INDUSTRY PROFILE

Industry, Science and Technology Canada
Industrie, Sciences et Technologie Canada

Synthetic Resins

Canada

INDUSTRY PROFILE

SYNTHETIC RESINS

1988

FOREWORD

In a rapidly changing global trade environment, the international competitiveness of Canadian industry is the key to survival and growth. This Industry Profile is one of a series of papers which assess, in a summary form, the current competitiveness of Canada's industrial sectors, taking into account technological and other key factors, and changes anticipated under the Canada-U.S. Free Trade Agreement. Industry participants were consulted in the preparation of the papers.

The series is being published as steps are being taken to create the new Department of Industry, Science and Technology from the consolidation of the Department of Regional Industrial Expansion and the Ministry of State for Science and Technology. It is my intention that the series will be updated on a regular basis and continue to be a product of the new department. I sincerely hope that these profiles will be informative to those interested in Canadian industrial development and serve as a basis for discussion of industrial trends, prospects and strategic directions.

Robert de Cotret

Minister

Canada

1. Structure and Performance

Structure

The Canadian synthetic resins industry comprises 86 establishments producing a variety of resins and compounds including polyethylenes, polyvinyl chlorides, polystyrenes, polypropylenes, acrylonitrile-butadiene-styrenes, polyamides, phenol-formaldehydes and others. These are primary inputs for other industries and are usually produced as powders or granules, but may, in some cases, be in the form of viscous liquids. Raw material inputs required by the resins industry include basic petrochemicals such as ethylene, styrene, vinyl chloride and propylene, and fillers and additives.

Major customers for the sector's output are the plastics products industry, estimated to consume over half of the sector's output, and a variety of other industries including adhesives, forest products, metals, wire and cable, paint, petroleum products and chemical specialties. The plastics products industry manufactures products such as films for packaging; bottles for soft drinks, detergents and oil; window and door frames; glazing; bathtubs and shower stalls; foamed insulation; pipe and fittings; toys; and housewares.

Resins consumed in Canada can be broadly subdivided into high-volume commodity thermoplastic, medium-volume commodity thermoset and engineering-type resins and compounds. Thermoplastics can be melted on the application of heat, and solidified when the liquid is cooled; thermosets cannot be melted and characteristically undergo chemical change when heated. High-volume thermoplastic resins and compounds include low-density, linear low-density and high-density polyethylenes (PEs), polyvinyl chlorides (PVCs), polypropylenes (PPs), polystyrenes (PSs) and acrylonitrile-butadiene-styrenes (ABSs) and are manufactured in numerous grades. Medium-volume thermoset resins and compounds include phenol-formaldehydes, urea-formaldehydes and unsaturated polyesters. Engineering resins and compounds are mostly thermosplastic in nature and include polycarbonates, specialty nylons, polytetrafluoroethylenes, epoxies, polyacetals and polysulfones, and are characterized by such properties as improved heat resistance, gas permeability, toughness and other properties, as well as higher price and low consumption.

Most of the resins manufactured in Canada are broadly similar to resins made in a number of other countries, and, as commodities, must compete internationally on a price basis. Some lower-volume specialty grades of both thermoplastic and thermoset commodity resins and compounds are imported because the demand does not justify domestic manufacture, or because the process technology is not available in Canada.

Engineering resins and compounds are mostly imported because the current Canadian demand does not justify the construction of plants, and the North American demand can be met by one or two plants in the United States.

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Imports, Exports and Domestic Shipments* 1986

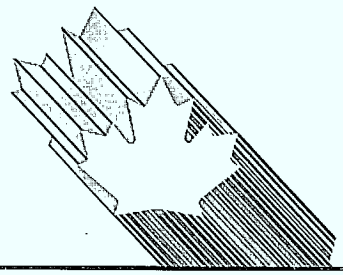
** Domestic Shipments data are preliminary*

The industry is generally oriented towards supplying the Canadian market. The value of shipments of synthetic resins by manufacturers in Canada was approximately $2 billion in 1986. Eighty-two percent of the shipments consisted of high-volume thermoplastic resins and compounds, while shipments of medium-volume thermoset resins and compounds accounted for approximately 18 percent of total shipments. Exports by the industry were $878 million in 1986, and included substantial quantities of polyethylenes. An estimated 10 percent of exports consist of specialized grades of commodity resins which are preferred by clients because of superior performance, in spite of premium prices. Imports by the industry were $1192 million, equivalent to 53 percent of the domestic market. Eighty-six percent of all imports came from the United States. Imports of low-volume grades of thermoplastic commodity resins accounted for 58 percent of the value of imports. Engineering resins represented 15 percent of total imports, while the balance consisted of cellulosics and other resins.

