STUDY OF THE PETROCHEMICAL INDUSTRIES IN THE COUNTRIES OF THE NORTHERN PORTION OF THE WESTERN HEMISPHERE

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Appendix B
The Petrochemical Industry in Mexico and Other North American Nations Excluding Canada and the United States

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APPENDIX B

The Petrochemical Industry in Mexico and Other North American Nations Excluding Canada and the United States

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FORWORD

In this volume the petrochemical industry of Mexico is divided into the following sectors:

(1) Olefins

(2) Aromatics

(3) Miscellaneous acyclic organic chemicals

(4) Cyclic intermediates

(5) Pesticides

(6) Anhydrous ammonia and nitrogenous fertilizers

(7) Synthetic rubber

(8) Manmade fibers from petrochemicals

(9) Cellulosic fibers from petrochemicals

(10) Plastics

(11) Other petrochemical derivatives

Each of these industry sectors is described and analyzed according to the general areas of description and uses, customs treatment, industry structure, technology, government impact, production, imports, exports, consumption, expansion plans, future demand, and trade.

OLEFINS

Present Situation

Description and Uses

Olefins are important petrochemical building blocks for a wide variety of products for consumer, industrial, and pharmaceutical use. They are the chemical raw materials needed to manufacture certain plastics, synthetic rubbers, fibers, solvents, and other chemicals.

Chemically, the olefins are a class of unsaturated hydrocarbons composed of the elements hydrogen and carbon. Olefins are obtained from cracking natural gas liquids or certain products obtained in the refining of petroleum as well as from the refining of petroleum. Feedstocks for olefins plants are natural gas liquids (NGL's) such as ethane, butane, and propane and "heavy" liquids such as naphtha and gas oil. The three principal olefins are ethylene, propylene, and butadiene.

Ethylene is a flammable, colorless gas possessing a characteristic sweet odor and taste. Ethylene is the most important petrochemical in terms of volume of production and is used in the manufacture of a wide variety of products. It is produced by cracking light hydrocarbons such as ethane, propane and butane, or heavy liquids, such as naphtha and gas oil which are obtained during the refining of petroleum. Ethylene is also produced during the refining of petroleum.

Propylene, like ethylene, is a highly flammable, colorless gas used as a building block for petrochemicals. It is produced during the refining of petroleum and along with ethylene, in olefins plants.

Butadiene is a flammable, colorless gas and like ethylene and propylene has a mild aromatic odor. It is obtained through the process of dehydrogenation of butane and butylene. It is also a co-product in the production of ethylene and is produced during the refining process.

Butylenes are also flammable, colorless gases obtained by distillation of refinery gases. Butylenes are used in the production of gasoline, aldehydes, alcohols, and butadiene.

U.S., Canadian, and Mexican olefins have the same chemical properties whether or not they are derived from the same feedstock. The olefins are used as building blocks for the same finished products; however, these products may account for a different share of the total olefins market in each country.

Ethylene is used in the production of low-density polyethylene (LDPE) which accounts for 48 percent of the total Mexican ethylene market. Ethylene dichloride accounted for 17 percent; acetaldehyde 15 percent; ethylene oxide 14 percent; ethylenebenzene 5 percent; and high-density polyethylene (HDPE) accounted for only 1 percent of the total domestic ethylene market in 1977. 1/

1/ Instituto Mexicano del Petroleo, Desarollo Y Perspectivas De La Industria Petroquimica Mexicana, Mexico, 1977.

Propylene is used in the production of dodecene which accounted for 60 percent of the total domestic market, while acrylonitrile accounted for 38 percent and isopropyl alcohol accounted for the remaining 2 percent of production in 1977. 1/

Customs Treatment

Duties established on the importation of olefins into Mexico are established by Petroleos Mexicanos (PEMEX) and are dependent upon the goals of the Mexican Government. Mexico has established an import duty rate of 5 percent AVE on all olefins including butadiene, ethylene,propylene and others as shown in table B-1.

Imports are subject to import controls at the discretion of PEMEX and the Mexican Government. The Mexican Ministry of Industry and Commerce, in an effort to promote and improve the trade balance, has advocated the use of import quotas and export incentive programs to ensure Mexico's future position in world trade.

Structure of the Industry

PEMEX is the Mexican state oil company formed in 1938. PEMEX was designed to maintain oil productivity after Mexico nationalized the industry, and expropriated foreign investments. By statute, PEMEX was designed to achieve certain social goals such as full employment of the Mexican population and stabilization of petroleum and petrochemical prices.

Ownership

PEMEX is owned and operated by the Mexican Government. Structured in 1980 as it was in 1940, PEMEX does not operate for profit.

In Mexico, NGL's and heavy liquids are the major feedstocks for olefins. Ethane, as a feedstock, yields approximately 100 percent ethylene. Naphtha and gas oil yield approximately 60-70 percent ethylene along with petrochemical co-products and fuels.

One oil company (PEMEX) accounts for 100 percent of the total annual production of olefins. As an oil company, PEMEX is equipped to dispose of fuels derived from olefin production based on heavy liquid feedstocks.

In Mexico, the preferred feedstock for ethylene production is ethane rather than heavy liquid feeds. Between 1978 and 1979, ethylene production increased by almost 80 percent as plants began operating at near full capacity. Ethylene capacity is expected to increase as new plants come on stream by 1981. Ethylene capacity is expected to increase by 28 percent per year by 1982. 2/

1/ Ibid.

2/ "Survey of Mexico" The Economist, Apr. 22, 1978.

During the period 1978 to 1979, butadiene capacity increased by 25 percent and is expected to be operating at near full capacity by the end of 1980. 1/

Propylene production increased by 21 percent from 1978 to 1979 and is expected to continue increasing as plants reach full capacity utilization. 2/

Integration

PEMEX is a vertically integrated firm. Unlike other national oil companies, it does not contract out to private and/or foreign-owned firms. PEMEX explores for, produces, and refines crude oil and also produces ethylene and other petrochemicals.

PEMEX has often been referred to as a model for nationalized oil firms. There is only a minimal level of horizontal integration since PEMEX produces basically natural gas and petroleum, as well as their derivatives.

Foreign investment

Article 27 of the Mexican Constitution divided the petrochemical industry into two sectors: the basic sector consists of the production of all raw materials derived from petroleum refining; and the secondary sector consists of the production of downstream derivatives. Production within the secondary sector is carried out by individual companies in which the state holds a major interest.

Olefins are classified under the basic sector, along with aromatics and first order derivatives, and are controlled by the State. No foreign investment is permitted in the basic sector. All refinement and production of olefins is mandated by legislation as the exclusive right of PEMEX.

Foreign investment is allowed by the Mexican Government in the production of olefin derivatives 3/ since they would fall within the secondary sector. The Mexican Government would hold a percentage of any such operation.

Technology

There is a scarcity of skilled workers in Mexico which limits the advancement of technology needed to operate oil and natural gas plants. In order to build a technological base from which to draw, Mexico needs to obtain the requisite technology that the United States, for example, possesses. The Mexican Government recognizes that its oil and gas resources provide a unique bargaining point from which to obtain needed technology in exchange for Mexican resources.

1/ Ibid.

2/ Ibid.

3/ First-order derivatives such as polyethylene and polypropylene are considered within the realm of the basic sector and their production are the exclusive rights of PEMEX.

The Institute Mexicano del Petroleo (IMP) is an independent research and training association which is intended to provide PEMEX with technical assistance, training, and adaptation of existing technology to new processes. IMP is not able, however, to provide all the needed expertise to develop Mexico's technological base. 1/ There are certain obstacles which the IMP and the Mexican Government need to overcome such as the lack of skilled manpower, technology transfer, incentives for businesses to locate in Mexico, and research and development (R. & D.).

The IMP controls research and development for PEMEX and has proven itself valuable in modifying technological processes in order to accomodate Mexico's petroleum industry. IMP is in charge of R. & D. for PEMEX; however, it has been unable to keep pace with the ever-increasing needs of the petroleum industry. As a result, Mexico has entered into technology transfer programs with the United States and other industrialized countries.

The technological processes used by PEMEX in the production of olefins are largely foreign-developed. The United States has been the main source of technological expertise, although a small percentage has recently come from Canada.

The major source of ethylene in Mexico has been the cracking of hydrocarbons derived from petroleum or natural gas streams. NGL's are the preferred feedstocks in Mexico due to the availability of abundant supplies.

Government Policies and Involvement

The Government-owned petroleum monopoly, PEMEX, is granted the exclusive right to produce primary petrochemicals in accordance with the National Petrochemical Law of 1956. A Petrochemical Commission, consisting primarily of the director of PEMEX and the Secretary of National Patrimony and Industrial Development, grants licenses for new investment programs or expansion plans.

