Economic Impact Analysis (EIA) for the Fabric Coatings NESHAP

Industry Profile

Prepared for

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SECTION 1

INTRODUCTION

The United States Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards (OAQPS) is developing an industry standard for emissions of Hazardous Air Pollutant (HAP) emissions for the fabric coatings industry. The profile presented here is intended to provide a basic understanding of the industry in support of an Economic Impact Analysis (EIA).

1.1 Category Description

The fabric coatings industry produces a wide variety of products, all of which are created by coating a textile substrate with various polymers. The final product takes on characteristics of both the substrate and the coating. Products made by the industry include air bags, clothing, wall coverings, upholstery, tarpaulins, tents, air inflated structures, and pond liners. The almost infinite variety of combinations of coating and fabric materials allows for the production of highly technical products with specialized performance characteristics. Consequently, coated fabrics can be found serving many different functions in the manufacturing, road building, apparel, aircraft, automotive, boating, transportation, outdoor equipment, mining, and other industries. Despite the wide variety of products, they are all created using similar processes. A coating is dipped, rolled, laminated, or spread onto a fabric substrate.

This report contains federal statistical data that are broken down into the Standard Industrial Classification (SIC) codes and the North American Industry Classification System (NAICS) code. After 1997, NAICS codes replaced SIC codes for all federal statistical data. The NAICS 31332 category is comprised of three segments; vinyl coated fabrics, including expanded vinyl coated; rubber coated fabrics; and other coated or laminated fabrics and coated yarns that are not rubberized. These categories are broken down further into subcategories as shown in Table 1-1.

Table 1-1. Types of Products in Coated Fabrics Industry (NAICS 31332)

Product	8-Digit NAICS Code
Vinyl coated fabrics, including expanded vinyl coated, lightweight fabrics, 10 oz or less per sq yd finished weight	31332011
Vinyl coated fabrics, including expanded vinyl coated, mediumweight fabrics, more than 10 oz up to 16 oz per sq yd finished weight	31332012
Vinyl coated fabrics, including expanded vinyl coated, heavyweight fabrics, more than 16 oz per sq yd finished weight	31332013
Vinyl coated fabrics, including expanded vinyl coated, not specified by kind	3133201Y
Rubber coated fabrics	31332031
Rubber coated fabrics, not specified by kind	3133203Y
Pyroxylin and polyurethane coated fabrics	31332051
Other coated or laminated fabrics, excluding rubberized fabrics	31332052
All other coated fabrics and yarns, all types except rubberized	31332054
Othe coated and laminated fabrics and coated yarns, not specified by kind	3133205Y
Fabric coating mills, not specified by kind, total	313320WY

Source: U.S. Census Bureau. 1999. *1997 Economic Census: Manufacturing—Industry Series*. <http://www.census.gov/prod/ec97/97m3133c.pdf>.

For all data prior to 1997, the SIC codes that cover the fabric coatings industry include SIC 2295 (coated fabrics, not rubberized) and SIC 3069 (fabricated rubber products, not elsewhere classified [NEC]). However, not all of SIC 3069 is part of the fabric coatings industry. In fact, only a small portion is included in the new NAICS 31332 classification, which is the current federal statistical category for fabric coatings. The components of SIC 3069 included in the new NAICS 31332 are rubber coated fabrics; garment and footwear fabrics; inflatable fabrics; and other coated fabrics (automotive and furniture upholstery, hospital and crib sheeting, and protective covering fabrics). In 1992, these components accounted for 2.2 percent of the value of shipments in SIC 3069 (U.S. Census Bureau, 1992a, 1992b). However, these products do account for a significant portion of the products included in NAICS 31332. In 1998, rubber coated fabrics accounted for 9.5 percent of the value of shipments in the NAICS 31332 category (U.S. Census Bureau, 2000a). Because of this discontinuity between SIC and NAICS codes and the lack of availability of

disaggregated data in years other than census years (1987, 1992), the fabric coatings industry is characterized here using SIC 2295 before 1997 and NAICS 31332 for 1997 and later years.

1.2 Environmental Concerns

EPA has determined that the fabric coatings industry is a source of HAPs. The principal source of HAPs is the use of solvents in the production process. EPA administered a survey to 21 facilities in the industry to gather qualitative data providing descriptions of the industrial processes and quantitative data for HAP emissions. The survey results were used to develop a Maximum Achievable Control Technology (MACT) floor for the industry. Results from 20 of the 21 industries were obtained for HAP emissions, the total of which was calculated to be 1,231 tons in 1997 for HAPs from all 20 facilities (Hellwig, 2000). Toulene was the number one hazardous pollutant, making up 47 percent of total HAPs, followed by Methyl ethyl ketone (34 percent), Hexane (8 percent), Dimethyl formamide (3 percent) (all others accounted for 8 percent of the total) (Hellwig, 2000).

Emissions from the production of coated fabrics come from various stages of the industrial process. The preparation of coating materials in mills, mixers, and tanks prior to application; the coating application area; the flash-off area; and the drying ovens are all sources of HAP emissions. Survey respondents indicated that 95.7 percent of all emissions came from the coating application and drying and curing stages of the industrial process. These processes are described in detail in Section 2.1 of this report. Emissions are dealt with by using a capture and a control device. Given the similarity among sources, it is not surprising that similar abatement technologies are used across the industry. Capture devices are typically covers, vents, hoods, and partial and total enclosures (EPA, 1988). The most common control devices are incinerators and absorbers.

1.3 Profile Structure

The supply side of the industry is described in the industry profile, including a description of the production process and its costs. Next is an examination of the demand side of the industry (i.e., the uses and consumers of coated fabric products), followed by a look at the fabric coatings facilities to be regulated, including size and location data and their financial characteristics. Finally, the profile presents the market data to be used in the EIA.

SECTION 2

THE SUPPLY SIDE

This section describes the supply side of the fabric coatings industry. The first part of the section illustrates the production process and describes materials and production techniques. A discussion of production costs follows, giving a detailed summary of the costs suppliers face in the production of coated fabric products.

2.1 Production Process

A similar production process is used to create a wide array of different products in the fabric coatings industry. All products are composed of a fabric substrate, to which a polymer coating is applied, giving the product characteristics of the coating and the fabric. The fabric gives the product strength, structure, and flexibility characteristics. The coating significantly enhances the fabric's performance capabilities and provides qualities such as water repellency, flame retardence, chemical resistance, increased strength, and abrasion resistance. Coatings are composed of the polymer base, solvents, pigments, plasticizers, lubricants, and fillers. These ingredients are prepared in mills and mixers to ready the material for application to the fabric. The coating is applied using a variety of techniques that dip, roll, or spread the coating onto the fabric material. The process must ensure that the fabric is not damaged during coating application. After application, the product passes through a flash-off area on its way to the drying and curing ovens. These ovens mark the final stage of the production process, where the coating is fused to the substrate. A diagram of the production process is shown in Figure 2-1.

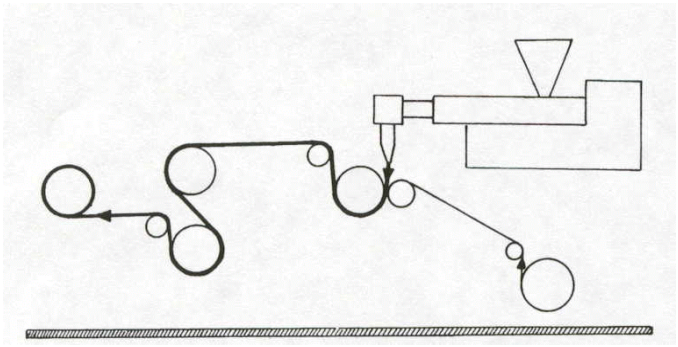

Figure 2-1. Extrusion Coating Plant

Source: Wypych, J. 1988. *Polymer Modified Textile Materials*. New York: John Wiley & Sons.

2.1.1 Substrates

The substrate used depends on the type of product desired. Factors such as tear strength, tensile strength, dimensional stability, and flexibility are heavily influenced by the choice of the textile material and the way in which it is constructed. The strength and weight of a fabric is a function of the construction method, the size and weight of the yarn, and the number of yarns per unit area in the fabric. The most common fabric construction types are weaves, knits, and nonwoven fabrics. Woven fabrics are very strong and are resistant to elongation. Knitted substrates allow the fabric to be stretched and contoured. Stretching allows for tear resistance, but the coating must be able to stretch and flex along with the fabric. Nonwoven fabrics are less expensive to construct, but are not strong unless they are coated. Unlike knits and weaves, a coating must be used to impart stability to a nonwoven fabric.