The United States Gulf Coast producers have been the standard for international competitiveness in petrochemical derivatives, including resins, throughout the industry's history and remains so today. Compared to typical operations along the United States Gulf Coast or in western Europe, the Canadian resins industry has a limited number of vertically integrated operations that are owned by individual companies. An example of vertical integration can be found in the Nova group of companies which own a natural gas pipeline system, two ethylene plants, two polyethylene plants, and have interests in two methanol plants and ethane extraction plants. Another example is Imperial Oil, owner of oil and gas properties in Alberta, several refineries, an olefins plant (producing ethylene and associated by-products) and two synthetic resin plants in Sarnia, Ontario, and a fertilizer complex in Alberta. An estimated 75 percent of synthetic resins manufactured in Canada are produced by subsidiaries of foreign-owned corporations. Novacor Chemicals and Polysar are two firms owned and controlled in Canada.

Of the 86 establishments in the sector, 51 are in Ontario, 23 in Quebec, seven in Alberta and five in British Columbia. In terms of production capacity, the distribution is approximately 58 percent in Ontario, 16 percent in Quebec, 25 percent in Alberta and the balance in British Columbia. The industry employed 5800 persons in 1986. The western segment of the industry, located mostly in Alberta, produces high-volume commodity resins and utilizes raw materials derived from natural gas. The eastern segment of the Canadian industry, located in Ontario and Quebec, produces both high-volume and medium-volume commodity resins. It is mostly based on raw materials derived from crude oil, although producers have been increasing the flexibility of their operation to allow the use of both petroleum and natural-gas-derived raw materials.

Production of synthetic resins is widespread in the world today, amounting to an estimated 77 million tonnes per year (56 million tonnes consisting of the main five "commodity" resins: polyethylenes, polyvinyl chlorides, polypropylenes, polystyrenes and acrylonitrile-butadiene-styrenes at 43, 27, 15, 12, and three percent respectively). Of the 77 million tonnes, western Europe is estimated to produce 30 percent, the United States 26 percent, Japan 11 percent, other Far East countries 11 percent, Latin America six percent, and Canada three percent. Manufacturers in western Europe, the United States and Japan dominate the production and marketing of both commodity resins and engineering resins and alloys on a global basis. The remaining world regions, including Canada, primarily produce commodity resins and import engineering resins and alloys.



Performance

Between 1975 and 1980, the value of shipments by the Canadian resins industry increased at an annual rate of 17 percent. This high growth rate was due to the commissioning of several large, new resin plants and substantial growth in domestic demand and exports. Between 1980 and 1986, the value of shipments increased at a substantially lower annual rate of four percent and reflected the commissioning of fewer new resin plants and lower growth in domestic demand and exports. By comparison, shipments by all manufacturing industries grew at an annual rate of 2.3 percent between 1980 and 1986. The number of firms producing resins and compounds has increased from 32 in 1973 to 53 in 1986. At the same time, the number of establishments increased from 40 in 1973 to 86 in 1986.

The industry in Canada added substantially to its manufacturing capacity in the period between the late 1970s and mid-1980s on the basis of an expected raw material price advantage, ever-increasing energy pricing and continued high growth of plastic markets, factors which would more than offset higher construction and other capital costs. In recent years, however, events have reduced the Canadian industry's advantages because of changes in the price of Canadian crude oil and natural gas compared to the United States Gulf Coast. This resulted in higher raw material costs. In the 1982 to 1986 period, the domestic and worldwide demand for resins did not develop as expected and instead resulted in worldwide overcapacity, low resin prices and low profits.

