Dyeing and Finishing of Apparel Fabrics

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In connection with legislation affecting the dyeing and finishing of apparel fabrics in the Caribbean Basin, this article presents a brief overview of dyeing and finishing as these processes relate to apparel fabrics. It highlights the major dyeing and finishing processes, recent developments in the dyeing and finishing segment of the U.S. textile industry, the relative importance of dyeing and finishing costs in fabric and apparel production, and dyeing and finishing capabilities in CBERA countries.[2]

Legislation Affecting Dyeing and Finishing of Apparel Fabrics in Caribbean Basin

The United States-Caribbean Basin Trade Partnership Act (CBTPA), enacted as Title II of the Trade and Development Act of 2000, amended the Caribbean Basin Economic Recovery Act (CBERA) to authorize the President to extend additional trade benefits to eligible CBERA beneficiary countries.[3] In part, the legislation grants duty-free and quota-free treatment to imports of qualifying apparel articles assembled in CBERA countries from "fabrics wholly formed in the United States" of U.S. yarns, whether the fabrics were cut to shape in the United States or CBERA countries.[4]

The legislation does not define "fabrics wholly formed in the United States," raising the question of whether the fabrics must be dyed and finished in the United States or whether they can also be dyed and finished in CBERA countries. The interim regulations issued by the U.S. Customs Service to implement the trade benefit provisions of the CBTPA do not specifically address the dyeing and finishing issue.[5] In the absence of a specific statutory

[1] The views expressed in this article are those of the authors, and are not the views of the U.S. International Trade Commission as a whole or of any individual Commissioner.

[2] This article draws on information compiled by Commission staff from a review of the available literature on the issue, and in-person and telephone interviews with U.S. and CBERA textile and apparel industry representatives.

[3] The CBTPA provides for duty-free and quota-free treatment for imports of qualifying textile and apparel articles from CBERA beneficiary countries during a transition period beginning on October 1, 2000, and ending on the earlier of September 30, 2008, or on the date on which the Free Trade Area of the Americas or a comparable free-trade agreement between the United States and CBERA countries enters into force.

[4] If the fabrics are cut to shape in CBERA countries, the garments must be sewn with U.S. thread.

[5] In the interim regulations (published in the *Federal Register* of October 5, 2000 (65 F.R. 59650)), which went into effect on October 1, 2000, Customs defined "wholly formed," when used with reference to fabrics, as "all of the production processes, starting with polymers, fibers, filaments, textile strips, yarns, twine, cordage, rope, or strips of fabric and ending with a fabric by a weaving, knitting, needling, tufting, felting, entangling or other process, [that] took place in a single country."

requirement or regulation, preferential treatment currently is being granted to imports of qualifying apparel articles assembled in CBERA countries from U.S.-formed fabrics, regardless of whether the fabrics were dyed or finished in the United States or CBERA countries.

U.S. Textile Industry Concerns

The U.S. textile industry has expressed concern that these interim regulations effectively grant preferential treatment to apparel assembled in CBERA countries from fabrics made in the United States, but dyed and finished in CBERA countries. According to the domestic industry, the apparel trade benefits for CBERA countries are for the assembly of apparel only, and the legislation does not "state or imply that the beneficiary countries will be permitted to engage in textile manufacturing or finishing operations," other than for a limited exception for fabric knitted in the Caribbean.[6]

Dyeing and Finishing: An Overview

Dyeing and finishing are critical and integral parts of the fabric production process, because a large part of the selling power of an apparel fabric depends on the attributes imparted by dyeing and finishing. Fabrics made for apparel generally come off the weaving loom or knitting machine in a "grey" or unfinished state.[7] As such, the fabrics generally must undergo treatments collectively referred to as "dyeing and finishing" before the fabrics can be cut into garment parts for assembly.[8] For practical and aesthetic reasons, dyeing and finishing generally cannot be done after the fabric is cut into garment parts.[9]

The aesthetic value of apparel fabrics depends mainly on the colors, patterns, and feel of the fabric, characteristics that are largely imparted by the dyeing and finishing of the grey fabrics. These fabrics may undergo bleaching, dyeing, and/or printing to impart the desired color or design. The fabrics may undergo other finishing treatments that change the character of the fabric, such as to add water-repellent or washable properties or to achieve desired fabric shrinkage and stiffness levels, fabric surface effects, and fabric widths. In some cases, the grey fabric may undergo as many as 50 different finishing operations before it is ready for use in apparel.

