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Plastics Industry

The exploding electronics industry will help boost the use of plastics, coupled with increased consumption in health care, household products, and the construction industry.

Plastics shipments were estimated to grow at a 4.3 percent rate in 1995, by CIT Group/Industrial Financing, a Livingston, New Jersey-based machinery financing company in their report entitled Plastics Industry Outlook - 1996-1998. Growth is anticipated to accelerate again in 1996 and 1997, by 5.3 percent and 6.9 percent, respectively, and level off at 5.0 percent in 1998 at \$119.5 billion. Those rates would represent an overall gain by 1998 of 23.0 percent over 1994's levels. New applications, such as brushless plastic motors, mooring piles, decking, transistors, intake manifolds and fuel tanks, should aid the growth.

Although resin prices have risen 31.0 percent since March 1994, manufacturers of finished plastic products have absorbed most of the increase, causing the prices for finished products to rise only about 6.0 percent. Prices for finished products are expected to rise about 1.5 percent during the next few years, and stabilizing resin prices will enable processors to recoup some of their margin losses.

By 1998, nominal exports of plastic products will rise to nearly \$8.8 billion annually, 42.0 percent ahead of 1994. Imports also will grow, but at a slower rate, with imports share of domestic plastic product consumption declining slightly from 5.7 percent last year, to 5.6 percent in 1998.

Imports from Mexico will grow well beyond their 6.3 percent of total imports in 1994, because Mexican plastics products are now 35.0 percent cheaper, due to the devaluation of the peso. An increased number of companies in the Far East have opened facilities in Mexico, enabling them to take advantage of the North American Free Trade Agreement.

Imports from China have increased more than 170.0 percent since 1991 to nearly \$1.0 billion in 1994, and Canada, China, Japan, and Taiwan account for nearly 63.0 percent of U.S. plastic product imports. The U.S. plastics industry's trade surplus swelled from \$336.0 million in 1993 to \$660.0 million in 1994.

Domestic purchases of plastics machinery will exceed \$2.9 billion by 1998, from the 1994 record level of \$2.36 billion, and the 7.9 percent growth rate for machinery sales will slack off to about 2.0 percent by 1998. Domestic machinery shipments soared an estimated 16.8 percent in 1994, over the previous year, while imported machinery sales plunged 16.2 percent.

During the past twenty-five years, the plastics industry has developed into a large, rapidly growing market, with plastics demand growing from 37.6 billion pounds to 62.7 billion pounds, over the ten year period from 1983 to 1993. Domestic plastic demand is projected by the Freedonia Group to increase 3.5 percent annually from 1993 to 1998, when estimated demand is projected to total 74.5 billion pounds.

Manufacturers in a wide array of industries have become accustomed to the tremendous processing ease and design advantages associated with plastics, and are consistently choosing the low cost and high performance of plastic components and parts, over components made from more costly and less adaptable materials. This trend toward materials substitution has driven demand for plastic compounds in two important ways:

Demand for more advanced resins: Over the past forty years, plastics have penetrated an increasingly wide variety of end markets, with complex and highly engineered compounds imparting to plastics the properties required to perform the most extreme functions in demanding environments. Compounding technology has therefore become a key driver of continued materials substitution, with both the further penetration of existing markets and entrance into new markets tied directly to the creation of plastics able to withstand extremes of temperature, pressure, and other environmental stresses.

Faster introduction of new compounds: Materials substitution has fostered increased competition. New compounds required to penetrate new end markets and support the advancing technology of their current customer base before these sales opportunities are seized by competitors. This pressure has led to an increase in the production of small-batch experimental compounds and highly engineered, application specific compounds. This flow of new and demanding compounding has allowed toll compounders to maintain their value-added position in the production and marketing strategies of major resin manufacturers. While some large resin manufacturers are selling some of their mature product lines to independent compounders, they must maintain the advanced compounding skills required to create new resins and produce quantities of proprietary compound sufficient to broaden their product lines, and to capture the exceptionally high margins associated with new, unique compounds.

Thermoplastics

A report from Freedonia Group Inc., of Cleveland, Ohio, says that independent compounders' demand for thermoplastics in the United States is projected to grow 4.0 percent annually from 1995 - 2000, when the market will exceed 6.0 billion pounds of resin content with a value of about \$4.8 billion.