During the 1982 to 1986 period, the reasons for Canadian industry's higher costs and lower profits included:

- A portion of the industry in the United States enjoyed higher earnings from specialty resins, not made in Canada, that were less subject to the price pressure that characterizes the commodity resin market.
- Proportionately, Canadian manufacturers exported a larger amount of total shipments at depressed world prices and, as a result, the margin on the value of shipments tended to be lower in the Canadian case.
- A large proportion of resin production in Canada was produced in new facilities with attendant higher capital costs.
- Western Canadian producers had higher freight costs which tended to counterbalance an advantage in raw material costs.

In this capital-intensive industry, it is economically necessary that resin plants be operated at high rates of capacity utilization. As a result, manufacturers in Canada have actively sought export orders, which frequently have been available only at very low prices. More recently, in 1987, some export prices were reported to be above domestic prices, reflecting a shift in the global commodity resins market from a buyers' market to a sellers' market.

Barring any significant downturn in the economy, Canadian manufacturers are likely to experience several profitable years of operations. This improvement in the market will provide funds for possible future expansions.

Based on available statistics, the Canadian market for resins increased at a real annual rate of 9.5 percent between 1975 and 1980, and four percent between 1980 and 1986. During the 1980 to 1986 period, exports increased at a real annual rate of nine percent, while imports increased at a rate of seven percent. Synthetic resins manufacturers in Canada have been serving a declining proportion of the domestic market. Their share was 57 percent in 1980, and 47 percent in 1986. Four factors contributed to this decline in market share:

- Increased use of engineering resins not made in Canada to meet an increasing rate of application of high-performance compounds in the packaging, automotive and other industries.
- Imports of high-volume commodity resins, especially polyethylenes, polyvinyl chlorides and acrylonitrile-butadiene-styrenes increased substantially in the 1982 to 1986 period due to world-wide excess capacity and low import prices.
- Three manufacturers of polyethylenes imported resin for market-development purposes prior to the start-up of their plants in the 1983 to 1985 period.
- Increased rationalization of Canadian and United States production facilities.

Exporting commodity resins to industrialized countries in western Europe and Japan has been difficult in the last decade because of the existence of strong, developed and export-oriented industries, freight and import duty costs, local marketing practices and corporate affiliations. Specialized grades of commodity resins have been exported by Canadian manufacturers to western Europe in limited quantities. Canadian manufacturers have been able to export commodity resins to Pacific Rim countries and some South American countries in competition with western European, Japanese and United States producers. During the 1982 to 1986 period, a higher portion of exports was shipped to the United States because of the prevalence of low prices outside the industrialized countries. Since 1987, prices have improved in less developed countries making exports more attractive.

2. Strengths and Weaknesses

Structural Factors

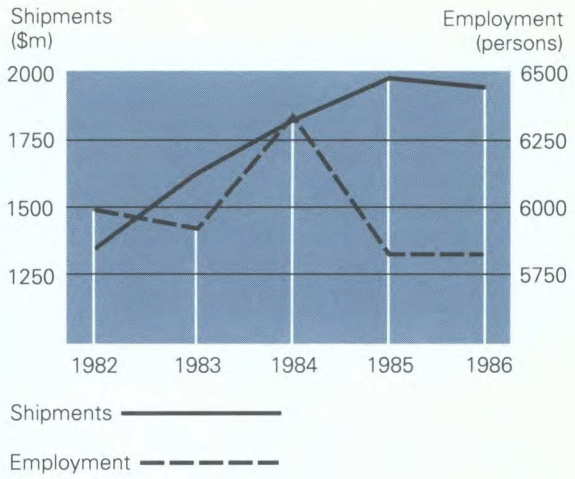
The resins industry is raw-material and capital intensive. In general, Canadian resin plants, most of which have been built or refurbished within the past 11 years, are modern, usually world-scale and efficient, and capable of producing resins with costs close to United States Gulf Coast levels. The major factors that affect competitiveness and profitability are the costs associated with raw materials, energy, capital and marketing. Among the strengths of the Canadian resins industry are its lower energy costs and, to a degree, its lower raw material costs. Weaknesses include higher capital-related and marketing costs.

The cost of raw materials represented about 65 percent of the total value of sales in 1985. Raw material costs depend on the price of crude oil and natural gas and profitability in the upstream basic petrochemical industry, both of which vary substantially over time. Since 1982, resin manufacturers in eastern Canada have been purchasing raw materials at typical United States Gulf Coast prices. Western Canadian producers have enjoyed lower raw material costs than United States Gulf Coast producers. Both the eastern and western producers buy raw materials on the basis of long-term contracts and pricing formulas.