Cotton, nylon, polyester, polypropylene, rayon, glass, and blends are the most common types of textile materials. Among these, polyester, cotton, and nylon accounted for over 90 percent of coated fabrics sold in 1998 (Industry News, 1999). Nylon is the strongest material used in coated fabrics. Its performance qualities include good abrasion resistance, high tensile strength, wet strength, excellent flexibility and elasticity, and it can be heat set to reduce shrinkage. Although sunlight degrades its performance characteristics, coating can eliminate this problem.

Polyester is not unlike nylon and is used in many similar applications. It is the most commonly used substrate fiber (Industry News, 1999). While polyester is more resistant to environmental degredation, the application of coatings is more problematic. The fibers have a very smooth surface that creates bonding difficulties. Polypropylene is very inexpensive and has the highest weight-to-strength ratio among common fibers. Like polyester, it is difficult to apply a durable coating to polypropylene. It is also easily susceptible to heat damage.

Cotton absorbs and transmits moisture very easily and is commonly used in apparel products. It can act as a barrier under intense heat and is stronger when wet. Rayon is a synthetic form of cotton; it is not as strong as cotton and tends to shrink. Mechanical adhesion is difficult, but chemical adhesion and dyes are easily imparted to the fabric. Glass is used in conveyor belts and other applications where rigid reinforcement. It resists high temperatures, is chemically inert, and has high tensile strength, but breaks easily when bent.

Other high-strength fibers such as kevlar and other carbon fibers are used in the industry for specialized applications.

2.1.2 Coatings

The most common coating materials used in the industry are vinyl (PVC), polyurethane, and rubber compounds. Other compounds, such as acrylic and teflon, are also used to produce coated fabrics. PVC is often the least expensive coating material, but does not always provide the desired product performance qualities. There is no unique solution to polymer choice because different materials can be used to achieve similar results in the end product. The manufacturer's choice of polymer is affected by polymer properties, polymer availability, cost analysis, equipment available, tradition, and environmental protection (Wypych, 1988).

Prior to application, base polymers are mixed in tanks with plasticizers and solvents to adjust viscosity. The viscosity of the coating must permit flow around the fiber surface (Kroschwitz, 1986). Pigments, lubricants, stabilizers, and fillers are also added to the mixture to form the coating material. From the mixing tanks, the coating is transported to the line of production, where it is applied using various techniques discussed later in this report.

PVC is the most commonly used polymer. It is inexpensive and resistant to combustion, chemicals, aging, and abrasion, and it can be applied to the substrate using a variety of techniques. With the use of plasticizers, PVC can be processed into a soft, manageable compound that can be easily applied to a fabric. PVC is used to produce coated products such as tarpaulins, tents, roofing materials, greenhouses, boat covers, boats, conveyor belts, pool covers, rainwear, luggage, automotive upholstery, and a variety of technical protective clothing products (Wypych, 1988).

Polyurethane is another common coating type that can be used for a wide variety of products such as tents, life vests, evacuation slides, flexible fuel storage tanks, and apparel items (Howe-Grant, 1993). Inflatable boats, rainwear, luggage, automotive upholstery, water storage bags, food conveyor belts, and fuel hoses are also made with polyurethane coatings (Wypych, 1988). They provide ultra-violet protection, toughness, and can impart a leather-like feel to the fabric. Like PVC, polyurethanes can create a clear protective finish to decorative products (such as wall coverings). Polyurethane coatings provide more protection from abrasion than PVC but are less elastic.

Rubber or elastomer coatings make up another category of commonly used coatings in the industry. There are an extremely large number of variations of available elastomers, including natural rubber, silicones, acrylics, styrene-butadiene (SBR), polyisoprene, and many more. These different materials can be used to create products that are oil, water, and flame resistant. Rubber or elastomer coatings are used in both latex and solid forms. Rubber coated products are used for rainwear, boats, lifeboats, gymnasium mats, aprons, truck covers, containers, garbage chutes, neoprene wetsuits, roofing materials, protective garments, inflated structures, balloons, and fumigation covers (Wypych, 1988; Howe-Grant, 1993). Solvents are often used with rubber coating processes and add high levels of HAP emissions to the production process.

Acrylic and teflon are also used extensively as coating materials. Acrylic resins are the most common material for a class of products known as geotextiles. These fabric products are used in earth structures. Drainage projects, asphalt construction, erosion control, mining, road building, and earth stabilization projects all make use of geotextiles (Wypych, 1988). Teflon is used to coat glass fabrics in industrial applications such as warehouses, sports halls, exhibition tents, stadiums, swimming pools, gaskets, conveyor belts, public meeting facilities, and other large structures (Wypych, 1988).

The list of products presented above illustrates the wide variety of uses for coated fabrics. It is important to note that the same products may be produced with different materials. As stated earlier, the choice of the coating material will depend on a variety of factors, including end use, cost, traditional local techniques, environmental concerns, and the availability of materials and equipment.

2.1.3 Coating Application Processes

There are various ways to apply coating to the fabric substrate. The method chosen depends on the properties of the substrate and the coating material. In all application types, the fabric is placed under tension and is directed through a system of rollers. Rollers are combined with various types of equipment used to apply the coating material. The most commonly used techniques are reverse-roll coating, calendering, knife-over-roll coating, transfer coating, impregnation, direct-gravure coating, lamination, rotary-screen, and extrusion coating. The coating is usually heated, and care must be taken to ensure that the fabric is not damaged by high temperatures. The coating application process is a source of HAP emissions, which come primarily from the use of solvents in coating materials.

Calendering is the most efficient method of coating. It allows for high speed processing using three vertically arranged rolls. A fabric under tension is passed between two of the rollers, one of which applies the coating. The coating passes over heated rolls before being applied to the substrate (see Figure 2-2). Coatings of 0.1 to 0.5 mm can be applied to the fabric (Kroschwitz, 1986). Rubber and PVC compounds lend themselves well to this coating technique.

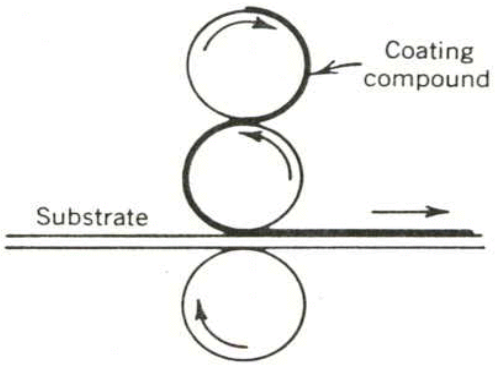

Figure 2-2. Calendering

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

In knife-over-roll coatings, the fabric passes under a blade that spreads the coating onto the fabric. The coating material is placed in front of the knife, and the distance between the knife and the fabric regulates the thickness of the coating (see Figure 2-3). This method is most commonly used in the production of polyurethane-coated fabrics (Howe-Grant, 1993). This process often requires the heavy use of solvents, which creates a larger amount of HAP emissions. The technique is usually used with slow application rates and is most common with thin coatings.

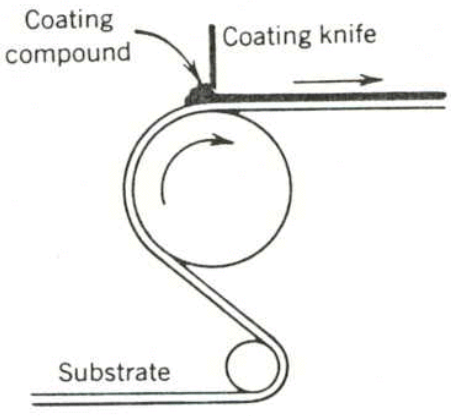

Figure 2-3. Knife-Over-Roll Coating

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

The most expensive coating technique is reverse-roll coating, which uses three precisely ground steel rollers to apply a coating to the fabric (see Figure 2-4). The rolls must have precisely regulated drive speeds to obtain the desired coating effect. Reverse-roll coating is versatile and can be used with the widest variety of coating viscosities and production speeds. The distance between the transfer roll and the backing roll determines the thickness of the coating. This technique commonly makes use of solvents.

Reverse-roll and knife-over-roll techniques often result in heavy penetration of the coating into the fabric. A method known as rotary screen coating is often used to avoid this result. In this technique, the coating material is placed inside a screen roller, and the fabric material passes underneath. The coating passes through the screen and onto the substrate. The size of the holes in the rotary screen regulate coating thickness (see Figure 2-5).

