778	5634	5,729	4,330
Denmark	1807	2466	3,097	3,552
Republic of Yemen	1722	2045	1,748	910
Thailand	1151	1440	2,014	2,383
Austria	944	1207	1,544	1,001
Afghanistan	160	388	299	12
Other Countries	3,35,320	3,62,766	4,06,487	3,98,289
Total	1,711,492	1,862,886	2,108,183	2,026,388

Source: Export Promotion Bureau, Government of Pakistan.

To enlarge the exports to \$45 billion by 2013, exporters have to focus on garments and make them increasingly value-added and their brands have to earn a name abroad for quality, style and packaging. ♦