Synthetic Resins

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Canada

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I N D U S T R Y P R O F I L E

1990–1991

SYNTHETIC RESINS

FOREWORD

In a rapidly changing global trade environment, the international competitiveness of Canadian industry is the key to growth and prosperity. Promoting improved performance by Canadian firms in the global marketplace is a central element of the mandates of Industry, Science and Technology Canada and International Trade Canada. This Industry Profile is one of a series of papers in which Industry, Science and Technology Canada assesses, in a summary form, the current competitiveness of Canada's industrial sectors, taking into account technological, human resource and other critical factors. Industry, Science and Technology Canada and International Trade Canada assess the most recent changes in access to markets, including the implications of the Canada-U.S. Free Trade Agreement. Industry participants were consulted in the preparation of the profiles.

Ensuring that Canada remains prosperous over the next decade and into the next century is a challenge that affects us all. These profiles are intended to be informative and to serve as a basis for discussion of industrial prospects, strategic directions and the need for new approaches. This 1990–1991 series represents an updating and revision of the series published in 1988–1989. The Government will continue to update the series on a regular basis.

Michael H. Wilson
Minister of Industry, Science and Technology
and Minister for International Trade

Structure and Performance

Structure

The synthetic resins industry comprises establishments producing a variety of polymers or resins and related compounds. The industry converts or "polymerizes" basic petrochemical building blocks such as ethylene, vinyl chloride, propylene and styrene into a variety of polymers. These basic resins are generally subsequently blended with other polymers and additive materials to produce concentrates and compounds that are used by various downstream industries such as those manufacturing plastic products, adhesives and certain wood products.[1] While the polymerization process is generally the domain of the basic resin companies, the compounding may be done by resin companies, independent compounders or certain end-user industries for their own consumption.

Resins produced and marketed widely can be broadly subdivided into two categories: thermoplastic resins, which can be melted on the application of heat and solidified when the liquid is cooled, and thermosetting resins, which cannot be melted and which characteristically undergo chemical decomposition when heated. Another distinction is that thermoplastic resins can be readily recycled, whereas thermosetting resins cannot.

[1] Industry profiles are also available on *Plastic Products*, *Adhesives and Sealants* and *Wood-Based Panel Products*, which describe some uses of synthetic resins. Synthetic resins are made from intermediate petrochemicals; for more information on the industry that supplies most of the raw materials, see the industry profile on *Petrochemicals*.