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[6] Carlos Moore, Executive Vice President, American Textile Manufacturers Institute, letter to the U.S. Customs Service dated December 4, 2000, providing comment on Customs' interim regulations.

[7] Some fabrics are made of colored yarns (e.g., yarn-dyed fabrics) and require few finishing treatments.

[8] Among the treatments that can be applied to fabrics are bleaching, dyeing, printing, stonewashing, and other mechanical finishing, such as preshrinking, shrinking, sponging, calendering, mercerizing, and napping.

[9] Some dyeing and finishing processes occur after apparel assembly, but such processes differ from those under consideration. Following assembly, a garment may be subject to such operations as garment dyeing, printing of designs or logos, or stonewashing.

Dyeing and Finishing Industry in the United States

U.S. producers of apparel fabrics dye and finish their fabrics to differentiate their goods in the marketplace from those of their competitors, whether domestic or foreign. Entry costs in the dyeing and finishing segment of the textile industry can be high, given the significant capital requirements and the fact that dyeing and finishing are highly knowledge-intensive operations. An official of the American Textile Manufacturers Institute estimates that a new dyeing and finishing plant in the United States would require a minimum investment of $50 million. Because of the high fixed capital costs and the large scale of many dyeing and finishing operations, integrated mills need to continuously feed large volumes of fabric from a number of different mills through their dyeing and finishing facilities to maintain economies of scale and, in turn, cost-efficient production.

Firms that dye and finish apparel fabrics include the "vertically integrated mills" and the "fabric finishing mills." The integrated firms tend to be large in size, make a wide range of goods, use multiple plants, and are vertically integrated from yarn spinning through fabric production, dyeing and finishing, and, in some cases, even production of end-use goods. The smaller integrated firms usually are vertically integrated from fabric production through dyeing and finishing. The integrated firms typically finish their own fabrics, although they may have them finished on contract by others, for example, during busy periods or for specialized applications. Some integrated firms also dye and finish fabrics on contract for others as a regular activity or during lulls in their own operations.

The fabric finishing mills are smaller in size but larger in number than the integrated firms. They include mills that specialize in dyeing and finishing purchased fabrics (domestic or imported) and "commission finishers" that dye and finish fabrics on contract for others. Also included are the "converters," which usually do not own plants and equipment, but instead buy grey fabrics from domestic and foreign sources, have them finished on contract, and sell the fabrics at wholesale.

Industry sources have indicated that the integrated firms generally focus more on "basic" fabrics, while the independent finishers tend to dye and finish "semi-basic" and fashion fabrics and novelties. The converters usually have greater flexibility than the integrated firms in the types of fabrics they market, owing to their more limited fixed capital costs. Industry sources indicated that converters tend to respond more quickly to fashion trends and are able to provide apparel companies with smaller runs of fabrics for the latest fashions.

The integrated firms reportedly account for as much as 70 percent of all the fabric dyed and finished domestically. However, these firms usually dye and finish the fabrics in plants that are separate from those in which they make the fabrics. According to the U.S. Census Bureau's *Annual Survey of Manufactures* for 1999, about 75 percent of U.S. producers' shipments of finished broadwoven fabrics by value were finished in such separate plants. Because of the high fixed costs of a dyeing and finishing facility, the integrated firms often send grey fabrics from their weaving plants to one central dyeing and finishing facility. For knit fabrics, by contrast, more than half the U.S. shipments of finished fabrics were made and finished in the same plant.

The domestic dyeing and finishing segment, like the textile industry overall, has been declining in size in recent years. The value of shipments of all finished knit and woven fabrics fell 14 percent during 1997-99 (table 1), with the largest decline occurring in shipments of fabrics that were finished in weaving mills. According to the Census Bureau's *County Business Patterns* for 1999, the number of finishing mills (excluding finishing that occurs in weaving or knitting mills) fell 5 percent from the 1998 level, to 6,044 establishments, while employment fell 14 percent to about 70,000 employees (also includes some workers involved in the dyeing and finishing of non-fabric textiles, such as yarn). The dyeing and finishing segment likely has continued to decline since then. For example, according to U.S. Bureau of Labor Statistics data, seasonally adjusted employment for textile finishing fell 6 percent in 2000 and by an estimated 11 percent in 2001.