Other less common coating techniques include transfer coating, extrusion and lamination coating, direct gravure coating, and impregnation coating (see Figures 2-6 through 2-10). The transfer technique applies a coating to release paper using a reverse-roll or knife-over-roll technique. The paper is then pressed against the substrate which subsequently peels the coating from the paper. Decorative effects are obtained by embossing designs on the release paper, so this process is commonly used for decorative products. Extrusion and lamination coating processes apply separate films to the fabrics at high speeds and the two are fused together using a melting or adhesive process. The thinnest coatings (as thin

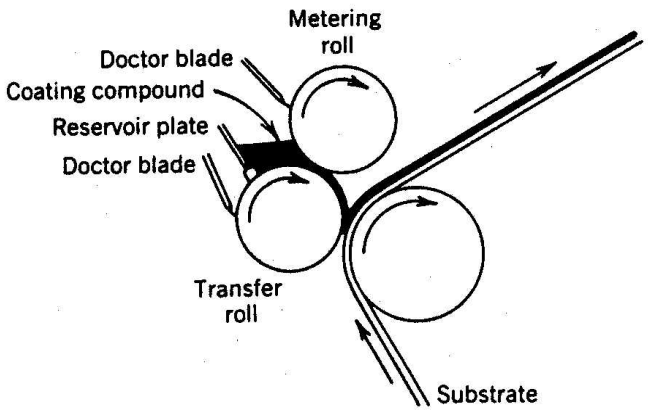

Figure 2-4. Reverse-Roll Coating

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

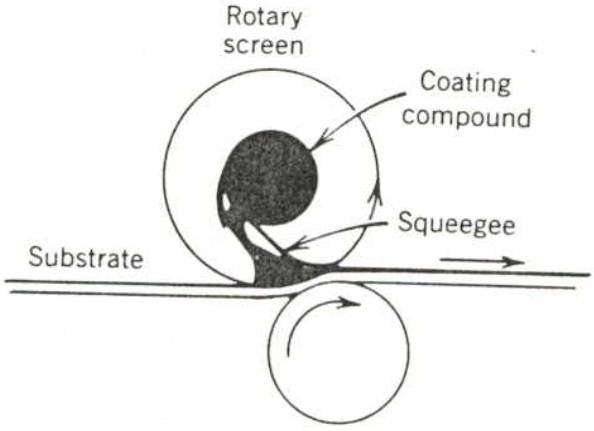

Figure 2-5. Rotary Screen Coating

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

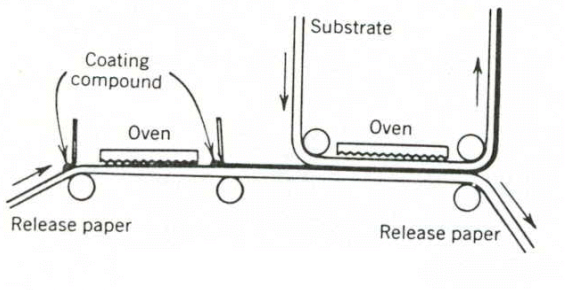

Figure 2-6. Transfer Coating

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

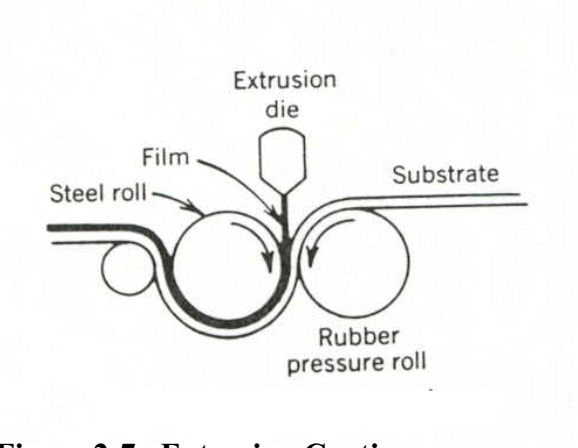

Figure 2-7. Extrusion Coating

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

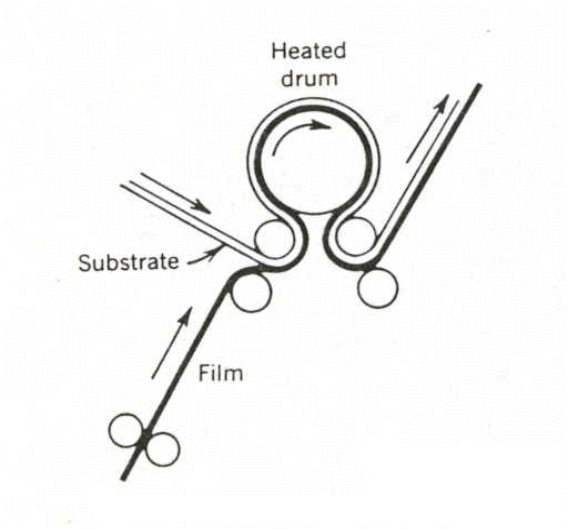

Figure 2-8. Lamination Coating

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

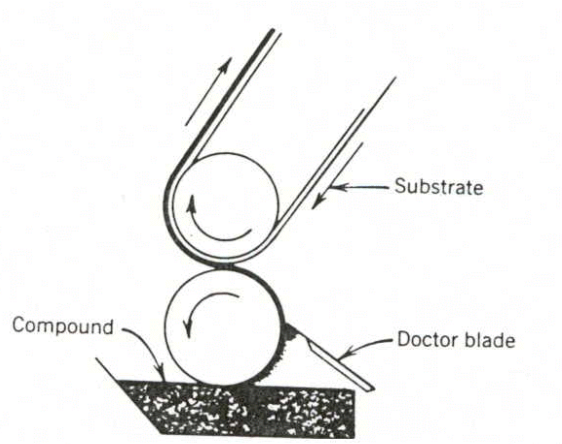

Figure 2-9. Gravure Print Coating

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

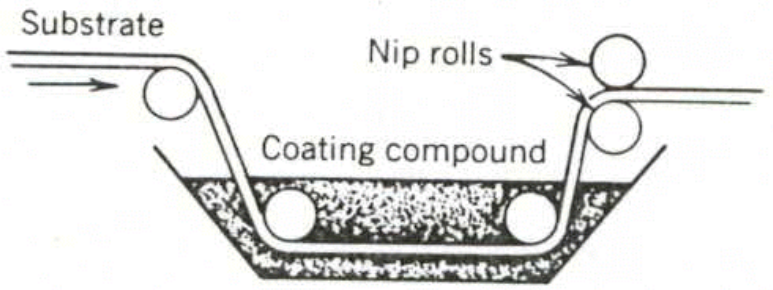

Figure 2-10. Impregnation Coating

Source: Kroschwitz, J.I. ed. 1986. *Encyclopedia of Polymer Science and Engineering. Volume 6: Emulsion Polymerization to Fibers, Manufacture*. New York: John Wiley & Sons.

as .003 mm) are applied using a direct gravure technique (Kroschwitz, 1986). A roller applies an extremely low viscosity compound, which passes by a blade that regulates the amount of coating applied to the fabric. Impregnation coating uses a dipping technique to apply material to the substrate. The fabric passes through rollers and is submerged in the coating material before surfacing and passing through another set of rollers.

The choice of coating technique controls coating thickness, which in turn influences water absorptivity, water permeability, weight, dimensional stability, tensile strength, tear strength, transparency, and elasticity. Different techniques can achieve similar results, and the choice is a function of cost, equipment availability, and traditional preference along with the desired product characteristics.

2.2 Costs of Production

The three primary costs of production for the fabric coatings industry are capital expenditures, labor expenses, and cost of materials.

- As shown in Table 2-1, capital expenditures totaled $74 million in 1997 and represent only 4 percent of the production costs for coated fabrics (U.S. Census

Table 2-1. Production Costs for NAICS 313320, Fabric Coating Mills

	1997 (10^6)	Percentage of Total Cost of Production
Total Cost of Production	1,881	100.0%
Total Capital Expenditures	74	4.0%
Buildings and Other Structures	12	0.7%
Machinery and Equipment	62	3.3%
Total Labor Expenditures	505	26.9%
Annual Payroll	383	20.4%
Fringe Benefits	122	6.5%
Total Cost of Materials	1,301	69.2%
Materials, Parts, Containers, etc.	1,203	63.9%
Resales	38	2.0%
Fuels	20	1.1%
Purchased Electricity	23	1.2%
Contract Work	18	0.9%

Source: U.S. Census Bureau. 1999. *1997 Economic Census: Manufacturing—Industry Series*. <http://www.census.gov/prod/ec97/97m3133c.pdf>.

Bureau, 1999). Buildings and other structures accounted for 16 percent of these expenses, while machinery and equipment made up the remaining 84 percent.

- The industry spent $505 million on labor in 1997, which accounted for 27 percent of total production expenditures. Approximately 76 percent of labor costs were spent on annual payroll, and the remainder went toward fringe benefits (U.S. Census Bureau, 1999).