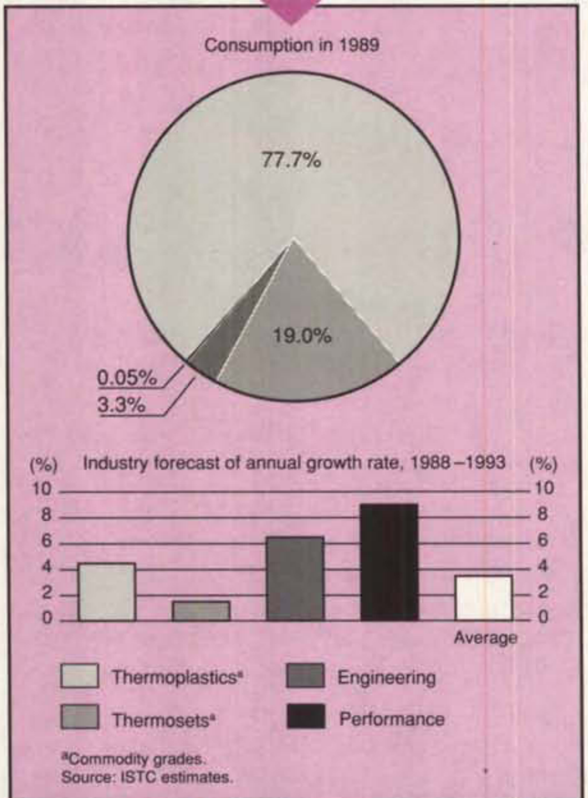

Figure 1 — World Consumption of Synthetic Resins

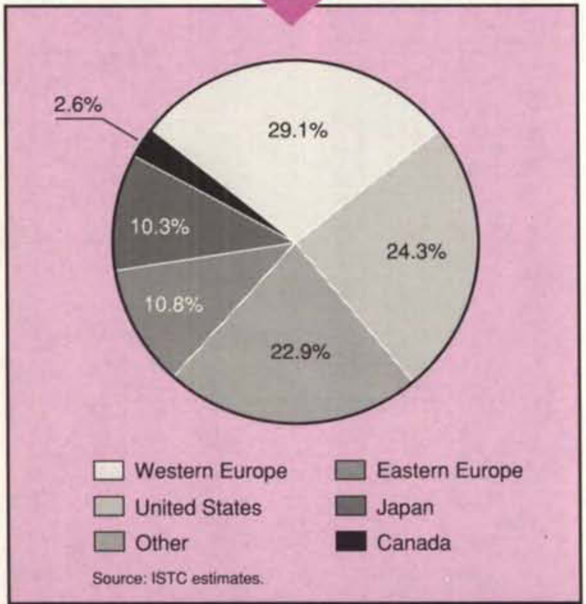

Figure 2 — Global Resin Demand by Region, 1989

Resins may also be categorized by performance and relative consumption in the marketplace. The most widely used resins include thermoplastics such as polyethylenes (PEs), polyvinyl chloride (PVC), polypropylene (PP), polystyrene (PS) and acrylonitrile-butadiene-styrene (ABS). These are generally described as commodity resins and are characterized by their relatively low ratio of value to volume.

Commodity-grade thermoplastic resins are widely used in flexible packaging for food and consumer products. Other forms of these resins are rigid for use in making bottles, beverage cases, barrels, pails and oil containers, or used in construction products such as PVC house sidings, window frames, water, sewer and ventilating pipe, flooring, and wire and cable sheathing. Foam types are used for automotive seating and furniture cushions, thermal insulation and equipment packaging. Moulded forms are used as automotive parts, appliance parts, furniture, sporting goods and toys as well as industrial fabricated products such as chemical tanks and advertising signs.

The second type of widely used resins are thermosets, which include phenol-formaldehyde (PF), urea-formaldehyde (UF) and unsaturated polyester. This category of resins often is widely used in rigid building materials made from wood, including plywood, particleboard and waferboard. They are also used in plastic laminates and lower-performance composites such as fibreglass-polyester to make leisure boats, chemical storage tanks and bathtubs as well as bathtub/shower enclosures. These resins often have a somewhat higher price than thermoplastic commodity-grade resins because of the lower level of consumption and the higher cost of raw materials.

Engineering and performance resins are additional classifications of polymer materials that are used in demanding applications. The performance requirements often include superior heat resistance, flame retardancy, mechanical strength, electrical properties and dimensional stability. These resins are often used in engineering applications as replacements for metals, thermosetting resins and ceramics in such products as faucets and valves, automobile seat belt components, microwave cookware, safety glazing, housings for consumer appliances, bushings, underhood automobile components, switches, circuit boards, camera and watch cases, electric motors, radar domes and jet engine components. Fillers (such as glass, carbon, metallic powders or calcium carbonate and silica products) and reinforcements (such as glass or carbon fibre) are often added to enhance these properties.

World consumption of the various types of resins and their growth rates are shown in Figure 1. Over the past 20 years, consumption of plastics has grown at about twice the rate of