Canadian energy costs tend to be lower than that along the United States Gulf Coast. However, this represents only a small advantage since, typically, energy accounts for only five percent of operating costs, which include all costs and expenses except delivery costs, based on 1986 conditions.

Capital-related charges, typically representing about 18 percent of total Canadian operating costs, have been higher than that along the United States Gulf Coast. This is largely because initial capital costs in Canada have been from 15 to 25 percent higher, due to higher construction costs arising from, among other things, a difference in climate and higher financing charges. These costs are manifested by higher depreciation and maintenance charges and a lower return on investment. The province of Alberta has a policy of locating major plants away from large cities which increases the cost of construction. The difference in cost of constructing plants in Canada compared with the United States Gulf Coast appears to have narrowed in recent years.

Unit marketing expenses tend to be higher in the Canadian resins industry than in the United States Gulf Coast industry since, in many cases, markets in Canada are more diffused than in the United States and shipment volumes are smaller. This leads to higher freight costs in Canada, especially for the landlocked western segment of the industry.



*Total Shipments and Employment**

** Data for 1986 are estimated.*

The net effect of the above-mentioned factors appears to be that, in comparison with a typical United States Gulf Coast producer of synthetic resins, the domestic industry has operating costs that are slightly higher in eastern Canada and slightly lower in western Canada. Western Canadian producers experience higher costs for shipping to their domestic and export markets.

Major capacity expansions committed between 1977 and 1985 were based on Canadian cost advantages in raw materials compared with United States Gulf Coast producers. Falling international prices and energy deregulation have significantly reduced this advantage and may impede future major expansions in synthetic resins in Canada. In addition, the severe impact of the 1982 recession and subsequent global excess capacity have made both petrochemical raw materials and resin companies in Canada and other industrialized countries reluctant to make substantial investments until reasonable profits have been generated by both industries for a period of time.

Canadian resin manufacturers have production capacity in excess of domestic demand for the five high-volume commodity resins. This excess capacity is being utilized for exports.

Trade-related Factors

Tariffs represent a significant element in international trade for products such as commodity resins that are characterized by uniform quality and low prices. Canadian import tariffs on synthetic resins range from 9.3 to 11 percent; United States tariffs from 6.3 to 12.5 percent; European Community tariffs from 6.9 to 12.5 percent and Japanese tariffs from 4.1 to 14 percent. Most engineering resins and compounds enter Canada duty free. Non-tariff barriers have not been significant in the synthetic resins trade.

The Canada-U.S. Free Trade Agreement (FTA) provides for the removal of tariffs on synthetic resins in five equal annual steps, beginning in January 1989. In addition, tariffs on raw material inputs for resin manufacturing will be eliminated over five years and on downstream plastic products over 10 years. Resin manufacturers are generally in favour of the FTA.

Technological Factors

For the most part, the technology utilized in Canada is up-to-date and is provided by licensing from parent companies or other foreign chemical companies. A few manufacturers in Canada have developed positions of technological strength in specific product types. Examples include: Du Pont Canada Inc., and its development of a range of specialized polyethylene resins and products derived therefrom; C-I-L Inc., and its development of ethylene-vinyl acetate copolymers; and Reichhold Ltd., and its development of novel solid phenolic resins for use in the forest products industry. These products are essentially specialty grades of high- and medium-volume commodity resins that typically command a higher price than more commonly used grades. They are generally consumed in smaller quantities and are used in more demanding applications. Canadian resin companies have access to the technology needed to produce engineering resins and compounds, but the domestic market is too small to justify manufacturing them.

Other Factors

The cost structure of the sector is sensitive to energy policy, because resins are derived mostly from raw materials produced from natural gas and crude oil.

The resins industry is moderately sensitive to changes in the U.S.-Canada exchange rate, because both the cost of the raw materials and resin prices are based on U.S. prices. Raw materials generally represent 65 percent of the total operating costs. In addition, the exchange rates vis-à-vis the currencies of western Europe and Japan are important in the context of export competition with products from Europe and Japan in developing-country markets.