- By far the largest cost of production for the industry in 1997 was the cost of materials. The $1,331 million spent on materials by the industry constituted about 69 percent of total production costs. Approximately 92 percent of materials costs were for materials, parts, containers, and other such materials. The remaining 8 percent was made up by resales, fuels purchased, electricity, and contract work. Table 2-2 shows the cost of materials consumed by kind for the industry in 1997. Man-made fiber fabrics and other materials make up the largest components of materials consumed in the production process (U.S. Census Bureau, 1999).

Table 2-2. Materials Consumed by Kind, NAICS 31332, 1997

Material Consumed	Delivered Cost ($1,000)	% of Total
Manmade fiber, staple and tow	40,668	3.4%
Yarn, all fibers	43,520	3.6%
Cotton fabrics	84,441	7.1%
Manmade fiber fabrics, including glass	211,829	17.7%
Paper (cellulosic wadding)	15,969	1.3%
Adhesives and binders (resins)	44,794	3.7%
Plasticizers	42,334	3.5%
Vinyl and vinyl copolymer resins, all forms	54,169	4.5%
Plastics resins (except vinyl) consumed in the form of granules, pellets, powders, liquids, etc.	38,707	3.2%
Plastics products consumed in the form of sheets, rods, tubes, film, and other shapes	33,391	2.8%
Ethylene-propylene type plastics and synthetic rubber	2,190	0.2%
SBR-type synthetic rubber	5,221	0.4%
Rubber compounds and mixtures purchased (dry rubber solids content)	12,050	1.0%
Other plastics materials and synthetic resins, synthetic rubber, cellulosic and other manmade fibers, except glass	28,987	2.4%
Natural latex rubber (dry solids content)	D	D
Natural dry rubber	D	D
All other materials and components, parts, containers and supplies	360,154	30.1%
Materials, ingredients, containers and supplies, n.s.k.	178,570	14.9%
Total	1,196,994	100.0%

D = Withheld to avoid disclosing data of individual companies; data are included in higher level totals.

Source: U.S. Census Bureau. 1999. *1997 Economic Census: Manufacturing—Industry Series*. <http://www.census.gov/prod/ec97/97m3133c.pdf>.

SECTION 3

THE DEMAND SIDE

This section gives a detailed illustration of the demand side of the fabric coatings industry. It starts by describing coated fabric products, and then discusses the uses and consumers of coated fabrics and possible substitutes.

3.1 Product Characteristics

The coated fabric's characteristics are a function of the type of fabric used and the coating that is applied to it. The fabric provides the foundation for the product's strength and flexibility characteristics. The coating improves durability, abrasion resistance, flame retardence, oil resistance, chemical resistance, strength, and/or flexibility. Table 3-1 lists the wide variety of product characteristics demanded by consumers of coated fabrics.

Table 3-1 shows the vast array of qualities demanded by the consumers of coated fabrics. The techniques used to achieve these product qualities are variable, and different materials and manufacturing techniques can be used to obtain the same characteristic in the final product. Coated fabric products are produced to meet specialized requirements determined by the end use. For example, the product may be relatively simple and inexpensive, or highly technical and expensive, depending on how it will be used.

3.2 Uses and Consumers

The fabric coating industry produces products for a wide variety of uses and consumers. Coated fabrics can be used for indoor and outdoor apparel, luggage, tarpaulins, equipment covers, wall coverings, automotive uses, tents, air-inflated structures, books, hoses, belts and gaskets, leather imitations, and a variety of industrial uses.

Table 3-1. Variables Essential for Product Development Derived from Applications of Coated Materials

Tensile Strength	Food Contact
Elasticity	Effect of Chemicals
Abrasion Resistance	Microbiological Protection
Tear Resistance	Biological Corrosion
Dimensional Stability	Aging Properties
Interlayer Adhesion	Service Duration
Surface Roughness	Weight
Compatibility	Odor
Joints Formation and Properties	Effect of Temperature
Burning Behavior	Thermal Properties
Water Permeability	Antistatic Properties
Solvent Vapor Permeability	Air Tightness
Light Transparency	Sunlight Reflection
Product Appeal	Colorfastness
	Cleaning Frequency

Source: Wypych, J. 1988. *Polymer Modified Textile Materials*. New York: John Wiley & Sons.

As Table 3-2 indicates, there are a wide variety of products in the industry. It is also important to note that many products are produced with a variety of techniques. For instance, food containers are produced with rubber, polyurethane, and PVC coatings. Similarly, clothing products are made with all three types of coatings. Although various coatings can provide the same function, many specialized products are only made with specific coating materials, such as arctic fuel drums and fabrics used to control erosion (Wypych, 1988).

The wide variety of uses and applications for coated fabrics translates into an equally wide variety of industries and consumers that use them. Automotive, apparel, furniture, wallcovering, book, tent, road building, and many other industries all make extensive use of coated fabrics. Table 3-3 presents the markets that demand coated fabrics. In a 1993 report on the industry, the United States International Trade Commission (USITC) gives another a

Table 3-2. Coated Fabric Products and the Materials Used to Make Them

Coated Fabric Product	Produced with PVC Coated Materials	Produced with Polyurethane Coated Materials	Produced with Rubber Coated Materials	Produced with Acrylic Coated Materials	Produced with Teflon Coated Materials
Air inflated structures			✓		
Aprons			✓		
Arctic fuel drums		✓			
Asphalt construction				✓	
Automotive upholstery	✓	✓			
Awnings	✓				
Boat Covers	✓		✓		
Boats	✓		✓		
Chimney covers	✓				
Clothing	✓	✓	✓		
Collapsible containers	✓	✓	✓		
Collapsible fuel tanks		✓			
Conveyor belts	✓	✓			✓
Devices to reduce escape of vapors			✓		
Earth stabilization				✓	
Erosion control				✓	
Factory curtains			✓		
Flexible space dividers	✓				
Food containers	✓	✓	✓		
Footwear	✓	✓	✓		
Fuel hoses		✓	✓		
Garbage chutes			✓		
Gaskets					✓
Greenhouses					
Gymnasium mats			✓		
Home furnishings	✓	✓			
Inflatable boats		✓	✓		
Large buildings and structures					✓
Life jackets		✓			
Luggage	✓	✓			
Membranes			✓		
Mining				✓	
Oil ring shelters			✓		

(continued)

Table 3-2. Coated Fabric Products and the Materials Used to Make Them (continued)

Coated Fabric Product	Produced with PVC Coated Materials	Produced with Polyurethane Coated Materials	Produced with Rubber Coated Materials	Produced with Acrylic Coated Materials	Produced with Teflon Coated Materials
Pool covers	✓				
Pool liners	✓				
Rainwear	✓	✓	✓		
Road building				✓	
Roof sealants		✓			
Silos	✓				
Sliding roofs	✓				
Sportswear	✓	✓	✓		
Storage bags	✓	✓			
Swimming Pools				✓	
Tarpaulins	✓	✓	✓		
Tents	✓	✓			✓
Truck Covers	✓		✓		
Ventilation Ducts	✓				
Ventilation Tubing			✓		
Warehouses					✓

Source: Wypych, J. 1988. *Polymer Modified Textile Materials*. New York: John Wiley & Sons.

account of industries that use coated fabrics. These industries and the factors that influence their demand are shown in Table 3-4. These industries range from the military and aerospace industries to apparel and homefurnishings. The automotive sector is the largest consumer of coated fabrics, (USITC, 1993). For each industry, there are specific factors that influence their demand for products. However, in general, demand closely follows changes in general economic activity, (USITC, 1993).

3.3 Substitutes

The presence of substitutes is important because they are a critical determinant of demand elasticity. Demand will be far more elastic for goods that have readily available substitutes with comparable price and performance qualities. The principal substitutes for coated fabrics are uncoated fabrics and leather, rubber or plastic products that do not have a

Table 3-3. Coated Fabric Demand by Product Market

Market	Percent of Demand
Motor Vehicles	26%
Furniture	19%
Industrial	10%
Wallcoverings	9%
Protective Clothing	9%
Books	6%
Awnings	5%
Non-auto Transportation	5%
Tents and Other	11%

Source: Freedonia Group. 1999. *Coated Fabrics in the United States to 2003—Introduction, Executive Summary, Market Environment, Coated Shipments, Demand and Markets*. Available at <http://www.profound.com/htbin/titles_do>.

fabric substrate. For example, uncoated canvas fabric is sometimes used for tents. Also, plastic sheets can be used as tarpaulins or rain ponchos. Imitation leather products are typically made with polyurethane coated fabrics. Consequently, authentic leather products are substitutes for the imitations. Coated fabrics tend to perform better than fabrics that are not coated; they can be stronger, more waterproof, or exhibit other qualitites presented earlier in this section that cannot be achieved from an uncoated fabric product. Similarly, materials that lack a fabric substrate are not as stable and resilient as a coated fabric product. Consequently, there are not many substitutes for coated fabrics that exhibit comparable performance characteristics. However, coated fabrics can be substituted for one another, as various types of fabrics and coatings can be combined to perform similar tasks.