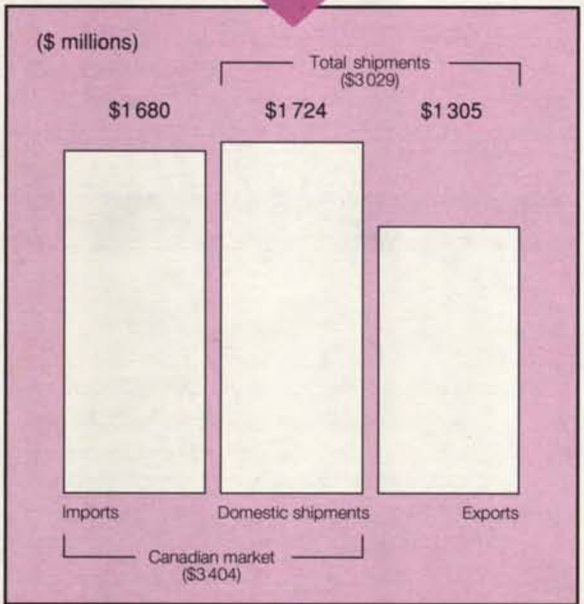

Figure 3 — Imports, Exports and Domestic Shipments, 1989

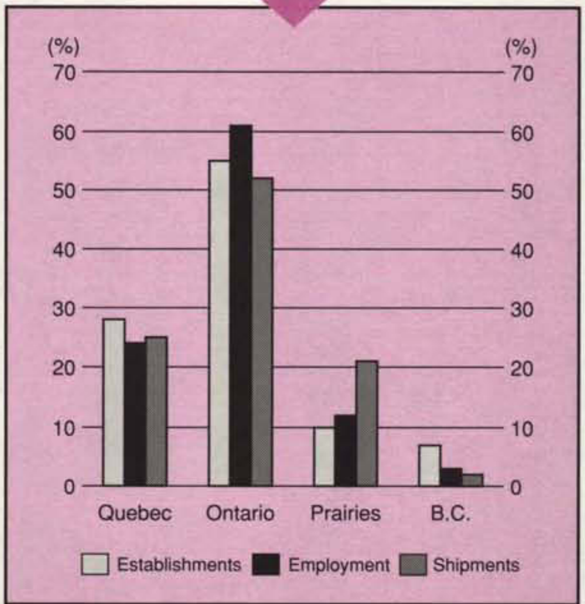

Figure 4 — Average Regional Distributions, 1986 to 1988

the global economy, primarily because of their ability to replace competing materials in a wide range of applications.

Production of synthetic resins is widespread in the world, and amounted to an estimated 84 million tonnes per year in 1989. Manufacturers in Western Europe, the United States and Japan dominate the production and marketing of resins on a global basis. Figure 2 shows world demand for these resins by region.

The Canadian synthetic resins industry produces primarily commodity-grade thermoplastic and medium-volume thermosetting resins and compounds. These two types account respectively for 83 and 17 percent of production. In 1989, the value of shipments of synthetic resins by Canadian manufacturers was $3.0 billion without resale products (Figure 3), and $3.7 billion with resale products. The industry employed 7 012 persons at some 97 establishments.

The majority of Canadian firms are owned by U.S., Western European or Japanese multinational firms that operate subsidiary or joint venture operations in most industrialized and some developing countries. Foreign-owned firms account for a major portion of the Canadian industry's assets and shipments. Novacor Chemicals is the only example of a major firm owned and controlled from Canada. Canadians also control other smaller producers, such as AT Plastics and Pétromont.

Traditionally, the Canadian industry has been oriented towards the domestic market. The exceptions are PEs and PP, for which Canadian manufacturers have a substantial export position that can be attributed in part to the pioneering of new process technologies (e.g., Du Pont Canada's SCLAIR process for linear low-density PEs), Canadian control of certain firms (e.g., Novacor Chemicals) and the need of some world-scale producers to export significant volumes in order to maintain operating volumes.

Plants based mainly in Alberta produce commodity-grade thermoplastic resins from raw materials derived from natural gas. Plants located in Ontario and Quebec produce commodity grades of both thermoplastic and thermoset resins and compounds. Most eastern producers use raw materials derived from crude oil, although manufacturers have been increasing the flexibility of their operation to also allow the use of raw materials derived from natural gas. The regional distribution of establishments, employment and shipments is shown in Figure 4.

Performance

The value of shipments of synthetic resins grew rapidly in the late 1970s as a result of high growth in demand in North America (see Figure 5 for comparison of some industry trends in the 1970s and 1980s). The Canadian petrochemical construction boom at this time saw the commissioning of several new, large, world-scale petrochemical and resin plants in Canada. Fewer new resin plants were built in Canada in the 1980s because of slower market growth, worldwide overcapacity during most of the decade and the resultant low profitability.