According to the National Petrochemical Law of 1956, any wholly-owned company in existence prior to the enactment of the foreign investment laws may remain so as long as it continues production of the same product line with no changes in either production processes or finished products. If, however, such a company wishes to add a product or change the processes of production, it must be chartered by the Foreign Investment Committee, at which time the Government becomes a partner.

"Mexican patent and trademark law does not include the same protection of confidential information and patents generally available in the rest of the industrialized world." 2/ Providing that s/he pays a royalty to the inventor,

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1/ "Survey of Mexico", The Economist, Apr. 22, 1978.

2/ The reader is referred to "U.S./Mexico Relations and Potentials Regarding Energy, Immigration, Scientific Cooperation and Technology Transfer," a document prepared by subcommittees of The Committee on Science and Technology, U.S. House of Representatives, Ninety-Sixth Congress, First Session, July 1979, pp. 6-7.

a person can "automatically work another man's patent" in Mexico. 1/ Certain changes in patent and trademark laws have been promised by the Mexican Government, ostensibly to make these laws more in step with those of the rest of the industrialized nations. 2/ Currently, there is little incentive for foreign-owned or domestic Mexican firms to develop new processes or for foreign corporations to bring their processes to Mexico. 3/ In 1974, the present administration instituted the National Industrial Development Plan (NIDP) which provided private industry with a number of incentives to boost the nameplate capacity for a number of chemicals. Some of these incentives include tax breaks, power rate discounts, and discounts on basic petrochemicals supplied by PEMEX especially if the feedstocks are for plants located in the "industrial ports". 4/

Discount pricing of feedstocks is used by the Government for a variety of purposes. The Government offers different prices to private firms based on unemployment rates. Differential pricing of feedstocks also depends on the type of chemical being produced (i.e., a priority chemical as determined by the Government), amount to be exported, and the price of the chemical to Mexican firms.

Another function of the NIDP is to reduce the balance of trade deficit by increasing exports. In early 1980, the Mexican Government created the National Foreign Trade Cabinet to oversee Mexico's export and import trade.

Mexican environmental laws are not as stringent as those in the United States, however, Mexican officials are increasingly aware of the need for laws protecting public health. In 1979, the Federal Act for the Prevention and Control of Environmental Pollution was ratified in order to protect the environment and health of the Mexican people. This law aims at preventing impairment of ecological systems and at protecting the public health. Of the two goals of the Act, protecting human health is seen as the more crucial facet of Mexico's ecological law. It appears that Mexican authorities have reasoned that some addition to environmental imbalance is affordable in the process of developing the industrial base.

Production

Mexico suffered a recession in 1974-75 in part as a result of the devaluation of the peso; during that period the industrial production index registered only a 3.5 percent growth as opposed to a forecasted 14 percent growth rate. 5/ Production began to improve by the end of 1977 and showed an increase by 1978, due to the abundant supply of hydrocarbons available for the development of the Mexican petrochemical industry.

1/ Ibid., p. 29.
2/ Industry sources.
3/ "Looking for the Formula in Chemicals," Mexican-American Review, Apr. 1980.
4/ ANALISIS-79, op. cit., p. 263.
5/ PEMEX, Memoria de Labores, Mexico, 1978.

Total PEMEX production of butadiene in 1975 amounted to 48.5 million pounds and increased to 109 million pounds in 1977. In 1978, production of butadiene reached 121 million pounds (see table B-2).

Production of ethylene increased steadily during the period 1975-78 growing from 469 million pounds in 1975 to 568 million pounds in 1978. There was little growth in 1977 attributable to the effects of the Mexican recession (table B-3).

Propylene production increased an average of 17.5 percent per year during the period 1975-77 but increased by less than 1 percent in 1978 (table B-4) as a result of a decrease in demand for certain propylene derivatives.

PEMEX's olefins capacity was approximately 8 million metric tons in 1979. 1/ Production was expected to increase by about 11 percent in 1980 as several new olefins plants came on stream. 2/ PEMEX's La Cangrejera and Morelos plants are expected to account for an addition 1.2 million metric tons of olefins by 1985. 3/

Feedstocks for olefins are readily available in Mexico at relatively low costs. In 1978, PEMEX explored for additional sources of feedstocks and discovered new oil and gas fields. Mexico produced an estimated 1.3 billion barrels per day of crude oil in 1978 which was an increase of 22 percent over the 1977 level. 4/ Natural gas production reached an estimated 2.6 billion cubic feet in 1978 which was approximately a 25 percent increase over the 1977 figure. 5/

Mexico's reserves are divided into three categories based on geographical area. The Zona Norte, Poza Rica, and Zona Sur are the three principal zones. The following tabulation shows the percent of Mexico's total production by zone for oil and natural gas for 1978: 6/

Zone	Percent of--	
	Oil production	Natural gas production
Zona Norte	6.2	24.7
Poza Rica	11.2	7.1
Zona Sur	82.6	68.2
Total	100.0	100.0

1/ Chemical and Engineering News, Dec. 24, 1979.
2/ Ibid.
3/ Ibid.
4/ PEMEX, op. cit.
5/ PEMEX, op. cit.
6/ Ibid.

The Zona Sur, which is the country's newest producing area accounts for the largest amount of oil production with 1 billion barrels per day and 2 billion cubic feet per day of natural gas production. 1/

Feedstocks for olefins are available in Mexico as a result of the abundant supply of natural gas and oil. In 1978, president Jose Lopez Portillo announced that Mexico's proven oil and gas reserves are 20 billion barrels (bbls oil equivalent), up from 16 billion bbls. in 1977. 2/ Probable reserves are an additional 37 billion bbls. and possible reserves are estimated to be as high as 300 billion bbls. 3/

Trade

During the period 1975-78, as Mexico continued to build its petrochemical industry, imports supplied its increasing demand for most chemical products. The value of imports of chemical products during this period rose from $480 million in 1975 to $1.3 billion in 1978.

The value of exports also increased during 1975-78 as the production of certain chemicals rose owing to new plants coming on stream. This increase in exports was reflected in the ratio of imports to exports (by value) which declined slightly from 3.5 in 1975 to 3.1 in 1978. This decline is expected to continue in the coming years as Mexico continues to produce more chemicals for its own use and exports the excess production from their world-scale plants.

PEMEX hopes to change Mexico's olefins supply status over the next decade with the addition of several new large-scale plants. Mexico intends to move from being a net importer of olefins to a self-sufficient exporter of olefins derivatives. Mexico's plan for 1980 was to fulfill domestic needs for olefins; however, PEMEX has not yet achieved the production levels needed to reduce imports and increase exports.

Imports

Imports of butadiene increased from 47 million pounds in 1975 to 60 million pounds in 1976 (see table B-2) as a result of increasing demand for the butadiene derivatives styrene-butadiene and polybutadiene.

Imports of ethylene during the 1975 to 1979 period were negligible (see table B-3). Ethylene was more readily available than butadiene during this period because the major feedstock used was ethane, which produces little butadiene co-product.

Imports of propylene decreased from an estimated 13 million pounds in 1975 to 6.6 million pounds in 1979 (see table B-4). This decline in imports is attributable to a decrease in demand for the derivatives isopropyl alcohol

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1/ PEMEX, op. cit.
2/ Chemical and Engineering News, Dec. 18, 1978, p. 42.
3/ Chemical Week, Dec. 13, 1978, p. 52.

and dodecene which are used in the manufacture of solvents and flavors and perfumes. Mexico imported large quantities of flavors and perfumes from the U.S. during this period.

Exports

Data for Mexican exports of butadiene, ethylene, and propylene were not available; however, Mexico's major crude oil export markets are the United States, Spain, and Israel. 1/ PEMEX owns a fleet of tanker trucks and railcars and operates pipelines. The most important pipeline project to date connects Mexico with McAllen, Texas. 2/ Mexico's prospects as an oil exporter are unavoidably linked to the United States.

As of January 1, 1980, Mexico adopted a value-added tax (VAT). The VAT is fully paid on all imports except those items which are considered necessities by the Mexican Government. The VAT is 6 percent for items crossing the U.S. border. 3/

Consumption

The internal market for olefin derivatives within Mexico is relatively small. Approximately two-thirds of Mexico's consumers are outside the money market and thus do not purchase olefin derivatives.

Mexico follows a pattern of keeping prices low within its internal market. Aided by these lower prices, the volume of sales of olefins increased by an estimated 11 percent from 1977 to 1978. 4/ Mexico's gross domestic product (GDP) increased from 4 percent in 1975 to 8 percent in 1979. The GDP in billions of U.S. dollars increased from $79 billion in 1975 to $119 billion 1979. 5/

Future

Expansion plans

PEMEX expects to have 82 petrochemical plants in operation in 1980. 6/ By 1985, this number is expected to nearly double, to 157 plants. 6/ During the same period nominal capacity is expected to grow almost threefold to over 8 billion gallons per year, while production is forecasted to increase by 4-5 billion gallons, also a threefold growth, to approximately 7 billion gallons per year 6/.