Table 3-4. Coated Fabrics: Principal U.S. Industries and Factors Affecting Demand

Industry	Demand Factors
Aerospace	Space programs and developmental projects; military spending on aircraft; replacement of aircraft or parts by commercial airlines.
Apparel and footwear	Styles and fashion; improved characteristics (i.e., breathability and moisture absorbency)
Automotive	New products, (i.e., air bags); interior style change (i.e., cloth seats); substitibility for other materials (i.e., plastics)
Chemicals and oil	Environmental awareness; new EPA regulations; change in storage and shipping capacity
Construction and building	Expansion of infrastructures; housing starts; repairing of existing civil engineering projects
Homefurnishings	Awareness of home energy conservation; home decorating; popularity of leisure and casual furniture
Luggage	Economic conditions affecting the travel industry; styles and fashion
Marine and boating	Popularity of water-related activities; favorable climatic conditions
Medical and health	Public and institutional awareness of confinement of contagious diseases; disposable versus reusable products; new medical discoveries and applications
Military	Shortage of required equipment; international armed conflict; change in number of active-duty and reserve forces
Recreation and sports	New sports facilities; promotion of physical fitness and individual conditioning; more individual leisure and recreational time

Source: U.S. International Trade Commission (USITC). 1993. *Industry and Trade Summary: Coated Fabrics.* Washington, DC: U.S. International Trade Commission.

SECTION 4

INDUSTRY ORGANIZATION

This section provides information for describing firms' behavior within the market for fabric coated products. Data for location of coating facilities are provided, along with a description of market structure in terms of key estimates of industry construction.

4.1 Market Structure

Market structure is of interest because it determines the behavior of producers and consumers in the industry. In perfectly competitive industries, neither consumers nor producers can affect the prices of goods. In addition, producers are unable to affect the price of inputs purchased for use in their products. This condition most likely holds if the industry has a large number of buyers and sellers, the products sold and inputs used in production are homogeneous, and there is free entry and exit for firms in the industry. Entry and exit of firms are unrestricted for most industries, except in cases where one firm holds a patent on a product, where the government regulates who is able to produce output (like in the utility industries), where one firm owns the entire stock of a critical input (as in the diamond industry), or where a single firm is able to supply the entire market. In industries that are not perfectly competitive, producer and/or consumer behavior can affect price considerations.

Concentration ratios (CRs) and Herfindahl-Hirschmann indices (HHIs) can provide some insight into the competitiveness of an industry. The U.S. Department of Commerce reports these ratios and indices for the four-digit SIC code level for 1992, which is the most recent year available. CRs are typically measured in two ways: the CR4 gives the percentage of sales for the top four companies in an industry, and the CR8 is the percentage of sales for the top eight companies in an industry. Table 4-1 shows the measure of market concentration for fabric coatings companies in 1992.

The criteria for evaluating the HHIs are based on the 1992 Department of Justice's Horizontal Merger Guidelines. According to these criteria, industries with HHIs below 1,000 are considered unconcentrated (i.e., more competitive), those with HHIs between 1,000 and 1,800 are considered moderately concentrated (i.e., moderately competitive), and

Table 4-1. Measure of Market Concentration for Fabric Coatings Companies: 1992

SIC	Number of Companies	Value of Shipments	CR4	CR8	HHI
2295	186	1,528.1	20	34	228
3069	984	6,937	18	26	129

Source: U.S. Census Bureau. 1992c. *Concentration Ratios in Manufacturing*, *MC92-S-2*. Available at http://www.census.gov/mcd/mancen/download/mc92cr.sum>.

those with HHIs above 1,800 are considered highly concentrated (i.e., less competitive). In general, firms in less concentrated industries are more likely to be price takers, while those in more concentrated industries have more ability to influence market prices. Based on these criteria, the fabric coatings industry is considered unconcentrated.

4.2 Manufacturing Facilities

EPA has identified 261 facilities that produce coated fabrics. The location (by state) of these facilities is shown in the map in Figure 4-1. Most production for the industry is concentrated in the eastern part of the country. Massachusetts has the greatest number of manufacturing facilities (37). North Carolina is second (28), followed by New York (21), New Jersey (19), and Ohio (17). There are 16 states without any facilities that produce coated fabrics. These are mostly concentrated in the western United States, but Vermont, West Virginia, Mississippi, and Oklahoma are also without any facilities.

4.3 Industry Production and Capacity Utilization

The U.S. Census Bureau collects data for capacity utilization rates industries across the manufacturing sector. Capacity utilization is defined as the ratio of actual value of production to the level at which a plant can produce at full production capacity. These data can indicate the health of an industry—a low rate of capacity utilization indicates the presence of idle capital equipment and lower than expected production rates. As shown in Table 4-2, census data for plant capacity utilization for SIC 2295 (coated fabrics, not rubberized) reveal approximately an 80 percent capacity utilization rate for facilities in the industry.

Figure 4-1. Facility Locations

Table 4-2. Full Production Capacity Utilization Rates by Industry: Fourth Quarters 1993–1998

SIC 2295-Coated Fabrics, Not Rubberized	1998	1997	1996	1995	1994	1993
Capacity Utilization Rate	78	84	79	81	83	82

Source: U.S. Census Bureau. 2000b. *Survey of Plant Capacity (1998): Current Industrial Reports.* <http://www.census.gov/1prod12000pubs/mqcl-98.pdf>.

Data provided to EPA by an industry trade association indicate a much lower capacity utilization rate than the census data reveal. These data show an average capacity utilization rate of only 43 percent for facilities that engage in the production of coated fabrics and related textile products. This very different capacity utilization rate may reflect a period of relatively low demand during which a substantial share of productive capital was idle. It may also represent a subset of the industry that was experiencing a more significant decline.

4.4 Facility Employment

Census data taken for the 31223 NAICS category facilities reveals a relatively even dispersion of facility employment sizes up to about 250 workers. As shown in Table 4-3, there are only six facilities that employ more than 250 workers. The smallest employment size category, with between one and four workers, has the largest number of operating facilities (59). This represents 23 percent of the 258 facilities that make up the 31332 NAICS category. The next largest employment size category has between 20 and 49 workers. There are 55 facilities in this grouping (21 percent of the total). It should be noted that these figures are for the facility level, not the company level. Company employment data are presented in Section 4.5.

Table 4-3. Distribution of Facilities by Employment

Employment Range	Number of Facilities	Share of Total
1-4	59	22.9%
5-9	43	16.7%
10-19	35	13.6%
20-49	55	21.3%
50-99	34	13.2%
100-249	26	10.1%
250-499	6	2.3%

Sources: Hoover's Online. 2001. *Companies and Industry*. Available at <http://www.hoovers.com/companyindustry/0,1334,8,00.html>.

. Lycos Companies Online. 2001. *Company Research*. Available at <http://www.companiesonline.com>.

Gale Group. 2000. INFOTRAC Database. <http://infotrac/galegroup.com>. Farmington Hills, MI: Gale Group.

Lexis/Nexis. 2001. Academic Universe Database. <http://web.lexis-nexis.com/universe>. Bethesda, MD: Lexis/Nexis.

Facilities of various sizes tend to have similar cost structures. Table 4-4 shows facility expenditures for wages, materials, and capital by size category for facilities in NAICS 31332 in 1997. The smallest facility size category has between one and four workers. For this grouping, wages constitute 14 percent of the total for these expenditures, materials make up 81 percent, and capital expenditures are 5 percent of the total. Similarly, the size category with 20 to 49 workers spends 14 percent of these outlays on wages, 83 percent on materials, and 3 percent on capital. The largest facilities spent more on wages and capital than their competitors in 1997. Approximately 18 percent of money spent on wages capital and materials went towards wages, 73 percent was for materials, and capital expenditures made up the remaining 8 percent.

Table 4-4. Costs of Production by Facility Size, 1997

Industry Segment Cost Component	Number of Employees						
	1 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100 to 249	250 to 499
313320 Fabric Coating Mills							
Wages (10^6)	1.80	4.43	7.45	31.69	43.05	88.76	45.49
Total Materials (10^6)	10.34	22.94	55.70	185.08	350.45	492.19	181.51
Capital Expenditures (10^6)	0.55	1.27	3.06	7.23	12.03	28.99	21.32
Number of Facilities	59	43	35	55	34	26	6

Source: U.S. Census Bureau. 1999. *1997 Economic Census: Manufacturing—Industry Series.* <http://www.census.gov/prod/ec97/97m3133c.pdf>.