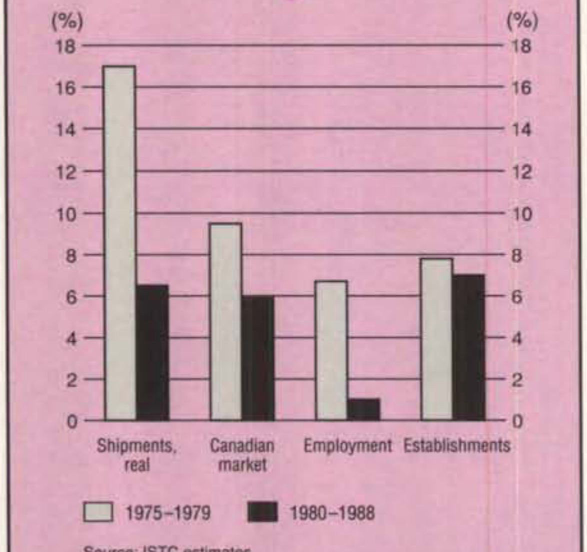

Figure 5 — Industry Growth Rates

Canadian exports of synthetic resins grew considerably during the 1980s from about one-third to one-half of total shipments. This growth reflected the need and ability of the newly built plants to capture world market share. Canadian imports of resins also increased significantly during this period and captured about 50 percent of total domestic consumption, despite the growth in domestic capability. The principal reasons for this increased import penetration were the increasing use of complex, higher-performance engineering resins and plastic alloys that cannot be made in Canadian plants, the general rationalization of the resins industry on a North American basis, and increased competition during periods of excess capacity, primarily from U.S. producers of commodity-grade resins.

The profitability of the Canadian as well as the U.S. industry was reportedly lower during most of the 1980s than in the late 1970s because of global excess capacity resulting from expansions in the late 1970s. Profits improved during 1987 and 1988, however, as prices rose during a period of tight supply. Generally, the profitability of the Canadian operations during the 1980s was lower than that of U.S. counterparts. Reasons included a shortage of the higher-margin engineering and performance resins in Canada, a greater dependence on exports to non-industrialized countries where prices experienced larger cyclical swings, higher distribution costs in shipping to a diffuse and relatively small domestic market, and reduction of margins to cover duties on commodity-grade exports. Additionally, some Canadian operations are not fully competitive with U.S. counterparts because of such factors as lower plant capacities and less specialization. Offsetting some of these factors was the somewhat higher price realized from sales to Canadian customers.

Strengths and Weaknesses

Structural Factors

The synthetic resins industry uses extensive amounts of capital as well as technology but not labour. U.S. producers located along the Gulf of Mexico tend to set the international standards for competition in the synthetic resins market.

The major factors that influence production costs of resins are the costs of raw materials, energy, capital, marketing and freight, and capacity utilization. The cost of raw materials, primarily basic petrochemicals, represented about 58 percent of the total value of sales in 1989 and the first half of 1990. The cost of these materials depends heavily on the prices of crude oil and natural gas, which vary substantially over time. For example, prices of hydrocarbon raw materials rose for a short time in response to the recent conflict in the Persian Gulf. Since 1982, resin manufacturers in Eastern Canada have been purchasing raw materials at typical Gulf Coast prices, while Western Canadian producers have enjoyed lower raw material costs because they use local ethane derived from natural gas. Both Eastern and Western Canadian resin manufacturers buy raw materials on the basis of long-term contracts.

Capital-related charges, typically representing between 12 and 18 percent of total Canadian operating costs, have been higher in Canada than in the Gulf Coast area. This is largely because initial capital costs in Canada have been about 15 to 25 percent higher. Higher construction costs arise from, among other things, a harsher climate, an inadequate existing infrastructure (pipelines, services, etc.) and higher financing charges. These differences leave Canadian companies with higher depreciation and maintenance charges.

Unit marketing costs have tended to be higher for Canadian resins firms than for Gulf Coast counterparts since, in many cases, markets in Canada are more diffuse than those in the United States, and numbers of customers and shipment volumes are smaller. Freight costs tend to be higher in Canada than in the United States, especially for the landlocked western segment of the industry, although deregulation of the trucking and rail industries has reduced costs. Marketing costs have decreased since the implementation of the Canada-U.S. Free Trade Agreement (FTA) on 1 January 1989 as a result of the process of the intra-company rationalization that followed.

Capacity utilization in Canadian resin facilities has tended to be comparable with or superior to that of the Gulf Coast area plants, particularly during periods of oversupply due to aggressive marketing and an ongoing involvement in offshore markets.

Trade-Related Factors

Tariffs represent a significant element in international trade for commodity-grade resins and compounds. Non-tariff barriers have not been significant factors in the trade of synthetic resins.