1/ Instituto Mexicano del Petroleo, op. cit.
2/ Ibid.
3/ Ibid.
4/ Chemical and Engineering News, Dec. 24, 1979.
5/ Ibid.
6/ Paper delivered by Jose Luis Garcia-Luna at The National Petroleum Refiners Association Meeting, March-April 1980.

Who, what, when, why, where

Ethylene capacity is expected to increase from 435,000 tons to 1.9 million tons by 1982. 1/ PEMEX purchased an operating ethylene plant in 1972 which had a capacity of approximately 400 million pounds and by the end of 1980, plan to have completed a 1.1 billion pound extension to the plant and will build additional capacity of over 2 billion pounds of ethylene per year.

An ethane-based olefins plant is expected to come on stream with a 500,000 ton capacity by 1983. This plant is expected to produce an additional 300,000 tons of propylene and 100,000 tons of butadiene per year. Another olefins plant is slated for 1985 which should increase propylene and butadiene capacity by approximately the same amount.

The following tabulation indicates some of PEMEX's plans for olefin expansion: 1/

Location	Product	Capacity (1,000 tons)
Morelos Veracruz	butadiene	100
	ethylene	100
	propylene	300
Cunduacan, Tabasco	ethylene	500
La Cangrejeie, Veracruz	ethane	705
	ethylene	500
	aromatics	105
Poza Rico, Veracruz	ethylene	182

Impact on industry

With additional olefins capacity, Mexico is in a position to become a net exporter as opposed to net importer of olefins. PEMEX has offered certain incentives in order to encourage the olefin industry's growth. The incentives consist primarily of low-cost fuel prices and rebates on hydrocarbon raw materials. Surplus olefin capacity is intended for export. New olefin plants are being located near oil-rich zones in an effort to reduce transportation expenses.

By 1982, PEMEX plans to be refining 1.9 million barrels of crude oil per day and hopes to triple its nameplate capacity for olefins by 1985. The

1/ "Survey of Mexico," The Economist, Apr. 22, 1978.
2/ Department of State, Airgram, Pemex Petrochemical Project, Wash., D.C., Aug. 2, 1978.

following tabulation shows the estimated percentage of investment committed to this projection: 1/

Project	Percent allocated
Exploration	2
Production costs	44
Refinery expansion	17
Capacity expansion	15
Transportation	16
Miscellaneous	6
Total	100

Demand

Forecast growth

In 1980 and 1985, Mexico's production of basic petrochemicals is slated for consumption according to the following tabulation:

Consumption disposition of Mexican basic petrochemicals production	Percent of total Mexican consumption	
	1980	1985
Domestic market	43	41
PEMEX	44	48
Exports	13	11
Total	100	100

Demand for olefins in Mexico is increasing as demand for olefin derivatives increases and PEMEX intends to expand accordingly. PEMEX intends to be the principal olefin supplier to Mexico and to alleviate the need for olefin imports.

During the period 1974-75, growth rates for olefins averaged 15 to 20 percent per year. Even with the effects of the recession still being felt, the abundant supply of hydrocarbon raw materials provided a sound foundation for olefin growth.

The annual Mexican growth rate for ethylene during the 1979 to 1984 period is estimated to reach 20 percent and then decline to 12 percent for the

1/ "Survey of Mexico," The Economist, Apr. 22, 1978.

1985-1990 period. 1/ The demand for ethylene remained virtually unchanged from 1975-1978 due to the worldwide recession and high inventory levels. Completion of several new plants is estimated to produce an increase in production of ethylene derivatives in the early 1980's. Demand is projected to reach 1 million metric tons by 1985, of which 36 percent will be used to manufacture low-density polyethylene. 2/

The propylene market was expanded by the end of 1980 with additional plants coming on stream. Demand for propylene derivatives is expected to reach an annual growth rate of 37 percent by 1984. 3/ By 1989, propylene consumption is estimated to increase as a result of propylene derivative demand increases. 4/

The market for butadiene is expected to increase during the early 1980's as a result of the continual demand for styrene-butadiene rubber and polybutadiene synthetic elastomers. Demand for butadiene is expected to increase by 11 or 12 percent during the period 1980-1984. 5/

Reasons for growth

PEMEX has established a plan which will have 10 percent of Mexico's hydrocarbons resources directed toward petrochemical production by 1985. Mexico is presently well supplied with oil and natural gas. Since 1977, PEMEX has discovered new oil fields, drilled over 180 new wells, and is producing from over 150 of these wells. 6/ Mexico's reserves are increasing and PEMEX plans to utilize them.

Most of the increases in Mexico's production hinges on fields in the Zona Sur. This area is expected to yield over 500,000 barrels of oil per day by 1981. 7/

Production of derivatives from both ethylene and propylene are expected to increase by 1984. Production increases in these areas will most assuredly affect production levels of olefins. The following tabulations show the percent of the total ethylene and propylene markets attributable to certain derivatives by 1984: 8/

1/ "Survey of Mexico," The Economist, Apr. 22, 1978.
2/ Ibid.
3/ Ibid.
4/ Ibid.
5/ Ibid.
6/ Chemical and Engineering News, Dec. 24, 1979, p. 38.
7/ Ibid.
8/ Instituto Mexicano del Petroleo, op. cit.

Ethylene derivatives	Percent of consumption in 1984
LDPE	35
HDPE	19
Ethylene dichloride	18
Ethylene oxide	17
Ethylbenzene	8
Other	3
Total	100

Propylene derivatives	Percent of consumption in 1984
Acrylonitrile	34
Dodecene	27
Polypropylene	22
Isopropyl alcohol	10
Acrylic acid	4
Cumene	3
Total	100

Relationship to the U.S. and Canada

Mexico has the raw materials but is sorely in need of technological talent to implement its olefins projects. With the approval of Mexico's extensive investment plans, comes a realization that there is a lack of domestic engineering and construction firms capable of handling the construction and operation of large-scale olefin plants.

In order to expand its olefin export market, Mexico will look more closely at the United States and Canada due in part to the higher cost of transportation to other markets. The following table shows estimated production, demand, and surplus (+) or shortages (-) in liquified petroleum gases (LPG) for 1980 and a forecast for 1985 for the United States Canada, and Mexico: 1/

1/ D.N. McClanahan, "Natural Gas and Gas Liquids," National Forum of the Chemical Industry, Oct., 1979.

Country	1980			1985		
	Production	Demand	Surplus/ shortage	Production	Demand	Surplus/ shortage
	(1,000 barrels per day)					
United States	1,000	1,300	-300	900	1,300	-400
Canada	200	100	+100	170	100	+ 75
Mexico	200	100	+100	300	150	+150

As indicated above, the United States needs Mexico's olefins and Mexico needs an export market.

Trade

Mexico's per capita consumption of olefins is still relatively small when compared with Canada and the United States; however, as the industry moves toward a situation of over-capacity, imports of olefins are expected to decline and exports rise. Growth rates for the domestic consumption of olefins are increasing by approximately 20 percent per year. 1/ PEMEX plans to keep pace with this trend and move toward self-sufficiency.

Changes in imports and exports

Mexico increased exports of olefins by about 80 percent from 1978 to 1979. 2/ Mexico's volume of olefins imports is expected to decrease as more plants come on stream thereby increasing total annual capacity for olefins.

Likely new trading partners

The United States continues to be the most likely recipient of Mexican olefins and olefin derivatives as a result of its location. Since transportation costs for olefins are high, it is likely that Mexico will be dealing with the United States, Canada, and Latin America rather than the Mideast, Asia, and China.

Impacts on producers and consumers, and new uses

As Mexico increases its olefin production, the rush to export olefins could harm the Mexican economy; the resultant cash flow would increase the high rate of inflation and cause further instability to the economy in general. 3/

1/ D.N. McClanahan, op. cit.
2/ Ibid.
3/ U.S. House of Representatives, Committee on Science and Technology," U.S./ Mexico Relations and Potentials," Wash., D.C., July, 1979.

Supplies of olefins feedstocks are abundant in Mexico. New plants coming on stream producing olefins and olefin derivatives will better supply domestic needs with relatively low cost products. Prices within the domestic olefins and olefins derivatives markets are expected to remain low.

AROMATICS

Present Situation

Description and Uses

The primary aromatic hydrocarbons have the same chemical formulas and the same chemical and physical properties regardless of the production process or the feedstock employed in their manufacture. Thus, Canadian, U.S., and Mexican benzene, toluene, and mixed xylenes--i.e., BTX; para-xylene; and naphthalene have little in the way of qualitative differences between them. 1/ An important consideration, however, is the matter of purity, or the extent to which BTX has been separated into its components, which determines their suitability especially for a variety of purposes such as blending into the gasoline pool, conversion for chemical use, solvent use, and so forth. Data on Mexican BTX production has not been demarcated according to levels of purity; at least, that information has not been made available. But BTX data are sufficiently homogeneous that comparisons between production and trade, and so forth, may be made. 2/

Customs Treatment

Tariff 3/

Mexico has distinguished between hydrocarbons and reagent hydrocarbons in its duty system throughout the 1970's and into 1980. Among the hydrocarbons mentioned in the International Customs Bulletin (ICB) to 1980, for Mexico, are benzene, toluene, the xylenes, and naphthalene.