3. Evolving Environment

The long-term growth in consumption of synthetic resins by the developed countries, the newly industrialized countries such as Taiwan, Brazil and Mexico, and the developing countries such as Nigeria and The People's Republic of China, is forecast to be in excess of the growth rate of the economies. The plastics industries in major industrialized countries are confident that synthetic resin-based products will continue to be developed for packaging, construction, communications, machinery, transportation and consumer goods, and will increasingly replace products derived from traditional materials.

The major worldwide trend evident in the late 1970s and early 1980s, in the period following the first oil shock, was for new basic petrochemical and derivative facilities, including resin facilities, to be built close to sources of hydrocarbon raw materials, in such locations as Saudi Arabia, Mexico and western Canada. These facilities, justified on the basis of availability of hydrocarbon feedstock and economic conditions at that time, have used a substantial portion of the natural-gas derived feedstock that was available and had been underutilized. It is more likely that, when major expansions of world-wide resin capacity are built in the future, they will again be located close to major markets, rather than at the source of hydrocarbon raw materials. On a global as well as a Canadian basis, major expansions will continue to require competitively priced and adequate raw materials, the simultaneous construction of nearby world-scale basic petrochemical facilities, growth of downstream market demand and attractive, competitive rates of return.

The start of Saudi Arabian production of polyethylene in late 1984 and polyvinyl chloride resins in early 1986 introduced a new, low-cost source of resin in the world. This could impact on Canadian export markets. Since Saudi Arabian resin is being marketed principally in Japan, western Europe and southeast Asia, it should not be a direct threat to Canada's principal resin exports to the United States. It could, however, have a detrimental effect on Canada's exports to southeast Asian and European markets which, typically, represent seven and two percent respectively of total shipments of resins by companies in Canada. While the People's Republic of China is building several world-scale commodity resin plants, these will contribute to satisfying China's growing domestic market, and are not expected to reduce the volume of its imports significantly.

A recent market analysis, jointly undertaken by the Department of Regional Industrial Expansion and the Society of Plastic Industries of Canada, predicts a growth in Canadian synthetic resins consumption of 6.3 percent per year for the next decade, or more than twice the forecast GNP growth rate.

It is likely that either major additional capacity or increased imports will be needed in Canada by the early 1990s to satisfy the forecast domestic market growth for polypropylene and polyvinyl chloride resins. Sufficient capacity exists to satisfy the domestic market for other high-volume commodity resins until the late 1990s. The elimination of the Canadian raw material advantage in the 1980s has tended to limit the prospects for major expansions in Canada. Such capacity expansions, designed to meet requirements for the domestic market and to take advantage of export opportunities, are possible if favourable conditions return.

Canada's resins industry, which largely manufactures commodity resins, may grow less rapidly than that of the United States because new applications, for instance, food "cans" based on polyethylene terephthalate resins to replace steel and aluminum cans, require engineering resins not made in Canada.

Tax reform generally, has moved to reduce tax rates and broaden the tax bases of corporations. While corporate tax payments will rise slightly to fund personal tax reductions, some corporations will experience tax reductions while others will have increases. The Canadian Chemical Producers' Association has expressed the concern that the proposed "put-in-use" rule and the reduction in the write-off rate for manufacturing machinery and equipment may reduce their ability to compete for new projects with the United States. This concern has been responded to in part by the modifications to lessen the impact of the put-in-use rule on longer lead-time projects.

The elimination of tariffs under the FTA can be expected to reduce the Canadian industry's prices and profits in domestic markets. Prices of, and profits from, exports to the United States will generally increase. The forthcoming elimination of tariffs is also expected to improve the presently limited prospects for major expansions in the natural gas-based segment of the industry located in Alberta, although the basic uncertainty with respect to attracting new investment remains. The FTA will also provide opportunities for the segment of the industry located in Quebec and Ontario to modestly expand operations to service the domestic market and markets in the northeast and mid-west United States. In addition, the FTA also is likely to provide an incentive to close less efficient and older plants and provide an opportunity to replace these with modern, world-class plants. To the extent that the downstream plastic products industry is adversely affected by the FTA, the resins industry — as a supplier to the plastics products industry — would also be affected.