Prior to the implementation of the FTA, Canadian tariffs on synthetic resins were 9.3 to 11 percent while U.S. tariffs were 6.3 to 12.5 percent. Most engineering-grade resins and compounds entered Canada duty-free. Under the terms of the FTA, Canadian and U.S. tariffs are being phased out in five annual, equal steps for monomers, resins and compounds, and in 10 annual, equal steps for many fabricated products. Tariff elimination has led U.S. producers to consider Canada as part of a larger, integrated North American market. In comparison, the European Community tariff for imports of resins is 6.9 to 12.5 percent, and that assessed by Japan is 4.1 to 14 percent.

On a broader front, many countries have been participating in the Uruguay Round of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT). These talks are aimed at further liberalizing trade. The Canadian resins industry supports reduction in world tariffs because changes could result in greater access to offshore markets. The economic integration of the European Community after 1992 is not expected to have an impact on the Canadian resins industry.

Technological Factors

For the most part, both the process and product technologies utilized in Canada are up-to-date and are licensed from parent companies or other foreign chemical companies. Access to technology is not an issue in the industry. A few manufacturers in Canada have developed positions of technological strength in specific product types. One example is Du Pont Canada, which has developed a range of specialized polyethylene resins. AT Plastics (acquired from C-I-L) has developed ethylene-vinyl acetate copolymers. Reichhold has developed novel solid phenolic resins for use in wood composites. These products are essentially specialty grades of high- and medium-volume commodity resins that typically command a higher price than more commonly used grades. Canadian resin companies have access to the technology needed to produce engineering resins and compounds, but the domestic market alone is too small to justify the manufacture of these polymers in Canada.

Other Factors

The cost structure of the synthetic resins industry is sensitive to energy pricing, because resins are derived mostly from raw materials produced from crude oil and natural gas. In times of international price instability, such as occurred in the latter half of 1990 in response to the Persian Gulf crisis, the Canadian industry may gain a short-term advantage, since a large portion of its capacity is based on domestic natural gas. The European industry, by contrast, depends on imported oil.

The Canadian resins industry is moderately sensitive to changes in the Canada-U.S. exchange rate in the domestic market, because Canadian raw material and resin prices are based on U.S. prices and, for most of the 1980s, on applicable tariffs. In addition, the exchange rates vis-à-vis Western European and Japanese currencies are important in the context of export competition with products from Europe and Japan in developing-country markets.

Evolving Environment

Long-term growth in world consumption of synthetic resins is expected to exceed overall world economic growth, especially for transportation and construction applications. However, several factors will influence this trend both worldwide and in North America.

Globalization and rationalization of markets and manufacturing facilities in response to declining trade barriers will bring changes in the industry's structure. In order to better serve regional markets, there is a renewed trend to locate facilities close to major markets. Locations close to a reliable source of raw materials, however, will continue to attract some investment, which could favour Western Canadian operations in the future.

Growing concerns about protecting the environment, particularly with regard to disposal of consumer waste as well as industrial waste, threaten to reduce the resins industry's growth in highly industrialized countries. The industry's response has been to encourage reduced consumption by reducing the thickness of resin applications and improving resin properties in some products as well as by recycling or incinerating consumer plastic waste. In North America, recycling plans have concentrated on plastic products made from large-volume thermoplastic resins.

In the mid-1980s, Saudi Arabia constructed considerable capacity for making commodity-grade thermoplastic resins. More recently, similar construction in Southeast Asia and China will lessen the dependence of these countries on imports from Canada and other leading industrial countries.

New capacity, primarily in the United States, will come on stream in the next three years and may also contribute to excess capacity.

The resins industry, particularly in the United States, Western Europe and Japan, has been developing a trend towards increased sales of higher-priced specialty resins and plastic alloys. This strategy has reduced income volatility and has improved the profitability of the industry.

With the integration of Canadian production into the North American market, Canadian plants that are competitive benefited from improved export potential and opportunities for growth. The global rationalization of this industry has resulted in the consolidation of corporate decision-making, including a downsizing of Canadian offices. Further, the likelihood of price equalization with U.S. plants will increase the rate at which productivity gains must be adopted. Past events have shown that major upsets involving oil supplies can affect the world price of raw materials, as occurred during the recent conflict in the Persian Gulf.

Future major expansions both worldwide and in Canada will continue to require competitively priced and secure raw materials, investment in nearby world-scale basic petrochemical facilities and infrastructure, and growth of downstream markets.