Mexican benzene imports are currently dutiable at 5.15 percent ad valorem, as are toluene and the xylenes imported into Mexico. Naphthalene, unlike BTX, is in a "basket" category within Mexico's organic chemicals chapter of the ICB. However, that basket category is also dutiable at the BTX rate, 5.15 percent ad valorem. In fact the individual reagent grade hydrocarbons in the BTX mixture have been given a duty rate of 5.15 percent ad valorem as well. For both the reagent and non-reagent hydrocarbons, the xylenes category includes o-, m-, and p-xylenes, as well as mixed xylenes; again, all are dutiable at 5.15 percent ad valorem (see table B-5).

Non-tariff barrier

Mexico's imports of BTX, p-xylene, and naphthalene are all subject to import licensing or import controls as well as being dutiable items. Mexico

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1/ BTX, "aromatics," and "primary aromatics" are equivalent to one another as mentioned herein. "BTX, p-xylene, and naphthalene" are also referred to as "aromatic hydrocarbons."

2/ The U.S. aromatics section contains information on the uses of aromatic hydrocarbons.

3/ Tariff information was provided by The Trade Advisory Center, U.S. Department of Commerce.

has also instituted export promotion programs in order to improve its trade posture. These non-tariff barriers or NTB's are examined in greater detail in the section of this report on "Relative Advantages."

Structure of the Industry

Ownership

Mexico's commerce in petroleum and other hydrocarbons and in "primary petrochemicals" is "reserved exclusively for the State." 1/ The State, in this case, is the Federal Government, in particular PEMEX, which is responsible for nearly all decision making in the area of Mexico's production and trade of BTX.

Integration

PEMEX owns and operates the petroleum and primary petrochemical industries in Mexico, and makes all the important management decisions, as mentioned above. It is therefore a monopoly, with very few exceptions, in the BTX product area and in a host of other product areas as well. PEMEX is vertically integrated in petrochemicals, making for example, the aromatic petrochemical benzene; ethylene; ethylbenzene, which calls for ethylene and benzene in its production; styrene, a derivative of ethylbenzene; and so forth. Horizontal integration by PEMEX or private firms producing aromatic hydrocarbons is minimal.

Foreign investment

PEMEX controls entirely the production and sales of toluene, the xylenes, and p-xylene in Mexico. Only a very small part of benzene production is controlled by two "non-PEMEX" Mexican firms; the remainder of benzene production is controlled by PEMEX. 2/ Mexican investment in the petrochemical industries of foreign nations is negligible or nil.

Other considerations on industry structure

Capacity utilization for Mexico's benzene facilities in 1978 was 66 percent, up 3 percent from benzene capacity utilization in 1977. Benzene capacity was constant during 1977 and 1978. Data on production and capacity are not available for 1979.

Mexican toluene capacity utilization has risen from 93 percent in 1971, and 84 percent in 1976, to over 100 percent in 1978. This apparent anomaly of

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1/ "Primary petrochemicals" is a PEMEX term. These petrochemicals are produced in Mexico solely by PEMEX. Petrochemicals falling in the category are subject to change by PEMEX at any time. Currently, BTX, p-xylene, and naphthalene are considered primary petrochemicals.

2/ These benzene exceptions are written into the Mexican law on industry ownership.

greater than 100 percent capacity utilization is owing to the fact that PEMEX capacity data are "nominal," i.e. in name, not in fact. In any case, comparisons of an ordinal type are useful. Cardinal information must be compared to actual production capacities, which are not available. Data on 1979 toluene capacity utilization are not available.

Mixed xylenes capacity utilization in 1978 was 23 percent greater than in 1977, 16 percent greater than in 1976, and 5 percent greater than in 1973. Each of these capacity utilization figures was greater than 100 percent. Data for 1979 are not available.

Para-xylene capacity utilization was 98 percent in 1976 and decreased to 89 percent in 1977. In 1978, capacity utilization for p-xylene increased to 93 percent. Figures for capacity utilization for p-xylene in 1979 and for naphthalene (all years) are not available.

Technology

As is the case with Canada, the preponderance, if not the entirety, of BTX, p-xylene, and naphthalene technology in Mexico has been obtained from its neighbor, the United States. This technology is used nearly the world over, with certain relatively insignificant exceptions involving the use of certain catalysts in catalytic reforming processes, and so forth, by one or some of the more technologically sophisticated nations. 1/

Government Policies and Involvement

Production facilities

Already spoken of in previous sections of this study have been Government duties, import and export controls, and laws on patents and trademarks, all of which may affect production facilities via petrochemical manufacture, sales, and so forth in Mexico. But the rules of law which set Mexico apart from its neighbors to the north are those creating and guiding the actions of PEMEX and those limiting foreign direct investment participation in petroleum and in petrochemicals industries, including aromatic hydrocarbons industries.

Government-industry relationships

PEMEX is not an industry but a Government entity. As such it does not compare with the relatively free market petroleum and petrochemical firms in Canada and especially in the United States. Information on PEMEX powers, and so forth, is contained in the section on olefins.

Production

Production of BTX plus p-xylene in 1976 was 89 million gallons and $US 59 million. Production decreased in 1977 to 75 million gallons and $US 52 million

1/ Industry sources.

and then increased in 1978, to 83 million gallons and $US 57 million. 1/ Data for naphthalene production are not available. Production figures for the most part represent the results of PEMEX decision-making more than they represent market forces for BTX and p-xylene, although market forces are taken into consideration for PEMEX planning purposes.

Mexican benzene production fell irregularly from 27 million gallons in 1975 to 24 million gallons in 1978. The Mexican petrochemical industry as a whole was growing by 24 percent for the same period 1/, in terms of value. Real Gross Domestic Product, GDP, in constant 1960 pesos, increased as well during the 1975-78 period, by approximately 11 percent. 2/ Benzene production value most likely increased owing to rising prices. The Wholesale Price Index in the Mexican economy increased by 16 percent in 1978 alone. 3/ Assuming that benzene production facilities were operating successfully, it is likely that the drop in benzene production on a quantity basis has been essentially a demand-oriented phenomenon.

Mexican toluene production increased from nearly 36 million gallons in 1975 to 38 million gallons in 1978, or by approximately 7 percent. 4/ While this is far from a spectacular rate of growth, it is more in line with some of Mexico's broader economic statistics than the rate of growth of benzene for the same period.

Mexico's mixed xylenes production increased irregularly from 15 million gallons in 1975 to 22 million gallons in 1978, or by approximately 46 percent. 5/ This growth outstrips both GDP and overall petrochemical growth since 1975. Mixed xylenes production growth indicates greater use for both p-xylene and o-xylene, and for their derivatives, and possibly greater use of the xylenes as a gasoline additive and export product.

Para-xylene production in Mexico increased by 30 percent from 1975 to 1978, from approximately 10 million gallons in 1975 to approximately 13 million gallons in 1978. 6/ Data on naphthalene production in Mexico are not available.

The aromatic hydrocarbon feedstock situation in Mexico is excellent. 7/ Mexican petroleum and natural gas production currently is far greater than needed for Mexico's petrochemical industry and is supplying a large percentage of feedstock and energy needs in other countries. Mexico's surplus of petroleum and natural gas will continue into the foreseeable future.

The following tabulation indicates the percentages of Mexican BTX manufacture from various feedstocks in 1980:

1/ Data on petrochemicals drawn from Analisis 1979--the Mexican Economy, a publication of ICI De Mexico, S.A. de C.V., p. 65.

2/ Analisis 1979--The Mexican Economy, a publication of ICI De Mexico, S.A. de C.V., p. 55.

3/ Ibid., p. 71.

4/ Data from "La Industria Petrolera en Mexico," 1979.

5/ Ibid.

6/ Ibid.

7/ This applies to p-xylene and naphthalene as well.

Source	Percent of BTX from various sources		
	Benzene	Toluene 1/	Xylenes 2/
Catalytic reformate	41	100	100
Hydrodealkylation	55	-	-
Coal	4	-	-
Total	100	100	100

1/ There will be significant toluene expansions in Mexico during the early 1980's.

2/ There will be a considerable expansion of Mexican xylenes capacity in the early 1980's.

Trade

Petroleos Mexicanos plans to be self-sufficient in petrochemicals by 1980. Mexico has previously been a net importer of aromatic hydrocarbons and of all other petrochemicals as a group. 1/ The Mexican plan of export expansion is aimed at a soon-to-be-realized positive trade balance in petroleum chemicals. The trade surplus is expected to reach 20 percent of domestic use, as exports are pegged to top US$600 million, in the early 1980's. 1/ The envisioned export surplus is based on plans to expand output of petrochemicals by 15-20 percent per year in the 1980's. 2/

In 1979, Mexico was a net importer of petrochemicals from the United States. Mexico exported 937 thousand gallons of para-xylene to the U.S., while importing almost 25 million gallons of p-xylenes from the United States.