4. Competitiveness Assessment

In comparison with United States Gulf Coast producers, the Canadian synthetic resins industry is, in most cases, competitive in Canada, and in the mid-west and northwest regions of the United States on a landed cost basis, assuming that no tariffs apply. The sector is usually considered to be non-competitive when shipping into other regions of the United States.

The recent change in exchange rates has improved the competitiveness of Canadian resin manufacturers vis-à-vis western European and Japanese producers. This is likely to improve the climate for increased exports to developing countries.

The FTA will encourage the industry to improve operations through increased rationalization of products, facilities and overheads, and through restructuring and incremental expansions of capacity. The FTA will also somewhat improve the prospects of major expansions of capacity in western Canada, although the basic uncertainty with respect to attracting new investment remains.

For further information concerning the subject matter contained in this profile, contact:

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PRINCIPAL STATISTICS

SIC(s) COVERED: 3731 (1980)

	1973	1982	1983	1984	1985	1986
Establishments	40	70	74	79	86	86*
Employment	4 657	5 997	5 921	6 300	5 800	5 800*
Shipments ($ millions)	303	1 368	1 619	1 824	1 969	1 922*
Gross domestic product (constant 1981 $ millions)	187	176	263	308	326	345
Investment ($ millions)	32	71.2	40.1	45.6	56.2	118.7
Profits after tax ($ millions)	—	(19.3)	60.9	21.5	(39.2)	—
(% of income)	—	(1.1)	3.2	1.0	(1.8)	—

TRADE STATISTICS

	1973	1982	1983	1984	1985	1986
Exports ($ millions)***	89	516	521	629	800	878
Domestic shipments ($ millions)	214	852	1 098	1 195	1 169	1 044*
Imports ($ millions)***	197	712	934	1 034	1 087	1 192
Canadian market ($ millions)	411	1 564	2 034	2 229	2 256	2 236*
Exports as % of shipments	29	38	32	34	41	46*
Imports as % of domestic market	48	46	46	46	48	53*
Canadian share of international production - %	—	—	—	—	—	3.1**

Source of imports (% of total value)		U.S.	E.C.	Asia	Others
	1982	89.7	7.8	1.3	1.2
	1983	87.2	9.7	1.2	1.9
	1984	86.6	10.2	1.7	1.5
	1985	84.8	11.7	3.0	0.5
	1986	85.6	11.3	1.7	1.4

Destination of exports (% of total value)		U.S.	E.C.	Asia	Others
	1982	44.2	5.0	25.6	25.2
	1983	59.1	3.2	15.5	22.2
	1984	62.8	4.7	14.4	18.1
	1985	62.8	3.4	17.6	16.2
	1986	60.8	5.4	16.4	17.4

(continued)

REGIONAL DISTRIBUTION — Average from 1983 to 1985

	Atlantic	Quebec	Ontario	Prairies	B.C.
Establishments - % total	—	27	58	8	7
Employment - % total	—	28	59	—	—
Shipments - % total	—	—	58	—	—

SOME MAJOR FIRMS

Name	Ownership	Location of Major Plants
1. Polysar Ltd.	Canadian	Cambridge, Ontario and Montréal, Quebec
2. Dow Chemical Canada Ltd.	United States	Sarnia, Ontario and Edmonton, Alberta
3. Du Pont Canada Inc.	United States	Sarnia, Ontario
4. C.I.L. Inc.	British	Edmonton, Alberta
5. Esso Chemical Canada	United States	Sarnia, Ontario
6. Novacor Chemicals Ltd.	Canadian	Joffre, Alberta and Sarnia, Ontario
7. B.F. Goodrich Canada Inc.	United States	Fort Saskatchewan, Alberta Shawinigan, Quebec and Niagara Falls, Ontario
8. Shell Canada Chemical Co.	Netherlands	Sarnia, Ontario
9. Himont Canada Inc.	Italy	Varennes, Quebec
10. Borg-Warner Chemicals Ltd.	United States	Cobourg, Ontario
11. Reichhold Ltd.	United States	North Bay, Thunder Bay, and Weston, Ontario; St-Therese, Quebec; Port Moody and Kamloops, B.C.

* Preliminary data
** Tonnage or weight basis
*** Including synthetic rubber

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