After taking into account necessary imports of specialty, low-volume, commodity grades of resins, Canadian resin manufacturers have sufficient capacity to satisfy domestic market needs for PEs, PP, and all commodity-grade thermosetting resins, assuming forecast growth rates. This level of capacity will continue past the year 2000. Increased capacity is needed to meet domestic market needs in PVC, PS and ABS resins by the mid-1990s. An opportunity also exists to significantly increase the production of compounds of several engineering resins.

Several new projects are being considered for Sarnia and Montreal as well as the Alberta communities of Joffre and Fort Saskatchewan. These projects would involve significant investment and commissioning of olefin, resin and other derivative plants over the next few years. These new projects are being built mainly for exports to the United States.

Uncertainty exists regarding the consumption of resins by Canadian plastic processors at current and previous growth rates. This industry is in the process of wide-ranging rationalization, and the extent of readjustment is not predictable.

At the time of writing, the Canadian and U.S. economies were showing signs of recovering from a recessionary period. During the recession, companies in the industry generally experienced reduced demand for their outputs, in addition to longer-term underlying pressures to adjust. In some cases, the cyclical pressures may have accelerated adjustments and restructuring with commensurate reduced autonomy. With the signs of recovery, though still uneven, the medium-term outlook will correspondingly improve. The overall impact on the industry will depend on the pace of the recovery.

Competitiveness Assessment

The Canadian synthetic resins industry is currently profitable and competitive on the basis of landed costs when supplying low-value-added, commodity-grade resins to the Canadian as well as to the northeastern, midwestern and northwestern U.S. markets, which they enter on a duty-free basis. The industry is close to being competitive on the basis of delivered costs with U.S., Western European and Japanese manufacturers when shipping to the newly industrialized countries in Southeast Asia and South America. However, it faces strong competition from Middle Eastern producers, who have access to low-cost petrochemical feedstocks.

New investment and facilities will be needed in the next decade to provide capacity for growing domestic demand and to replace obsolete facilities, as these types of facilities generally need replacing after 15 to 20 years of service. Several projects now under consideration would increase Canadian olefin and resin capacity.

Improvement in Canadian resin competitiveness is unlikely in the next decade, unless significant change in the factors affecting costs takes place. Growth of the industry's capacity and modernization can be expected to be gradual and limited.

For further information concerning the subject matter contained in this profile or in the ISTC sectoral studies listed on page 10, contact

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PRINCIPAL STATISTICS[a]

	1983	1984	1985	1986	1987	1988	1989
Establishments	74	79	86	94	94	100	97
Employment	5 921	6 300	5 800	6 234	6 610	6 726	7 012
Shipments ($ millions)	1 619	1 824	1 969	2 069	2 544	3 130	3 029
Shipments[b] (constant 1981 $ millions)	1 434	1 514	1 617	1 679	1 952	2 092	2 129
GDP[c] (constant 1981 $ millions)	262.9	289.0	269.0	296.3	299.1	282.5	299.7
Investment[d] ($ millions)	40.1	45.6	56.2	112.9	101.0	117.2	176.3
Profits after tax[e] ($ millions)	60.9	21.5	-39.2	65.0	134.0	N/A	N/A
(% of income)	3.2	1.0	N/A	3.4	6.3	N/A	N/A

[a]For establishments, employment and shipments, see *Chemical and Chemical Products Industries*, Statistics Canada Catalogue No. 46-250, annual (SIC 3731, plastic and synthetic resin industry).

[b]Shipments in constant 1981 dollars were obtained by adjusting shipments in current dollars using the index for synthetic resins taken from *Industry Price Indexes*, Statistics Canada Catalogue No. 62-011, monthly.

[c]See *Gross Domestic Product by Industry*, Statistics Canada Catalogue No. 15-001, monthly.

[d]See *Capital and Repair Expenditures, Manufacturing Subindustries, Intentions*, Statistics Canada Catalogue No. 61-214, annual.

[e]See *Corporation Financial Statistics*, Statistics Canada Catalogue No. 61-207, annual.