1/ PROMT, a Predicasts publication, Aug. 1979, p. 98. Also PROMT, a Predicasts publication, Sept. 1978, p. 148.

2/ PROMT, a Predicasts publication, Mar. 1980, p. 92, for example. The PEMEX planning function for petrochemical trade appears to be based upon the proper economic considerations (fiscal, technological, work force, and so forth.) However, part of the planning by PEMEX for export expansion is based upon forecasts of domestic demand or consumption which are often on the low side. The reader is referred to "The Mexican Economy-1979," Publicacions Ejecutivas De Mexico, S.A., p. 21. In a period of rising prosperity for a country which is essentially populated by the poor and where income is being distributed more evenly among the rich and the poor, the consumption function will probably indicate a high propensity, and a changing propensity, to consume. The historical consumption function may be rendered obsolete. PEMEX has to deal with such volatile economic circumstances, as well as fluctuations in consumer credit, and other problems in planning for the future of the petrochemical sector. It would not be surprising to see PEMEX trade projections vary considerably from reality in the 1980's. But the fact that PEMEX is a Central Government "arm", with considerable flexibility, increases the chances for bridging the gaps between planning, predicting, and the ultimate outcome. For a look at BTX consumption, including imports, in comparison to GDP, all petrochemicals production, and so forth, the reader is referred to the Consumption section of this chapter.

P-xylene was the only Mexican aromatic exported to the United States in 1979. Mexico imported 3 million gallons of benzene, 12 million gallons of toluene, 4 million gallons of mixed xylenes, and 44,000 gallons of naphthalene from the United States in 1979.

Imports

Mexican imports of benzene were nil in 1975, 2 million gallons in 1976, over 6 million gallons in 1977, and approximately 4 million gallons in 1978. The value of these imports did not exceed US$5 million in any year.

Mexico's toluene imports were between 2.8 million and 7.4 million gallons during the period 1975-78.The value of toluene imports to Mexico during 1975-78 did not exceed US$4.5 million annually.

Mexican imports of mixed xylenes fell from nearly 4.7 million gallons in 1976 to less than 2 million gallons in 1978. The value of these imports nearly halved in 1978. Mexico's para-xylene imports grew without interruption from 1975 to 1977, to 18 million gallons from 4 million gallons, and then fell in 1978 to 13 million gallons. Like the value of mixed xylenes, the p-xylene import value nearly halved in 1978.

Exports

During the period 1975-78, Mexican exports of BTX and p-xylene were negligible or nil. Data for most of Mexico's 1979 exports are not available.

Consumption

Consumption of Mexican BTX and p-xylene as spoken of in this section is more commonly known as "apparent consumption" (production plus imports minus exports). 1/ Mexican BTX consumption in 1975 was 81 million gallons while p-xylene consumption was nearly 14 million gallons in the same year. 2/ Throughout 1976, 1977, and 1978, BTX and p-xylene consumption in Mexico were higher and relatively stable; BTX consumption averaged 95 million gallons during 1976-78, while p-xylene consumption averaged 26 million gallons during the same period.

Mexican benzene consumption was relatively stable during the period 1975-78, averaging 29 million gallons per year. Toluene consumption in Mexico was, like benzene consumption, reasonably stable during 1975-78, near the 40 million gallon mark each year.

1/ Consumption data are available for benzene, toluene, mixed xylenes, and para-xylene for the years 1975-1978. Naphthalene consumption data are not available.

2/ Consumption data are compiled from statistics of La Industria Petrolera en Mexico, 1979.

Mexican mixed xylenes consumption varied somewhat more than did consumption of either benzene or toluene. Consumption of mixed xylenes grew by nearly 60 percent in 1976 to 24 million gallons, then fell 12 percent to 21 million gallons in 1977. In 1978, Mexican mixed xylenes consumption reversed directions and grew by 13 percent to 24 million gallons.

Mexican para-xylene consumption was only 14 million gallons in 1975. In 1976, 1977, and 1978, Mexico's consumption of p-xylene was higher, averaging 26 million gallons per year.

Mexico's production of benzene and toluene in 1978 was consumed as follows: 1/

	Benzene (percent)		Toluene (percent)
Cyclohexane	35	Solvents	50
Ethylbenzene	30	Benzene	39
Alkylbenzene	15	Dodecylbenzene	10
Maleic anhydride	5	Benzoic acid	1
Aniline	2		
Other	13		
Total	100	Total	100

It is instructive to consider the demand for BTX and p-xylene in terms of prices and in terms measuring Mexico's overall economic status or growth (GNP for example). While demand represents a schedule of quantities and prices, and consumption is merely a statistic, a comparison of Mexico's BTX consumption, Mexican GDP, the production of all other petrochemicals in Mexico, and an appropriate price index will offer certain insights into the behavior of BTX markets in the Republic, as shown below:

Year	Quantity, value, and unit value indexes, 1975=100			
	BTX, quantity index of apparent consumption	GDP index	Production index	BTX unit value of production index
1975	100	100	100	100
1976	122	102	109	114
1977	110	105	105	114
1978	120	111	124	114

There are no apparent anomalies in these data. Although BTX consumption fell in 1977, while GDP increased and the BTX unit value remained steady, the figures do not indicate anything remarkable or grossly out of place. The direction of change in BTX consumption figures has been the same as those for

1/ Figures are approximate. Data on other aromatics are not available.

production of all petrochemicals since 1975; this may suggest that PEMEX planning is working well, if these data can infer that production and consumption are the result of planning. All in all, the data can be said to indicate, on the surface, a relatively smooth market for Mexican BTX.

Future

There are few possible occurrences for Mexican BTX markets to 1985 which could upset the scenarios described in this section. First, Mexico--that is, PEMEX--may experience difficulties with transportation and other infrastructure such as communications, compounding the gulf between production and getting BTX, p-xylene, and naphthalene to their markets. Secondly, if the commitment by PEMEX to export up to 20 or 30 percent of production in the 1980's falls through, 1/ the aromatics industry will likely suffer from excess capacity and from buyers who may refuse to purchase except at very low prices. Finally, there is the problem or possibility of overcapacity regardless of the outcome of export plans.

Expansion plans

Who, what, when, why, where

While the overall petrochemical sector production in Mexico is planning a threefold expansion, aromatic hydrocarbons production expansion plans are even more ambitious. Production of benzene, toluene, and m- and p-xylene 2/ are expected to grow approximately sevenfold. 3/

In 1980, 88 million gallons of benzene, toluene, and m- and p-xylene production are expected. By 1985, production of these products is forecasted to be 600 million gallons.

Benzene production is expected to grow from 29 million gallons in 1980 to nearly 180 million gallons in 1985, a sixfold increase. Toluene production is forecasted to grow sixfold as well, from 36 million gallons in 1980 to nearly 230 million gallons in 1985. M- and p-xylene production is forecasted to grow from 23 million gallons in 1980 to nearly 190 million gallons in 1985.

The benzene and toluene additions will be made at Cangrejera and Tabasco. While xylenes production increases had at one time been scheduled at Cangrejera, especially p-xylene production increases, the location for these production facilities is currently not certain.

1/ The reader is referred to the speech "Competitiveness of the Mexican Chemical and Petrochemical Industry," by Fernando Gutierrez Saldivar of the Sociedad Quimica de Mexico, given at the Second Chemical Congress of the North American Continent.

2/ M-p-xylenes are the meta- and para-xylene isomers.

3/ PEMEX projections, from a paper by Jose Luis Garcia-Luna, 1980.

Impact on industry

An abundance of the primary aromatic hydrocarbons produced in the early 1980's will likely go to PEMEX plants for further processing into BTX derivatives. Some of the additional BTX production will likely be exported, according to PEMEX plans. 1/ Exportation has been an important consideration in PEMEX production plans for the aromatic hydrocarbons as have other obvious considerations such as availability of feedstocks, capital, and labor, the acquisition of technology, and so forth. The gain in foreign exchange and the effect on Mexico's balance of payments are further obvious considerations. None of these considerations stands out as particularly more important than the others except possibly the wealth which PEMEX BTX and other petrochemicals expansions may create for both the Government and the populace over the long run. As mentioned earlier, PEMEX expansion should be a major "engine for growth" in the Mexican economy.

Demand

During the period 1980-85, consumption and production of aromatics are expected to grow by approximately a factor of three, while percentage changes in "end-use" are expected to be relatively small. Certain BTX expansions, as stated earlier herein, are forecast to increase up to sixfold in the 1980's.