The large volume and diverse markets for PVC will provide the best opportunities in compounding. PVC's low cost and many uses is expected to provide positive growth, but the independents will continue to face competition from large resin producers focusing on downstream compounding from markets such as siding. (Plastics News, 7/1/96).

Industry sources note that engineered thermoplastics have opportunities to replace steel or aluminum. The plastics have comparable strength, are more easily maintained, and cost less. Demand from motor vehicle and other markets for near-engineered grades will advance sales of polypropylene, although resin producers have a strong presence in the U.S. Thermoplastic

elastomers' flexibility, compressibility, and energy-absorption characteristics are expected to bring rapid growth for motor vehicle and consumer uses (Plastics News).

POLYETHYLENE

Polyethylene (PE) has the highest production volume of any plastic, according to Standard & Poor's (S&P) Industry Reports, 2/8/96. Production increased slightly, to approximately 24.0 billion pounds, in 1995 over 23.7 billion in 1994, increasing for the sixth consecutive year. The decrease in domestic use and sales that occurred in 1995 was offset by exports, which continue to increase. Demand for low and high density resins have led the gains for PE since 1989. Long term annual growth is projected to be between 4.0 to 5.0 percent due in large measure to anticipated growth in packaging applications

Total capacity for the manufacture of PE increased dramatically, by an estimated 33.0 percent, in the early 1990s with the construction of large plants by the industry's leading producers, including Phillips Petroleum, Dow Chemical, Himont, and Union Carbide.

With increased capacity and declining demand, prices decreased in 1994, and although the industry implemented price increases in early 1995, prices continued to fall in mid 1995 and at the year-end. With a forecast for strengthening demand in late 1995, producers indicated planned price increases slated for 1Q of 1996.

Attitudes about plastic packaging and the environment are changing as a result of the growing success of high-density polyethylene (HDPE) and polyethylene terephthalate (PET) recycling, the clearance of some post-consumer recycled (PCR) PET resin for food contact applications and the realization that plastic's light weight can provide source reduction benefits.

Source reduction may be the stimulus needed to expand use of flexible plastic packaging in the U.S., where acceptance has been low compared to other countries. Improvements in easy-open/reclose technology and flexographic printing also are helping.

High-density polyethylene (HDPE) is the largest-volume PE, and the second-largest volume plastic on an individual basis, after PVC. The chart below shows the market segments for HDPE and the percentage of the 1994 market.

Market Segments	Percentage of 1994 Market
Packaging	53.0
Construction	9.0
Consumer Goods	6.0

Source: S&P

Major markets include packaging which accounted for 53.0 percent of HDPE, followed by construction, and consumer goods. Primary uses include blow molding, mainly for containers and bottles (31.0 percent); injection moldings, such as pails, crates, and food containers (17.0 percent); films and sheets (16.0 percent); pipe and conduit (6.0 percent); exports (12.0 percent); and others (18.0 percent).

HDPE has been one of the fastest growing major plastics, with an annual growth of 6.0 percent during the 10-year period. Long-term demand growth for HDPE is projected at about 4.0 percent per year, aided by the increasing use of HDPE in containers for a variety of consumers products, such as milk and other beverage containers, food, motor oil, household and personal care products, shipping drums, and automotive fuel tanks; in barrier containers for hydrocarbons and solvents products such as gasoline tanks, and in grocery sacks, merchandise bags, and other consumer packaging.

POLYPROPYLENE

Polypropylene (PP) has been used in automotive, durable goods, and textile markets. The following chart indicates domestic usage as of 1994.

Products	Percentage of the Market
Consumer and Institutional	24.0
Packaging	20.0
Furniture and Furnishings	17.0

Source: S&P

POLYSTYRENE

Polystyrene (PS) production contracted during 1995 by 1.0 percent, to 5.8 billion pounds, reversing a two year trend of increasing demand. Demand rose 18.0 percent from 1992 to 1994. The downswing was primarily attributed to a 15.0 percent reduction in exports, mostly in trade with China. Capacity was not greatly increased during the early 1990s as was other plastic resins.