4.5 Companies

Potentially directly affected companies include entities that own coated fabrics manufacturing plants. The chain of ownership may be simple as one plant owned by one company or as complex as multiple plants owned by subsidiary companies. Based on survey and secondary source data, EPA identified 230 ultimate parent companies that own and operate the directly affected fabric coatings facilities. For the economic analysis, EPA

obtained company sales and employment data from survey data or one of the following secondary sources:

- Dun & Bradstreet Market Identifiers (Lycos Companies Online, 2001);
- Academic Universe (Lexis/Nexis, 2001);
- General BusinessFile International (Gale Group, 2000); or
- Hoover's Company Profiles (Hoover's Online, 2001).

Sales and employment data were available for 169 of the 230 companies and are included in Appendix A.

4.5.1 Small Business Identification

The Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996, requires EPA to give special consideration to small entities affected by federal regulation. Companies operating fabric coatings manufacturing plants can be grouped into small and large categories using Small Business Administration (SBA) general industry size standard definitions. The SBA defines small business in terms of the sales or employment of the owning entity, and these thresholds vary by the industry classification (NAICS code). Businesses within the NAICS 31332 industry category that have 1,000 or fewer employees are considered small by the SBA (U.S. SBA, 2001).

Table 4-5 shows the large number of facilities in this industry that employ a small number of workers. Based on survey and secondary source data, EPA identified 230 parent companies that own and operate the directly affected fabric coatings facilities. Employment and sales data were available for 169 of the 230 companies. Only 18 percent of the companies identified by EPA as owners of affected facilities employ more than 1,000 workers. Using the SBA definition of a small business, 57 percent of the companies identified fall in the small business category. This is probably an underestimate of the proportion of small businesses in the industry. It is likely that a relatively large share of companies for which data are not available are small, because small businesses are less likely to be found in publicly available financial databases.

The table also shows that there is a relatively even dispersion of employment size categories within the industry. For example, 13 percent of companies employ less than 50

Table 4-5. Employment Size Distribution of Companies

Employment Range	Number of Companies	Percent
0 to 49	30	13%
50 to 99	22	10%
100 to 249	37	16%
250 to 499	27	12%
500 to 999	13	6%
1,000 to 4,999	15	7%
>5,000	25	11%
NA	61	27%
Total Companies	230	100%

Sources: Hoover's Online. 2001. *Companies and Industry*. Available at <http://www.hoovers.com/companyindustry/0,1334,8,00.html>.

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workers, 10 percent employ between 50 and 100, and 12 percent employ between 250 and 500 people. The employment size category with 100 to 249 employees per company had the largest number of companies in the identified grouping with 37 companies (16 percent of the total).

Table 4-6 shows a frequency distribution of companies in the industry by sales. As with employment data, sales data were not available for 61 of the 230 identified companies. Companies with more than $1 billion in annual sales made up approximately 10 percent of the identified firms. Twenty-two percent of the companies had more than $100 million. Thirty percent of companies had less than $25 million in sales. Once again, this is most likely a substantial underestimate, because it does not include the companies for which data are not available (these companies are most likely small).

Table 4-6. Sales Size Distribution of Companies

Sales Range (10^6)	Number of Companies	Percent of Total
0 to 4	19	8%
5 to 9	11	5%
10 to 24	39	17%
25 to 49	31	13%
50 to 99	20	9%
100 to 499	24	10%
500 to 999	4	2%
1,000 to 5,000	15	7%
>5,000	6	3%
NA	61	27%
Total	230	100%

Sources: Hoover's Online. 2001. *Companies and Industry*. Available at <http://www.hoovers.com/companyindustry/0,1334,8,00.html>.

. Lycos Companies Online. 2001. *Company Research*. Available at <http://www.companiesonline.com>.

Gale Group. 2000. INFOTRAC Database. <http://infotrac/galegroup.com>. Farmington Hills, MI: Gale Group.

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The large number of small firms in the industry is in part the result of significant structural change in recent years. The fabric coatings industry has seen the entry of many small, highly specialized firms. Between 1987 and 1992, the industry realized a net gain of almost 30 firms (USITC, 1993). Most of these new firms are believed to be very small manufacturers of high performance textiles with special properties for specific end-use applications. The trend towards specialization can be explained primarily by the fact that these products often have very specific capital equipment requirements for their production (USITC, 1993).

SECTION 5

MARKETS

This section examines market volumes and prices for the fabric coatings industry. It starts by examining trends in product shipments for the industry. This discussion is followed by a presentation of market price data. Next is a brief analysis of the industry's future outlook. Finally, foreign trade issues are examined, along with export and import data.

5.1 Value of Shipments

Table 5-1 shows the trends in employment and shipments for the industry from 1985 through 1998. It is clear from these data that while there has been an expansion in shipments over this time, employment has not increased significantly. For SIC 2295, value of shipments increased approximately 55 percent from 1985 to 1996 (U.S. Census Bureau, 2000a). Conversely, employment increased a paltry 1 percent over the same period. Thus, increased production can be explained by an increased productivity per worker rather than by the addition of more workers. The decline in the average number of production workers in the industry is the result of an increased emphasis on capital investments and the greater efficiency of machinery (USITC, 1993).

The value of shipments by product type has been fairly stable over the past decade. Table 5-2 presents data from a Freedonia Group report from August of 1999. It shows that the proportion of total shipments accounted for nonrubber-coated fabrics was 71 percent in 1989, 71 percent in 1993, and 72 percent in 1998. The report predicts that these numbers will jump to 74 percent and 76 percent, respectively, in 2003 and 2008. Rubber-coated fabrics made up 17 percent of total shipments in 1989, 19 percent in 1993, 17 percent in 1998, and are predicted to be 16 percent in 2003 and 15 percent in 2008. Finally, fabric-backed wallcoverings accounted for 11 percent of total shipments in 1989. The proportion is predicted to be 9 percent in 2003 and 8 percent in 2008 (Freedonia, 1999).

Table 5-1. General Trends: 1985–1998

Year[a]	Value of Shipments (10^6)	Employment	Value of Shipments/Employee (10^6)	New Capital Expenditures[b] (10^6)
SIC 2295				
1985	$1,228.2	10,400	$0.1181	$33.9
1986	$1,172.0	9,700	$0.1208	$37.4
1987	$1,433.7	10,300	$0.1392	$63.4
1988	$1,509.4	10,300	$0.1465	$38.7
1989	$1,542.7	9,400	$0.1641	$59.8
1990	$1,361.8	8,900	$0.1530	$52.9
1991	$1,298.4	8,000	$0.1623	$54.5
1992	$1,528.1	9,200	$0.1661	$47.1
1993	$1,773.3	9,900	$0.1791	$55.8
1994	$1,804.3	10,800	$0.1671	$75.2
1995	$1,827.9	11,100	$0.1647	$74.8
1996	$1,906.1	10,500	$0.1815	$89.8
NAICS 31332[c]				
1997	$2,256.7	11,592	$0.1947	$74.39
1998	$2,304.2	11,441	$0.2014	$47.686

[a] Data from 1993–1996 were taken from U.S. census annual surveys of manufactures for those years. Data from 1985–1992 were taken from 1992 U.S. census data. Data from 1997–1998 were taken from U.S. census annual survey of manufactures for NAICS 31332 for 1997–1998.

[b] The 1997–1998 survey of manufactures refers to capital expenditures as "total capital expenditures," rather than "new capital expenditures," which was the term used for data from previous years.

[c] Data for 1997–1998 are for NAICS code 31332, which includes "rubber coated fabrics." These products were not previously classified under the SIC code 2295. In 1998, "rubber coated fabrics" accounted for 9.5 percent of the value of product shipments for coated fabrics included in the NAICS 31332 product class.

Source: U.S. Census Bureau. 2000a. *Annual Survey of Manufactures—Industry Statistics*. <http://www.census.gov/prod/2000pubs/M98-as1.pdf>.

Table 5-2. Coated Fabrics Shipments by Type: 1989–2008 (10^6)

Product	1989	1993	1998	2003	2008
United States GDP (10^9)	5,439	6,558	8,511	1,075	13,550
$ Fabric/million $ GDP	374	342	331	319	304
Nonrubber-Coated Fabrics	1,459	1,585	2,052	2,555	3,150
Rubber-Coated Fabrics	351	431	484	550	630
Fabric-Backed Wallcoverings	226	226	285	310	340
Total Coated Fabric Shipments	2,036	2,242	2,821	3,415	4,120

Source: Freedonia Group. 1999. *Coated Fabrics in the United States to 2003—Introduction, Executive Summary, Market Environment, Coated Shipments, Demand and Markets*. Available at <http://www.profound.com/htbin/titles_do>.