Benzene production is forecast to increase from approximately 28-30 million gallons in 1980 to 180 million gallons in 1985. Toluene production is projected to increase by 190 million gallons to 230 million gallons from 1980 to 1985, and m- and p-xylenes production is forecast to reach 190 million gallons in 1985, up from about 20-30 million gallons in 1980. Consumption of these chemicals should be roughly in line with production, though possibly somewhat lower.

Reasons for growth

Since BTX, p-xylene, and naphthalene are not usually final products, their consumption will be divided primarily between PEMEX internal consumption and the export market. The export market's rate of consumption of Mexican aromatic hydrocarbons will depend upon petrochemical market forces throughout the world, especially petrochemical prices for the most part in the non-Communist-dominated areas. The following tabulation of benzene, toluene, and p-xylene home market prices offers a means of comparison between Mexico's price schedule and those of other producing and exporting nations:

1/ As primary hydrocarbons, these chemicals cannot be produced in Mexico except by Petroleos Mexicanos. The disposition of p-xylene and naphthalene are uncertain.

Item	U.S. dollars per gallon of BTX item				
	Mexico	United Kingdom	West Germany	USA	Japan
Benzene	$1.08	$1.74	$1.79	$1.54	$1.83
Toluene	1.78	1.18	1.26	1.87	1/
P-xylene	0.92	0.56	0.59	1.27	1.66

1/ Not available.

In terms of price alone, Mexico's benzene, toluene, and p-xylene were competitive with the corresponding U.S. products. Moreover, it appears that transportation costs were not high enough to cancel the Mexican price advantage. Benzene from Mexico had a price edge over all four competing nations shown above, indicating excellent export expansion prospects to all third country markets, as well as the possibility of developing markets in producing countries. Finally, Mexican p-xylene was competitive with the Japanese p-xylene home market price. Assuming no trade barriers are raised, Japan and Southeast Asia may become export markets for Mexico's p-xylene.

These speculations, of course, depend upon Mexican production and consumption of BTX. BTX consumption growth rates are likely to be somewhat below the increases in production to 1985. Mexican population may double by the 1990's, indicating a possible 50 percent growth in population by 1985; GDP is also expected to grow at a healthy rate. But consumption of BTX, and so forth, will have to be pushed domestically to keep pace with production.

Benzene consumption, in order to grow approximately at the rate of production growth, will need to experience ethylbenzene consumption of 40 million gallons or more annually by 1985; cyclohexane consumption must increase to 25-plus million gallons per year; alkylbenzene consumption will need to grow to 20 million gallons per year; and cumene consumption must grow to 8 million gallons per year, to point out only a few of the essential growth rates apparently needed for a supply-demand balance. 1/ Toluene, mixed xylenes, and p-xylene consumption must show similar derivative growth patterns to stay abreast of production through 1985.

Relationship to the U.S. and Canada

The forecasted overall benzene, toluene, and xylenes production growth rate in Mexico to 1985 is approximately 45-50 percent using an annually-compounded rate. Mexican aromatics consumption growth rates will likely lag production growth rates. 2/ The Canadian aromatics growth rate for internal consumption to 1985 will probably be near 5 percent per annum. 3/ The

1/ Industry sources.
2/ PEMEX projections by Jose Luis Garcia-Luna, presented at the National Petroleum Refiners Assoc. meetings, Mar.-Apr. 1980. Data on other aromatic petrochemicals are not available.
3/ Industry sources.

expected Canadian rate of growth is approximately the equivalent of projected U.S. growth rates for the aromatics overall to 1985. 1/ Thus the projected rate of growth for Mexican aromatics consumption is an order of magnitude larger than the corresponding rates for the U.S. and Canada; i.e., while U.S. and Canadian aromatics consumption growth to 1985 will likely be 20-30 percent, or 5 percent per year, Mexican aromatics consumption will probably increase fivefold or more overall, or by nearly 50 per cent annually.

Per capita consumption of Mexican aromatics to 1985 will be affected by a forecast growth rate in Mexican population of 3.5 percent per annum. However, while U.S. and Canadian population growth rates are likely to be low compared to Mexico's population growth rate, Mexican aromatics consumption growth per capita will still dwarf the corresponding aromatics per capita growth for Canada and the U.S. U.S. and Canadian overall aromatics growth rates of 5 percent per year are equivalent to a 28 percent growth of aromatics consumption to 1985; Mexico's projected 45 percent growth annually is equivalent to an increase in consumption of over 500 percent. Projected population growth rates would cut the U.S. and Canadian overall aromatics rate of growth to slightly less than 22 percent to 1985. The larger "bite" on the Mexican overall aromatics growth rate caused by population growth should still leave Mexican aromatics consumption growth at 400 per cent or more to 1985. 2/

Trade

Changes in imports and exports

Surplus capacity, PEMEX development incentives, and possible problems with sufficient domestic demand will likely induce the Mexican petrochemical industry to increase exports, both for balance of trade and payments necessities and as "an engine of growth," for the next several years. Mexico will become self-sufficient in BTX and p-xylene and begin to reverse the surplus of imports over exports during the early-to-mid 1980's. As exports of these petrochemicals increase, at the same time imports will begin to fall.

Likely new trading partners

Owing to a strong price advantage, Mexico will probably develop BTX and p-xylene export markets in Japan, the U.S., and in Western Europe. Further, Mexico will make inroads into the producing nations' export markets for the same reason she will exploit import markets in these very producing nations, i.e., attractive prices, and increasing availability.

Impacts on producers, consumers, and new uses

Mexico obviously does not desire inflationary petrochemical prices in its own markets. However, if Mexican BTX, p-xylene, and other petrochemical prices are markedly below the world price during the early 80's, it is not inconceiv-

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1/ Industry sources.

2/ The discussion of growth does not include growth in production or consumption of p-xylene and naphthalene. There are no data on these chemicals.

able that export prices will be increased above home market prices. Home market prices must be made affordable at least as far as end-use products for Mexico's growing middle class.

The profitability 1/ of PEMEX for investment purposes, PEMEX licensing and patent considerations, new applications, and so forth, are all considerations of PEMEX's planning and operation functions. Trade will be considered an important constituent in generating profits. Therefore, it would be no surprise that a planned, but flexible, export and import program will also emanate from the officials of Petroleos Mexicanos. Nations seeking growing and relatively cheap imports from PEMEX, of BTX or any other petrochemicals, will likely be induced to "sweeten" any deals made with the Mexican Republic. 2/

Mexico will add new uses for BTX, p-xylene, naphthalene and their derivatives 3/ as PEMEX regards these new uses as profitable, feasible, and/or otherwise desirable for PEMEX itself, Mexican businesses, or the Mexican people.

1/ Total revenue minus total cost. At this point in time, the magnitude of Mexico's BTX and p-xylene future imports and exports are highly dependent on other factors with unknown magnitudes (domestic consumption, production, and so forth). No published forecasts are available. Even if these forecasts were available, they would be somewhat suspect.

2/ "Sweetening" of deals may involve technology transfers, education programs, and so forth.

3/ New uses here include established uses available in mature markets such as the United States, Western Europe, and so forth.

MISCELLANEOUS ACYCLIC ORGANIC CHEMICALS

Present Situation

Description and Uses

Miscellaneous acyclic organic chemicals comprise many thousands of straight-chain organic compounds and mixtures which are nonbenzenoid in nature or derivation. Because of the vast array of compositions and end uses of these chemicals, it is more useful and meaningful to divide them into the following functional subgroups:

--Nitrogenous compounds
--Acids, acid anhydrides, and acyl halides
--Salts of organic acids
--Aldehydes
--Ketones
--Monohydric alcohols, unsubstituted, and halohydrins
--Polyhydric alcohols and their derivatives
--Esters of monohydric alcohols, organic acids, and inorganic acids
--Epoxides, halogenated epoxides, and ethers of monohydric alcohols
--Halogenated hydrocarbons
--Other miscellaneous acyclic organic chemicals

A brief discussion of each subgroup follows.

Nitrogenous compounds

This subgroup can be subdivided into amides, amines, ethanolamines, nitriles, and miscellaneous. The nitriles include the commercially important acrylonitrile, used in plastics and fibers and in nitrile rubber, and acetone cyanohydrin, used in insecticides and as a chemical intermediate. Ethanolamines are consumed in detergents, emulsifiers, and in further organic synthesis. The more important amines are butyl-, methyl-, ethyl-, and propylamines, all of which are consumed as intermediates for pharmaceuticals, pesticides, rubber processing chemicals, dyes, detergents, and other products.

Acids, acid anhydrides, and acyl halides

Acetic acid and its derivative, acetic anhydride, are the chief representatives of this subgroup; both are intermediates for any number of organic chemical end products. A third important commercial acid is adipic acid, which is a basic raw material for nylon fibers and resins.