PS is used primarily in packaging and food serviceware (41.0 percent), consumer and institutional product (13.0 percent), electrical/electronics (11.0), and furniture, furnishings, and construction (5.0 percent).

Industry analysts forecast increased production in 1996 and project 3.0 percent growth rates for the long term. The forecast is based on increasing use of polystyrene in such consumer products as egg cartons, dairy packaging, takeout packaging, electronics, computers, compact discs, and appliance components.

OLEFINS

Over the past decade, olefins fibers (polypropylene and polyethylene) have been the fastest growing manufactured fiber category. They now account for 24.0 percent of total manufactured fiber production. Growth has been spurred by the increasing use of olefins in a variety of products. More than 50.0 percent of demand is for carpets and carpet backing, primarily for commercial uses. In addition to various industrial applications, other uses of olefins are for nonwoven products such as disposable fabrics and medical garments.

POLYOLEFINS

Related to polyethylenes, and of better quality, are other polyolefins. More stable than polyethylene, with superior resistance properties, these polyolefins bridge the gap between promotional polyethylene and high-performance reinforced vinyl.

Two types of polyolefins are common in the sign industry. The first is generally described as a "spun-bond" product, known more commonly as DuPont's Tyvek brand. Similar in weight to two-sided polyethylene, Tyvek is usually corona treated, and coated with an anti-static topcoat that also enhances ink adhesion. Industry spokesmen report that it has a better printing surface than polyethylene, due to its spun-bond nature. The spun bonding enhances its absorption, and acts as a porous system, allowing the ink to anchor itself onto the material. On the downside, Tyvek lacks the gloss of substrates like polyethylene and vinyl, so process-color images printed on it will have more of a matte appearance.

The second material in this category is a polyolefin blend that most closely resembles synthetic paper. Like polyethylene, it is corona treated when it is manufactured, and can be printed with multiple ink types without a topcoating. Polyolefin blends have excellent opacity for double-sided printing, and their resistance to wind, moisture, and ultraviolet rays places them in the long-term outdoor market. Like Tyvek, polyolefin blends are now available in specially topcoated versions, designed for ink-jetting. Generally, polyolefin banner stocks are not recommended for electrostatic applications (Screenprinting, 9/95).

POLYVINYL CHLORIDE (PVC) DEMAND

A recent study by the Freedonia Group reported that the demand for polyvinyl chloride packaging in the U.S. will grow an average of 3.0 percent annually, to reach 1.0 billion pounds in 1998 (Packaging World, 4/95). Further growth will be threatened by maturity in film/sheet uses and environmental concerns in the bottle segment. PVC packaging application will account for about 8.0 percent of total U.S. PVC demand over the next decade. By segment, PVC film and sheet demand will grow 2.8 percent, bottle demand 3.3 percent, and closure demand, 3.6 percent (Standard and Poor's Industry Surveys (S&P), 2/8/96).

ACRYLIC

Acrylic is the smallest volume noncellulosic fiber, accounting for only about 4.0 percent of manufactured fiber production. Acrylic is used in apparel such as sweaters, fleecewear, and hosiery, which accounts for about the majority of domestic acrylic demand.

U.S. acrylic production has been relatively steady over the past years, ever since DuPont, which was the second-largest domestic producer after Monsanto, closed its acrylic business in 1991. That business had accounted for 200.0 million pounds annually, or about 30.0 percent of domestic capacity.

Strong export demand, especially from China, boosted overall demand in 1994 and early 1995. Higher cotton prices also stimulated demand for acrylic fiber in both years (S&P, 2/8/96).

POLYESTER FILAMENT FIBERS

Fiber executives said increases in commodity chemicals have fueled the latest wave of price hikes. Of all human-made fibers, polyester has taken the biggest hit. The leading human-made fiber in the apparel market, on a fabric-weight basis, enjoys about a 24.0 percent market share. The price of polyester filament has risen twice since September 1994. Rayon, due to the rising cost of wood pulp and caustic soda, has seen two hikes since January 1, 1995. Acrylic and nylon prices have also risen twice since January 1995 (Daily News Record, 6/13/95).