N/A: not available or not applicable

TRADE STATISTICS[a]

	1983	1984	1985	1986	1987	1988[b]	1989[b]
Exports ($ millions)	521	629	800	878	1 135	1 481	1 305
Domestic shipments ($ millions)	1 098	1 195	1 169	1 191	1 409	1 649	1 724
Imports ($ millions)	934	1 034	1 087	1 192	1 348	1 584	1 680
Canadian market ($ millions)	2 032	2 229	2 256	2 383	2 757	3 233	3 404
Exports (% of shipments)	32.2	34.5	40.6	42.4	44.6	47.3	43.1
Imports (% of Canadian market)	46.0	46.4	48.2	50.0	48.9	49.0	49.4

[a]See *Exports by Commodity*, Statistics Canada Catalogue No. 65-004, monthly; and *Imports by Commodity*, Statistics Canada Catalogue No. 65-007, monthly.

[b]It is important to note that data for 1988 and after are based on the Harmonized Commodity Description and Coding System (HS). Prior to 1988, the shipments, exports and imports data were classified using the Industrial Commodity Classification (ICC), the Export Commodity Classification (XCC) and the Canadian International Trade Classification (CITC), respectively. Although the data are shown as a continuous historical series, users are reminded that HS and previous classifications are not fully compatible. Therefore, changes in the levels for 1988 and after reflect not only changes in shipment, export and import trends, but also changes in the classification systems. It is impossible to assess with any degree of precision the respective contribution of each of these two factors to the total reported changes in these levels.

SOURCES OF IMPORTS[a] (% of total value)

	1983	1984	1985	1986	1987	1988	1989
United States	87.2	86.6	84.8	85.6	85.2	85.8	88.1
European Community	9.7	10.2	11.7	11.3	11.3	10.5	9.5
Pacific Rim	1.2	1.7	3.0	1.7	1.5	1.6	1.7
Other	1.9	1.5	0.5	1.4	2.0	2.1	0.7

[a]See *Imports by Commodity*, Statistics Canada Catalogue No. 65-007, monthly.

DESTINATIONS OF EXPORTS[a] (% of total value)

	1983	1984	1985	1986	1987	1988	1989
United States	59.1	62.8	62.8	60.8	56.4	52.2	59.3
European Community	3.2	4.7	3.4	5.4	7.1	3.3	6.5
Pacific Rim	15.5	14.4	17.6	16.4	23.4	37.2	29.0
Other	22.2	18.1	16.2	17.4	13.1	7.3	5.2

[a]See *Exports by Commodity*, Statistics Canada Catalogue No. 65-004, monthly.

REGIONAL DISTRIBUTION[a] (average over the period 1986 to 1988)

	Atlantic	Quebec	Ontario	Prairies	British Columbia
Establishments (% of total)	–	28	55	10	7
Employment (% of total)	–	24	61	12	3
Shipments (% of total)	–	25	52	21	2

[a]See *Chemical and Chemical Products Industries*, Statistics Canada Catalogue No. 46-250, annual.

MAJOR FIRMS

Name	Country of ownership	Location of major plants
Dow Chemical Canada Inc.	United States	Sarnia, Ontario Fort Saskatchewan, Alberta
Du Pont Canada Inc.	United States	Sarnia, Ontario Maitland, Ontario
Esso Chemical Canada	United States	Sarnia, Ontario
G.E. Plastics Canada	United States	Cobourg, Ontario
B.F. Goodrich Canada Inc.	United States	Fort Saskatchewan, Alberta Shawinigan, Quebec Niagara Falls, Ontario
Himont Canada Inc.	Italy	Varennes, Quebec
Novacor Chemicals Ltd.	Canada	Joffre, Alberta Corunna, Ontario Sarnia, Ontario Cambridge, Ontario Montreal East, Quebec
Reichhold Limited	United States	North Bay, Ontario Thunder Bay, Ontario Weston, Ontario Sainte-Thérèse, Quebec

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SECTORAL STUDIES AND INITIATIVES

The following publications are available from Industry, Science and Technology Canada (see address on page 6).

Assessment of the North American Plastics Processing Industry
Compiled by SRI International in 1990, this report covers such products as plastics used in packaging and construction.

Canadian Plastics End-Use Market Analysis, 1986–1996
Published jointly with SPIC in 1988, this report deals with actual and anticipated demand for plastics in various markets from 1986 to 1996.

Chemicals Directorate Statistical Review
Published annually by the Chemicals Directorate of ISTC, this review includes statistics on synthetic resins, elastomers, plastic fabricated products and rubber products.

Printed on paper containing recycled fibres.