Salts of organic acids

Organic salts result from combining metal or mineral ions with organic acids; a vast array of chemicals are produced in this fashion. The usefulness

of any one salt may stem from either the metal ion component or the acid component, or both, depending upon the desired end product. Though this subgroup constitutes only a small portion of the miscellaneous acyclic organic chemicals group, the use of salts pervades nearly every facet of the chemical industry.

Aldehydes

Formaldehyde and acetaldehyde are the dominant items of this subgroup. The bulk of formaldehyde output worldwide is consumed in adhesives (especially for plywood) and plastics copolymers. Acetaldehyde and other aldehydes are used as solvents and as intermediates for drugs, flavor and perfume chemicals, photographic chemicals, and pesticides.

Ketones

There are three major ketones: acetone, methyl ethyl ketone (MEK), and methyl isobutyl ketone (MIBK). Acetone is used primarily to produce MIBK and other chemical intermediates. All three find solvent applications in paints, varnishes, lacquers, and other solvent uses. MEK is also used in the manufacture of smokeless powder; MIBK is often used for extraction of uranium from fission products.

Monohydric alcohols, unsubstituted, and halohydrins

Methanol, isopropanol, and butanols all find applications in organic synthesis and solvent formulations; more specialized end uses vary by product. 2-Ethylehexanol is an important plasticizer for polyvinyl chloride resins and has numerous other uses.

Polyhydric alcohols and their derivatives

Ethylene glycol and propylene glycol are the principal derivatives and end products of their respective precursors, ethylene oxide and propylene oxide. Ethylene glycol's chief end use in Mexico is the production of polyethylene terephthalate fibers and films. Propylene glycol is consumed chiefly in the plastics industry.

Esters of monohydric alcohols, organic acids, and inorganic acids

This subgroup, like the salts, includes a large number of chemicals, but the most commercially important are the acetate and acrylate esters. These esters are used as solvents and as intermediates.

Epoxides, halogenated epoxides, and ethers of monohydric alcohols

The two most important epoxides, ethylene oxide and propylene oxide, are mainly consumed in production of their respective glycols. (See Polyhydric alcohols and their derivatives, above.)

Halogenated hydrocarbons

The largest item in this subgroup, ethylene dichloride, is mostly consumed in production of the next largest item, vinyl chloride monomer, a precursor for polyvinyl chloride (PVC) plastics products. Other chlorinated hydrocarbons (not otherwise halogenated) are used chiefly as solvents and intermediates. Fluorinated hydrocarbons are used chiefly as refrigerants (e.g., "freon"); their use as aerosol propellants has diminished in the wake of adverse publicity regarding their alleged destruction of the earth's ozone layer.

Other miscellaneous acyclic organic chemicals

It is impossible to characterize this subgroup, because the chemical makeup and end-use applications are too diverse. Important products and product groups include organo-sulfur compounds, silicones, phosgene, and lead alkyls.

Customs Treatment

Tariff

The bulk of miscellaneous acyclic organic chemicals are classified in chapter 29 of the Brussels Tariff Nomenclature (BTN); a notable exception is ethanol, which falls in chapter 22. Table B-6 is a compilation of Mexican tariffs applicable to imports of selected commercially important chemicals representing the functional subgroups described in the previous section. Tariff rates on these chemicals vary widely, from a low of 5 percent ad valorem for acrylonitrile, acetic acid, methyl ethyl ketone, methyl isobutyl ketone, methanol, certain acetate esters, epoxides, and halogenated hydrocarbons, to a high of 60 percent ad valorem for acetone, ethylene and propylene glycols, vinyl acetate, and methyl methacrylate.

Non-tariff barriers

Non-tariff barriers as applied to miscellaneous acyclic organic chemicals are no different than non-tariff barriers applied to all Mexican imports and exports. These barriers to trade are discussed in that part of this study entitled "Relative Advantages."

Structure of the Industry

Ownership and integration

PEMEX, employing some 130,000 people, is a vertically integrated company: it produces natural gas and crude petroleum which it uses to make petrochemicals. PEMEX reserves the exclusive right to produce some 50 "basic" petrochemicals. Of those 50, the following commercially important chemicals are included in the miscellaneous acyclic organic chemicals sector:

Chemical	Estimated production capacity (1980) (million pounds/year)
acetaldehyde	317.5
acrylonitrile	163.1
ethylene dichloride	727.5
ethylene oxide	282.2
isopropanol	52.9
methanol	401.2
propylene oxide	1/
vinyl chloride	595.2

1/ While there is no production capacity for propylene oxide, it is projected that 132 million pounds per year capacity will be built before 1985. PEMEX's capacity to produce these and other acyclic basic petrochemicals is estimated to be 3.0 billion pounds per year. Additional planned acyclic capacity of 1.0 billion pounds per year is expected to be onstream within the next decade.

The "secondary" petrochemicals industry in Mexico includes the remaining major chemicals in this sector, and is open to entry by privately owned companies. It is necessary to obtain a Government license called a "petrochemical permit" before entry can be effected. To date, at least 54 privately owned firms have obtained such permits. Capacity that is either in place or under construction for production of acyclic secondary petrochemicals is estimated to be at least 1.0 billion pounds per year. In addition, petrochemical permits that have been issued, but not exercised, account for a potential of about 0.3 billion pounds per year more within the next decade. The bulk of acyclic secondary petrochemical capacity is accounted for by ethylene glycol and derivatives (39 percent of the secondary petrochemicals total); acetic acid (15 percent); formaldehyde (16 percent); acetone (6 percent); propylene glycol and derivatives (4 percent); and acetic anhydride (5.5 percent).

Foreign investment

U.S. firms have minority interest in about 40 percent of the secondary petrochemical capacity in Mexico. Other foreign minority interests are involved with an estimated 1 percent of the secondary petrochemical sector total. With the planned expansions of basic petrochemical production by PEMEX in the 1980's, there is expected to be ample opportunity for further foreign investment (through joint ventures) in the Mexican industry.

Technology

Technology status in Mexico's secondary petrochemical sector and in the acyclic organic chemicals industries is the same, essentially, as the technology status in other parts of the Mexican petrochemical industries. The sections of this study entitled "Olefins" (in Mexico) and "Relative Advantages" contain more in-depth information on Mexican technology status.

Government Policies and Involvement

The Government of Mexico plays a crucial role in the Mexican petrochemical industry. The impact of PEMEX has already been discussed in previous sections, as has the Law to Promote Mexican Investment and to Regulate Foreign Investment. These and other considerations on Government policies and development are discussed in other sections of this study, in particular the section on "Relative Advantages."

Production

Total Mexican production of miscellaneous acyclic organic chemicals increased steadily from 938.4 million pounds in 1975 to 1,650.6 million pounds in 1979, or by an average annual rate of 15 percent (table B-7). These figures are somewhat understated, because they represent the totals for only selected major chemicals in the sector; however, it is estimated that the figures shown account for at least 95 percent of the total.

Production of nitrogenous compounds increased from 52.7 million pounds in 1975 to 65.7 million pounds in 1979, or by an average 5 percent per year. Acrylonitrile accounted for about three-fourths of the total.

Mexican production of acetic acid and acetic anhydride increased 16 percent per year, from 99.0 million pounds in 1975 to 210.0 million pounds in 1979. Acetic acid production accounted for 64-71 percent of the total, and experienced somewhat faster growth.

Aldehydes production increased from 141.8 million pounds in 1975 to 232.1 million pounds in 1979, or by 10 percent per year. Acetaldehyde and formaldehyde were produced in roughly equivalent amounts and together accounted for nearly all production during the period. There is known capacity for production of crotonaldehyde and butyraldehyde, but separate production statistics are not available.

Production of ketones increased from an estimated 29.4 million pounds in 1975 to 61.4 million pounds in 1979, or by 16 percent per year. Acetone accounted for 81 percent of the total in 1979, up from 61 percent in 1975. There is believed to be significant production of methyl isobutyl ketone in Mexico, but separate statistics are not available.

Production of monohydric alcohols increased from 111.4 million pounds in 1975 to 449.7 million pounds in 1979, or by 32 percent per year. The most dramatic growth was in the production of methanol which increased more than 5-

fold during 1975-79, and accounted for 85 percent of the monohydric total in 1979. Production of isopropanol, on the other hand, dropped from 17.1 million pounds in 1975 to only 14,000 pounds in 1979, despite rising demand for the product in Mexico. Because PEMEX's plant utilization was very poor (the reasons are not clear), demand was met by imports, mostly from the United States.

Production of esters increased from 36.0 million pounds in 1975 to 91.4 million pounds in 1979, or by 20 percent per year. Vinyl acetate and methyl methacrylate accounted for about two-thirds of the total in 1979.

Production of polyhydric alcohols is reflected by data for ethylene glycol. Separate production data are not available for propylene glycol, but production of that chemical is believed to be about 10 percent of ethylene glycol production. EG production increased from 98.9 million pounds in 1975 to 126.8 million pounds in 1979, or by 5 percent per year.