One fiber division announced an increase in the price of polyester filament of 10.0 to 15.0 percent on all apparel, home furnishings and industrial fibers, due to the continuing escalation of raw material costs and global demand for polyester filament products. DuPont also increased the prices of polyester filament, including microfiber yarns. This increase will cover all yarns used in apparel, home furnishings, upholstery and industrial markets. According to DuPont, the raw materials supply could be tight all the way through 1996. Polyester bottle resins are affecting the whole price and their demand has grown by double digits.

Client Market Segments

PLASTICS IN THE AUTOMOTIVE INDUSTRY

Plastics have become an increasingly important material in the automotive industry as they allow manufacturers to build economical, energy efficient cars within a low-cost, highly flexible design, and manufacturing structure. All participants in the automotive industry, from the domestic and foreign automobile manufacturers down through every level of their supply chain, have focused their manufacturing efforts on building lighter, lower-cost vehicles. These vehicles are expected to have the greater fuel efficiency required by state and federal regulations, while maximizing vehicle performance. The use of molded plastic parts not only allows for a decrease in total vehicle weight, but also offers greater design flexibility and minimizes the vehicle's susceptibility to corrosion.

Faced with increased competition and significant pressure to reduce costs, automobile manufacturers and their suppliers have embraced design innovation and proprietary products as the best means of protecting market share while maintaining healthy margins. Plastic products offer suppliers at all levels the opportunity to create unique product lines which have technologically advanced features and performance required to protect price in a cost-conscious environment. Automotive suppliers are poised to see a significant increase in demand in light of the growing number of foreign-based automobile manufacturers opening plants in the U.S., many of whom are pressured both politically and economically to use U.S. suppliers.

PLASTICS IN THE ELECTRICAL, ELECTRONICS, AND TELECOMMUNICATIONS INDUSTRIES

The growth of plastics in electrical products, electronic and telecommunication devices, and home appliances, is driven primarily by materials substitution. Plastics give electronic manufacturers greater design freedom and flexibility, unlimited styling flexibility, thermal and insulation properties, corrosion and oxidation protection, lighter weight, lower costs, and greater strength. In addition, because one molded thermoplastic component can often replace

a number of metal parts, manufacturers that use plastics are able to eliminate processing, storage, and other costs through parts consolidation.

PLASTIC FILM INDUSTRY

According to Packaging World, plastics, both rigid containers and films, were identified as materials that showed considerable increases (8/95). Plastic film prices were up for 71.2 percent of the 220 respondents to the survey conducted by Packaging World and Market Research Support Services (MRSS). Plastic containers were noted on 62.0 percent of the responses.

Tightened supplies of some materials, particularly plastic resins, has been a major issue in the marketplace, and a subject of some discussion between raw material producers and package manufacturers. In plastics, pricing was the primary cause of problems in varying degrees for each segment, 71.4 percent of the time for films, 82.1 percent of the time for containers. Order lead times was shown as a problem for film buyers 21.4 percent of the time, although just 14.3 percent of the time for container purchasers.

RECYCLED PLASTIC MARKET

The demand for recycled plastics is expected to grow 13.0 percent annually through 1998. Fueling that demand will continue to be recycled content legislation, an expanding collection network, improvements in sorting technology and increased applications development, according to the Freedonia Group, a research group in Cleveland, Ohio.

For 1995, plastic recyclers probably had the biggest variance in pricing of all the recycling commodity segments. Prices for recovered PET (polyethylene terephthalate) and HDPE (high density polyethylene) hit record highs, but crashed soon thereafter. When post-consumer regrind was in tight supply, recyclers wanted to hold out for higher prices and bids, instead of selling at the current market price. Now the mills have a turn at their pricing, as market prices have softened. The recycled HDPE market got its strength this summer for a lack of virgin HDPE capacity, while the PET market was benefiting from a shortage of supply overseas in Asia and a strong demand domestically. Then, virgin HDPE capacity came up to speed and virgin prices fell and recycled HDPE followed as prices crashed.

Natural HDPE is still going down in price, and it may near the same price as for colored HDPE in the near future, which will be the first time that has happened. Recycled HDPE just cannot sustain its price levels because virgin keeps going lower.