Table 1
Finished fabrics: Value of shipments, 1997-99

(*Million dollars*)

Item	1997	1998	1999
Broadwoven fabrics finished in weaving mills	3,155	2,927	2,631
Broadwoven fabrics finished other than in weaving mills	9,107	8,484	7,817
Knit fabrics finished in knitting mills	3,072	2,841	2,684
Knit fabrics finished other than in knitting mills[1]	2,510	2,235	2,232
Total	17,844	16,488	15,363

[1] Estimated, based on data from the U.S. Census Bureau 1997 Economic Census.

Source: U.S. Census Bureau, *Annual Survey of Manufactures*.

Relative Importance of Dyeing and Finishing

Dyeing and finishing of fabrics can be quite complex, and can represent a significant portion of the total cost of producing the finished fabric, depending on the type of finishing treatment; the type, weight, and color of the fabric; and apparel application. For example, industry sources noted that printing a design on a fabric generally adds more value to the fabric than dyeing it in a single color. One mill noted that the printing of designs on grey fabrics can add as much as $3 of value for every $1 worth of grey fabric being processed.

In terms of the cost of manufacturing an apparel fabric, industry sources stated that dyeing and finishing generally account for at least 35 percent of the total cost and can reach as much as 70 to 75 percent of the total. One firm estimated that dyeing and finishing account for about 50 to 54 percent of the total value of woven apparel fabrics and as much as 71 to 78 percent for some knit fabrics, such as dyed knit fabrics for T-shirts and polo shirts.

In terms of the cost of making a garment, the relative importance of dyeing and finishing the grey fabric varies widely, depending on the type of fabric, finishing, and garment. For a garment made from a printed woven fabric, data from one firm show that, on average, the cost of printing and finishing the fabric accounts for 29 percent of the total cost of making the garment. The data also show that the cost of garment assembly accounts for 63 percent of the total garment cost, while the cost of making (weaving) the grey fabric accounts for 8 percent.

For many knitwear articles such as knit tops, dyeing and finishing reportedly account for 8 to 10 percent of the total cost of making the garment. In general, designs are printed on knit tops after the garment has been assembled, rather than before the garment-manufacturing stage. As such, the printing of knit tops is less affected by the dyeing and finishing issue than, for example, shirts and blouses made from woven fabrics, in which the designs are generally printed on the fabrics before the garment-manufacturing stage.

Dyeing and Finishing in CBERA Countries[10]

Several U.S. textile and apparel industry sources have indicated that only small amounts of U.S. fabrics being exported to CBERA countries for cutting and sewing into garments are actually being dyed and finished there. Although U.S. industry sources have noted that many of the Asian-based firms currently producing apparel in CBERA countries for export to the United States have access to financial resources that would enable them to invest in dyeing and finishing facilities in CBERA countries, Asian firms have yet to make such investments.

The production of textiles from yarns to fabrics, including fabric dyeing and finishing, occurs in the major apparel-exporting CBERA countries, including Costa Rica, the Dominican Republic, El Salvador, Guatemala, and Honduras, according to a textile association official in El Salvador. Reportedly, the textile manufacturing facilities in most of these countries date back to the 1960s; however, many of them have been upgraded and modernized over the years. The CBTPA reportedly has prompted new investment in cutting, stonewashing, and dyeing equipment in several countries, particularly the Dominican Republic and Guatemala.[11]

CBERA textile mills reportedly import cotton or manmade fibers primarily from the United States, spin the fibers into yarns, and process the yarns into woven or knitted fabrics. The fabrics are dyed and finished locally, and are sold primarily for local consumption and also for export. According to the textile association official in El Salvador, the average annual installed capacity in El Salvador is estimated at 300 million square meter equivalents (SMEs) of finished knit fabric and 200 million SMEs of finished woven fabric.[12] The El Salvador official estimated that Guatemala's installed capacity is about 20 percent larger than that in El Salvador. Among the textile mills in the CBERA region having dyeing and finishing capabilities are Listex, a large mill in Guatemala; IUSA, a Japanese firm with plants in El Salvador and Costa Rica; and Grupo M in Honduras.■

[10] This section summarizes the limited amount of information that was available to Commission staff on dyeing and finishing operations in CBERA countries. Commission staff was unable to verify the accuracy of the information presented here.

[11] Officials of two Dominican apparel producers, interviews by Commission staff, Santo Domingo, June 6, 2001.

[12] The United States shipped 3.1 billion SMEs of cut garment parts to CBERA countries for assembly in 2000, based on imports of apparel from CBERA countries that entered under U.S. production-sharing provision 9802 (formerly the "807" provision).