Table 5-3. Coated Fabrics Pricing Trends: 1989–2008 (10^6)

Year	1989	1993	1998	2003	2008
Coated Fabrics Demand (million sq yards)	355	401	525	635	770
$/sq yd	5.22	5.17	4.72	4.54	4.39
Coated Fabrics Demand (10^6)	1,854	2,072	2,480	2,880	3,380

Source: Freedonia Group. 1999. *Coated Fabrics in the United States to 2003—Introduction, Executive Summary, Market Environment, Coated Shipments, Demand and Markets*. Available at <http://www.profound.com/htbin/titles_do>.

5.2 Market Prices

Price data for the fabric coatings industry are presented in Table 5-3. The table shows that prices in dollars per square yard of coated fabric were $4.72 in 1998, according to a Freedonia Group report from August of 1999. Prices for coated fabrics fell roughly 10 percent between 1989 and 1998. The report predicts a similar decline through 2008. Because of the wide range and variability of coated fabric products, the price per yard also

varies widely and specialized, highly technical products are more costly. Disaggregated price data were not available.

5.3 Future Outlook

Shipments of coated fabrics are forecast to increase 3.9 percent annually until 2003 (Freedonia Group, 1999). This represents a decline in growth from the mid-1990s, when demand was high due to a rebound from the recession of the early 1990s. The Freedonia Group (1999) forecasts that average prices for coated fabrics will continue to decrease through 2008.

Parts of the industry are expected to expand. The increased use of airbags with the addition of side-impact airbags, under-dash airbags, and expanded use of airbags in trucks will create an increase in demand for coated nylon. Industry segments of nonautomotive transport equipment (boat and truck covers), protective clothing, awnings, and canopies are also expected to have increased demand. Table 5-4 shows the demand over time from 1989 through 2008 by market sector. It shows that for all sectors except industrial uses, the growth in demand from 1998 through 2008 is expected to decline from the levels

Table 5-4. Coated Fabrics Demand (million sq yards)

						Percent Annual Growth	
Coated Fabrics Demand	**1989**	**1993**	**1998**	**2003**	**2008**	**1989–1998**	**1998–2008**
Coated Fabrics Demand	355	401	525	635	770	4.4	3.9
Motor Vehicles	79	96	137	182	236	6.3	5.6
Furniture	74	79	101	115	135	3.5	2.9
Industrial	46	49	53	61	68	1.6	2.5
Protective Clothing	28	34	47	56	65	5.9	3.3
Wall Coverings	37	38	45	47	51	2.2	1.3
Book Coverings	27	30	32	34	36	1.9	1.2
Awnings and Canopies	14	15	27	33	40	7.6	4
Nonautomotive Transportation Equipment	12	15	25	36	53	8.5	7.6
Commercial Tents	11	13	18	21	25	5.6	3.3
Other Markets	27	32	40	50	61	4.5	4.3

Source: Freedonia Group. 1999. *Coated Fabrics in the United States to 2003—Introduction, Executive Summary, Market Environment, Coated Shipments, Demand and Markets*. Available at <http://www.profound.com/htbin/titles_do>.

experienced by the industry from 1989 through 1998.

5.4 International Trade

When compared to the textile industry in general, the fabric coatings industry has fared extremely well in the face of increased foreign competition. Unlike the broader textile goods industry, the coated fabrics industry has not seen a significant decline in employment over the past decade (Heil and Peck, 1998). It is clear that trade activity overall has increased because of the industry's increasingly global nature (Smith, 1999). Import and export sales totals rose 30 percent from 1989 to 1998. However, despite the growth of the industry abroad and an increase in imports, exports have also increased. Actually, the trade surplus for the United States doubled from $170 million in 1993 to $341 million in 1998. This growth came after a 7 percent decline in net exports from 1988 to 1993. The increase in net exports is expected to continue through 2008. Net exports are forecast to be $535 million in 2003 and $740 million in 2008 (Freedonia, 1999). Table 5-5 shows data from the 1999 Freedonia Group report.

Table 5-5. Coated Fabrics Foreign Trade: 1989–2008 (10^6)

	1989	1993	1998	2003	2008
Coated Fabric Shipments	2,036	2,242	2,821	3,415	4,120
Exports	480	400	677	985	1270
Imports	298	230	336	450	530
Net Exports	182	170	341	535	740
Sales	1,854	2,072	2,480	2,880	3,380
Imports as Percent of Sales	16.1	11.1	13.5	15.6	15.7
Exports as Percent of Shipments	23.6	17.8	24	28.8	30.8

Source: Freedonia Group. 1999. *Coated Fabrics in the United States to 2003—Introduction, Executive Summary, Market Environment, Coated Shipments, Demand and Markets*. Available at <http://www.profound.com/htbin/titles_do>.

While US producers have been able to dominate the domestic market for high priced items, imports of lower priced items have increased dramatically. U.S. imports of coated fabrics rose by 33 percent from 1988 to 1992 (USITC, 1993). Imported products are usually lower priced items, such as imitation leather and other consumer goods where small

variations in quality are not critical. Canada was the largest supplier of imports from 1988 to 1992, supplying 28 percent of imports by value. Others suppliers were Germany, Taiwan, Italy, and Japan, which collectively supplied 39 percent of the value of imported products (USITC, 1993).

Larger manufacturers supply the greatest proportion of US exports (USITC, 1993). These products tended to be high quality, high priced, industrial-use products with specific applications. U.S. producers have a reputation of producing high quality products with high levels of consistency. The United States is increasingly less competitive in markets for lower priced consumer goods. The largest export markets for U.S.-produced coated fabrics were Canada, Japan, and Europe from 1988 to 1992. However, in developing countries, the market for fabrics that prevent water pollution and contamination is expected to expand considerably (USITC, 1993).

The increase in production of coated fabrics abroad is important when considered within the context of an increasingly strict regulatory environment in the United States. Environmental issues can be expected to have more of an impact on where goods are produced than will the economics of production because compliance costs are becoming a major portion of production costs (Smith, 1999). Unless foreign producers are also facing an increase in regulatory costs, a well developed foreign industry is likely to become even more competitive with the coated fabrics industry in the United States.

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APPENDIX A

FABRIC COATINGS COMPANIES

Table A-1. Fabric Coatings Companies

Company Name	Employment	Sales
A & S Glass Fabrics Company, Inc.	40	35.00
AF Junker Company	4	3.75
A. S. Browne Manufacturing Company	NA	NA
Advance Fiber Technologies Corporation	NA	NA
Albany International	7,164	853.00
Albert Trostel & Sons, Inc.	3,500	500.00
Alco Industries, Inc.	2,000	225.00
Aldan Industries, Inc.	200	15.00
Alpha Associates, Inc.	105	35.00
Amerbelle Corporation	300	26.00
American Combining Corporation	NA	NA
American Felt & Filter Company	250	30.00
American Tape Company	NA	NA
American Waterproofing	NA	NA
American White Cross, Inc.	NA	NA
Ames Rubber Corporation	453	47.76
Arkwright Mills	6	35.00
Armstrong Holdings, Inc	18,300	3,443.80
Ashaway Line & Twine Manufacturing Company	85	15.00
Athol Corporation	230	47.00
Atlantic Bag Company	NA	NA
Auburn Manufacturing, Inc.	85	4.80
Aurora Bleachery	128	18.00
Bando Manufacturing of America, Inc.	153	13.80
Barbour Threads, Inc.	207	38.75
Bennett Goding & Cooper	NA	NA

(continued)

Table A-1. Fabric Coatings Companies (continued)

Company Name	Employment	Sales
Berkley, Inc.	768	190.00
Bettcher Industries, Inc.	155	10.00
BF Goodrich	27,044	4,364.00
Bibb Company	NA	NA
Bloomsburg Mills, Inc.	470	50.00
BondCote	NA	NA
Bradford Dyeing Association	250	17.00
Bradford Industries, Inc.	177	53.00
Buffalo Weaving and Belting	50	15.00
Bridgestone Corporation	101,489	20,403.00
Burke Narrow Fabric Corporation	NA	NA
Burlington Industries, Inc.	17,900	1,620.20
Burrell Leder Beltech, Inc.	90	35.00
Cadie Products Corporation	70	10.00
Carolina Mills, Inc.	2,500	200.50
CEBI Norton	NA	NA
Champion Dyeing & Finishing Company, Inc.	71	15.00
Chase Corporation	347	68.50
Chemfab Corporation	738	126.48
Chemprene, Inc.	200	12.00
Chemtech Archer Rubber	NA	NA
Chris Craft Industries, Inc.	1,254	491.50
Chrysler Plastic Products Corporation	NA	NA
Cleveland Plastics	NA	NA
Coats American	1,100	254.00
Collins and Aikman Corporation	15,600	1,898.60
Columbus Coated Fabrics	450	53.30
Consolidated Thread Mills, Inc.	15	1.75
Cooley, Inc.	250	63.23
Crimptex of Rhode Island, Inc.	NA	NA
Crown Textile Company	NA	NA
Culp, Inc.	3,800	488.10
Custom Coated Products	NA	NA