In the PET segment, exports have slackened and that market is now seeing processed PET fiber being imported in greater quantities. However, the incoming shipments are damaging the PET fiber markets, causing losses to domestic processors by bringing prices down. This has caused some "flip-flopping" in the import/export area. Baled PET is just not going overseas as much. Two reasons cited for this are 1) the finished goods the Chinese were making were too expensive and the market for them receded, and 2) there were some problems with processing and contamination.

Injection Molding

Economists are predicting the overall economy to expand by 2.5 percent to 3.0 percent in 1996 (Injection Molding Magazine (IMM), 12/95). Several molders now face the coming period of solid, yet not spectacular, growth with modernized manufacturing plants, expanded molding capacity and many new injection machines.

While many business segments slowed for a while in 1995, the sale of new injection molding machines had not ceased. Imports of new machines grew spectacularly month to month as compared to 1994. For the 12-month period ending September 1995, injection molding machine imports were 34.0 percent above the prior 12-month period.

Data collected by the U.S. Department of Commerce and by the Federal Reserve suggest that molders in almost all plastics markets have been investing heavily in new plants and equipment, spending approximately 18.0 percent more in the first nine months of 1995 as compared to 1994 of the same period.

Packaging applications have never been a major outlet for injection molded parts. However, for those injection molders serving that market, growth in 1996 is expected to be around 3.0 percent. This market moves up and down with the rest of the economy for which, overall, solid growth is projected. In the 12-month period ending September 1995, injection molded packaging applications grew a moderate 1.8 percent.

Shrink Wrapping Boats

Polyethylene sheets are used to shrink wrap boats in order to weatherproof and dustproof new boats, and for seasonal storage. According to the purchasing manager of a large midwestern marine retailer, 100.0 percent extruded polyethylene sheets are used. The sheets are 6 mm thick, come in 20 ft wide rolls costing approximately \$84.00 wholesale, and cover 2,000 square ft. A special propane torch is used to shrink the wrap around the boat. Self adhesive plastic zippers and shrink film tape are available to make doors, windows, and openings.

Various colors of wrap are used. Clear wrap is used for new boats in the showroom, white wrap is used for storage in hot climates to reflect the sun, and blue is used for storage in moderate climates. The business is seasonal, with a lot of wrapping done in the fall, when boats are put in storage. Since the polyethylene is completely recyclable, most wrap is returned for recycling in the spring. Some manufacturers include pre-paid, self-addressed mailable recycling bags inside the boat. These are placed inside the boat before wrapping, and reminder stickers are placed on the outside of the wrap.

Polyethylene wrap has many other uses. Some shrink wrap distributors sell kits to make greenhouses, sun rooms, and canopies, from polyethylene film and frames made from electrical conduit tubing.

Shrink Wrapping Buildings

Shrink wrap is used to create temporary roofs and walls at disaster sites by disaster restoration companies (The Star-Ledger, 6/4/96). The sites are protected from the elements until permanent restorations are completed. Shrink wrap can be used to create "sanitary"

passageways with zippered doors inside fire-damaged buildings, so that business can continue to be conducted. Temporary ozone rooms can be constructed within damaged rooms, in which smoke odor is removed from fire-damaged objects. Dust-free environments can be built for temporary furniture storage until restoration is completed.

The thick plastic, which is similar to the type used in consumer product packaging, is shrunk around the structure with a butane torch. It is lighter than wood, which makes it safer to carry onto weakened roofs, and may last up to two years (North Valley Business Journal, 4/1/96). Temporary emergency shells can enable households to live in fire-damaged buildings for months until repairs can be made. Prior to the use of shrink wrap, tarpaulins were used to seal off exposed areas and create temporary enclosures.

Import and Export Markets

By 1998, nominal exports of plastic products will rise to nearly \$8.8 billion annually, 42.0 percent ahead of 1994. Imports also will grow, but at a slower rate, imports' share of domestic plastic product consumption declining slightly from 5.7 percent in 1994 to 5.6 percent in 1998.

Imports from Mexico will grow well beyond their 6.3 percent of total imports in 1994 because Mexican plastics products are now 35.0 percent cheaper due to the devaluation of the peso, and because an increased number of companies in the Far East, wishing to take advantage of the North American Free Trade Agreement (NAFTA), have opened facilities in Mexico.

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