(continued)

Table A-1. Fabric Coatings Companies (continued)

Company Name	Employment	Sales
Custom Lamination Inc.	40	3.75
Dana Corporation	84,200	13,270.00
Dan River, Inc.	7,300	628.90
Dash Multi-Corporation	508	138.00
Decora Manufacturing	950	162.50
Deep River Mills Coated Fabrics, Inc.	13	7.50
Deitsch Plastic Company, Inc.	100	75.00
Dela, Inc.	28	7.50
Delatex Processing Corporation	8	0.75
Delaware Valley Corporation	45	15.00
Dicey Mills, Inc.	200	33.00
Dimension Polyant Sailcloth, Inc.	35	7.50
Duracote, Inc.	60	11.00
Durkee-Atwood Company	NA	NA
Duro Industries, Inc.	800	198.96
E.I. DuPont de Nemours & Company, Inc.	94,000	29,202.00
Eagle Dyeing and Finishing Company	NA	NA
Eddington Thread Manufacturing Company	100	5.00
Eli Sandmand Company	NA	NA
Elizabeth Webbing Company, Inc.	400	300.00
Emerson Textiles	NA	NA
Empire State Leather Corporation	65	16.00
Emtex, Inc.	85	10.00
Engineered Yarns, Inc.	NA	NA
Eva Incorporated	NA	NA
Excello Fabric Finishers, Inc.	15	3.75
Experimental Fabrics, Inc.	25	3.75
Exxon Chemical Americas	NA	NA
FAB Industries	1,300	128.90
Fabrite Laminating Corporation	90	9.33
Facemate Corporation	454	45.00
Farnsworth Fibre Corporation	42	3.75
Fenner Drives	200	18.00

(continued)

Table A-1. Fabric Coatings Companies (continued)

Company Name	Employment	Sales
Ferro Corporation	6,881	1,447.00
Fil-Tec, Inc.	83	14.00
Flexfirm Products, Inc.	20	15.00
Flexicote, Inc.	NA	NA
Foamex International, Inc	5,900	1,279.99
Foss Manufacturing Company, Inc.	600	119.00
Freudenberg Nonwovens Limited Partnership	900	209.00
Gastonia D & F	NA	NA
General Fabric Fusing	NA	NA
General Shoe Lace Company, Inc.	NA	NA
Gentex Corporation	575	56.46
Georgia Duck & Cordage Mill	450	40.00
Glen Raven Mills, Inc.	1,586	455.00
Glenoit Mills, Inc.	500	50.00
Globe Albany	NA	NA
Goodyear Tire & Rubber Company	100,649	12,881.00
Graniteville Company	NA	NA
Great Lakes Paper Company	250	37.00
Guilford Mills, Inc.	5,929	814.20
H.A. Gelman, Company	NA	NA
Haartz Corporation	350	100.00
Habasit	1,850	212.70
Hadbar	NA	NA
Hallwood Group, Inc.	807	115.30
Hawkeye Rubber Manufacturing Company	100	9.49
HDB Industries, Inc.	1,350	100.00
Hexcel Corporation	6,328	1,056.00
Hoffman Mills, Inc.	550	75.00
Hollingsworth and Vose Company	200	33.00
Holliston Mills, Inc.	184	21.20
Hub Fabric Leather Company, Inc.	35	4.72
Humphrys Textile Products	60	30.00
Industrial Coatings Group, Inc.	335	78.60

(continued)

Table A-1. Fabric Coatings Companies (continued)

Company Name	Employment	Sales
Intermark Fabric Corporation	150	1.75
Interface, Inc.	7,250	1,228.20
Intex Corporation	178	35.00
JB Group, Inc.	220	29.00
J.P. Stevens and Company, Inc.	NA	NA
James Thompson & Company, Inc.	180	14.00
Jersey Pacific Netting Company	NA	NA
Jewell Sheen Coating, Inc.	NA	NA
Joanna Western Mills Company	NA	NA
Johns Manville Corporation	9,740	2,161.80
Johnston Industries, Inc.	2,600	264.00
K M Fabrics, Inc.	81	15.00
Kenyon Laminating Group	NA	NA
Kiesling-Hess Finishing Company	7	1.75
Kleen-Tex Industries, Inc.	516	50.04
Lacey Mills, Inc.	200	24.00
Lacrosse Footwear, Inc.	1,100	124.30
Lantor, Inc.	175	35.00
Lawrence Schiff Silk Mills	25	3.75
Lewcott Corporation	66	10.70
Lloyd Manufacturing Company, Inc.	27	7.50
Ludlow Composites Corporation	140	26.80
Ludlow Textiles Company, Inc.	110	10.00
Marathon Rubber Products	NA	NA
Mark IV Industries, Inc.	15,600	1,993.70
Max Katz Bag Company, Inc.	NA	NA
McCord Gasket Company	NA	NA
Meridian Industries, Inc.	1,200	270.00
Middlesex Research Manufacturing Company, Inc.	25	7.50
Milliken & Company	20,000	4,000.00
Mitchellace, Inc.	221	17.00
M L Rose & Sons, Inc.	7	1.75
Molded Dimensions, Inc.	66	15.00

(continued)

Table A-1. Fabric Coatings Companies (continued)

Company Name	Employment	Sales
Monterey, Inc.	400	38.00
Mount Hope Finishing Company	150	35.00
Murray Rubber Company	NA	NA
National Coating Corporation	29	15.00
National Dye Works, Inc.	35	3.75
Neese Coated Fabrics	NA	NA
New England Belting	9	0.60
New England Ropes, Inc.	110	17.00
New York Wire Textile	400	35.00
Newtown Finishing Corporation	4	0.75
NFA Corporation	1,000	65.00
North American Rayon Corporation	NA	NA
Nylco Division	200	34.20
OOC, Inc.	NA	NA
Orchard Manufacturing Company	NA	NA
Osterneck Company	75	15.00
Otto Fabric, Inc.	NA	NA
Ouimet Corporation	65	15.00
Pacific Combining Corporation	45	10.00
Packaging Systems Corporation	NA	NA
Penn Racquet Sports	390	75.00
Perma Glas-Mesh, Inc.	100	5.00
Pillowtex Corporation	14,000	1,552.10
Plymouth Rubber Company	475	77.70
Polyclad Laminates	1,440	235.00
Putman-Herzl Finishing Company, Inc.	NA	NA
Rapid Die & Molding Company, Inc.	8	3.75
RCA Rubber Company	250	35.00
Reef Industries, Inc.	220	20.98
Reeves Brothers, Inc.	531	35.00
RM Industrial Products, Inc.	NA	NA
Rockland Industries, Inc.	300	50.00
Ross & Roberts, Inc.	110	15.90

(continued)

Table A-1. Fabric Coatings Companies (continued)

Company Name	Employment	Sales
Ruddick	20,000	2,682.80
Sara Lee Corporation	154,000	17,511.00
Scandura, Inc.	400	31.00
Scapa Dryers, Inc.	NA	NA
Scapa Forming Fabrics	135	35.00
Schneider Banks, Inc.	9	1.75
Schneller, Inc.	200	28.30
Seaman Corporation	290	22.00
Semperit Industrial Products, Inc.	10	1.75
Sommers, Inc.	60	35.00
Stacy Fabric Corporation	NA	NA
Stanbee Company, Inc.	50	7.50
Standard Coated Products	NA	NA
Star Tex Industries	NA	NA
Starensier, Inc.	60	20.00
Stedfast Rubber Company	NA	NA
Stonecutter Mills Corporation	343	53.20
Superior Fabrics	150	11.00
Takata, Inc.	6,000	375.00
TBMC, Inc.	NA	NA
Tex-Tech Industries, Inc.	438	63.39
Textile Proofers LP	6	1.75
The Alpine Group	6,600	1,370.40
Tomkins PLC	70,039	8,722.00
TSG, Inc.	80	7.00
Twiss Associates, Inc.	20	3.75
Uniroyal Technology Corp	440	68.30
Uniroyal Goodrich Tire Manufacturing	225	75.00
Uretek, Inc.	70	12.88
Utex Industries	450	47.00
Victor Products	NA	NA
Viking Technical Rubber Company	NA	NA
Voyager Emblems	108	16.00

(continued)

Table A-1. Fabric Coatings Companies (continued)

Company Name	Employment	Sales
W.R. Grace and Company	6,300	1,569.00
Wade Manufacturing Company	386	75.00
Warwick Dyeing Corporation	NA	NA
Wellington Sears Company	NA	NA
West Coast Fibre Corporation	NA	NA
Worthen Industries, Inc.	200	34.20