Similarly, production of epoxides is reflected by data for ethylene oxide. Production of EO declined from 60.2 million pounds in 1975 to 53.6 million pounds in 1979. Rising demand for EO was met by imports, mostly from the United States. There was no production of propylene oxide during the period; all demand was met by imports, chiefly from the United States.

Production of halogenated hydrocarbons increased from 309 million pounds in 1975 to 358 million pounds in 1979, or by 3 percent per year. The bulk of production was accounted for by ethylene dichloride and its chief derivative, vinyl chloride monomer.

Trade

Mexico was a net importer of miscellaneous acyclic organic chemicals during 1975-79. However the ratio of imports to exports declined from 182:1 in 1975 to only 5:1 in 1979. Import and export data for the sector are shown in table B-7.

Imports

Sector imports increased from 205 million pounds in 1975 to 515 million pounds in 1979, or by 20 percent per year. The ratio of imports to apparent consumption increased from 0.1 percent to 5.0 percent during the period. The greater portion of imports were accounted for by the "basic" petrochemicals: acrylonitrile, acetaldehyde, isopropanol, methanol, ethylene and propylene oxides, ethylene dichloride, and vinyl chloride monomer. Since PEMEX has the exclusive right to produce basic petrochemicals, imports represent demand that could not be met by PEMEX alone during 1975-79. It is interesting to note here that Mexican tariffs on these items are relatively low, 5 to 10 percent in all cases. Imports of secondary chemicals, on the other hand, represent only a fraction of total imports, and the tariffs on those items range from 10 to 60 percent.

Exports

Sector exports increased nearly 100-fold from 1.1 million pounds in 1975 to 102 million pounds in 1979. The ratio of exports to production increased from 0.1 percent to 6.2 percent during the period. The rapid growth of Mexican exports in 1978 and 1979 is attributable almost entirely to methanol. In 1978, PEMEX brought on stream a methanol plant with capacity of 331 million pounds per year. For the first time supply exceeded demand and substantial exportation of methanol began. In 1978 about one-fourth of Mexico's methanol exports were to the United States; in 1979, nearly all of them were to the United States.

Consumption 1/

Mexican consumption of miscellaneous acyclic organic chemicals increased from 1.1 billion pounds in 1975 to 2.1 billion pounds in 1979, or by 12.5 percent per year.

Acrylonitrile consumption increased from 66.2 million pounds in 1975 to 118.4 million pounds in 1979, or by 12 percent per year. Chief end uses were polyacrylonitrile for fibers (89 percent), acrylate esters (6 percent), and acrylonitrile-butadiene-styrene (ABS) resins (4 percent).

Acetic acid consumption increased from 64.2 million pounds in 1975 to 149.9 million pounds in 1979, or by 18.5 percent per year. Acetic acid was consumed in production of acetic anhydride (68 percent) and cellulose acetate (14 percent), and as a solvent (12 percent).

Acetic anhydride consumption increased from 36.0 million pounds in 1975 to 60.2 million pounds in 1979, or by 11 percent per year. About 90 percent of acetic anhydride consumption was in production of vinyl acetate monomer.

Consumption of aldehydes increased from 162.0 million pounds in 1975 to 282.2 million pounds in 1979, or by 12 percent per year. Acetaldehyde was consumed chiefly as an intermediate for secondary petrochemicals. Formaldehyde was consumed in production of urea-formaldehyde, phenolic, and melamine resins (together, 76 percent of the total), and as an intermediate (24 percent).

Ketone consumption increased from 30.2 million pounds in 1975 to 67.8 million pounds in 1979, or by 17.5 percent per year. Acetone was consumed as an intermediate (74 percent) and as a solvent (26 percent). Methyl ethyl ketone and methyl isobutyl ketone were mostly used as solvents for paints, lacquers, and adhesives.

Consumption of monohydric alcohols increased from 137.5 million pounds in 1975 to 405.5 million pounds in 1979, or by 24 percent per year. The largest factor in the growth of alcohols consumption was methanol, for which consumption more than tripled during 1975-79. Methanol was consumed in the production of dimethylterephthalate (37 percent) and formaldehyde (29 percent), and as a solvent (22 percent). Consumption of n-butanol,

1/ Table B-7 contains Mexican acyclic organic chemicals consumption data.

2-ethylhexanol, and isopropanol each more than doubled during the same period. Eighty-three percent of isopropanol went into production of acetone; n-butanol was consumed in production of esters (63 percent) and as a solvent (37 percent); and 2-ethylhexanol was used mostly as a plasticizer for polyvinyl chloride resins.

Consumption of esters (mainly methyl methacrylate and vinyl acetate) increased form 49.5 million pounds in 1975 to 93.5 million pounds in 1979, or by 13.5 percent per year. The chief end use for MMA was polymethyl methacrylate resins, while vinyl acetate was consumed almost entirely in polyvinyl acetate and polyvinyl alcohol polymers and copolymers.

Consumption of ethylene glycol increased from 111.7 million pounds in 1975 to an estimated 142.0 million pounds in 1979, or by 5 percent per year. Separate data are not available for consumption of propylene glycol, but it is estimated at about 10 percent of that for ethylene glycol. Ninety percent of EG consumption was for polyethylene terephthalate resins, and 73 percent of PG was consumed in other polyester resins.

Consumption of epoxides (ethylene oxide and propylene oxide) increased from 140.0 million pounds in 1975 to 207.1 million pounds in 1979, or by 8 percent per year. At least 75 percent of the consumption of EO and PO was in their respective glycols, and the remainder was consumed in surface-active agents. All PO consumption was supplied by imports, chiefly from the United States.

Finally, consumption of halogenated hydrocarbons increased from 335.9 million pounds in 1975 to 520.9 million pounds in 1979, or by 9 percent per year. Virtually all ethylene dichloride was consumed in the manufacture of vinyl chloride monomer. VCM, in turn, was polymerized to polyvinyl chloride for further processing.

Future

Expansion Plans

Current estimated capacities for selected acyclic organic chemicals are shown along with projected increases in table B-8. By 1985, acyclic basic chemical production capacity is expected to have increased by 35 percent to 3.9 billion pounds per year. The largest growth will be in capacities for ethylene and propylene oxides and acrylonitrile. The three largest chemicals in the basic group--ethylene dichloride, vinyl chloride, and methanol--have all undergone large capacity expansions recently and no further expansion is projected through 1985.

Capacity for production of acyclic secondary petrochemicals is also expected to increase 35 percent to 1.3 billion pounds by 1985. Some expansion is projected for each major chemical in the secondary group.

Demand

Acrylonitrile

Demand is expected to grow at an average annual rate of 14 percent through 1985, chiefly because of acrylonitrile's use in the production of acrylic fibers. Most of the output is expected to be for home-market consumption, but exportation is a goal set for later in the decade. Corresponding growth rates in Canada and the United States are estimated to be 3.5 percent per year and 6.0 to 7.5 percent per year, respectively.

Acetic acid

Projected demand is 13.5 percent per year through 1985, chiefly for use in producing vinyl acetate monomer, which in turn will go into plastics. Corresponding growth rates in Canada and the United States are estimated to be 11 percent per year and 5 to 7 percent per year, respectively.

Formaldehyde

Demand is expected to increase 5 percent per year, along with demand for adhesive resins. This compares with growth in Canada and the United States of 4 percent per year and 3.5 to 4.0 percent per year, respectively.

Acetone

Consumption is expected to increase 15 percent per year through 1985. Though acetone's use as a solvent has become less important, demand for its use to produce other solvents and to meet expanding methyl methacrylate production requirements will cause growth to continue strong. Demand growth in Canada will be 5 percent per year, and in the United States, 4 to 5 percent per year.

Methanol

Demand for home-market consumption will increase 11 percent per year through 1985, but production growth will be even faster. It is believed that excess production is earmarked for export markets, including the United States. Demand growth in Canada will be 4 to 5 percent per year, but production levels there are also expected to rise sharply. Demand growth for methanol in the United States is estimated to be 10 percent per year through 1985.

Ethanol

There is currently little or no production of industrial ethanol, though a 110-million-pound-per-year plant is planned for later construction. Demand data are not available. Growth in demand for synthetic ethanol in the United

States is expected to be only 2.0 to 2.5 percent per year, while that for fermentation ethanol may see tremendous growth depending on the gasohol situtation.

Ethylene glycol (EG)

Based on continued growth of the polyester fibers market in Mexico, demand for EG is expected to grow 15 to 16 percent per year through 1985. Corresponding growth in Canada and the United States is expected to be 4.5 percent per year and 3.8 percent per year, respectively.

Ethylene oxide (EO)

Because consumption of EO is closely tied to ethylene glycol, demand for EO will increase 15 percent per year through 1985. The recent expansion of EG production facilities will require more EO than ever before. Canada's demand will grow about 14 percent per year for the same reason. Excess output in either Canada or Mexico will be destined for export markets. After 1985, growth in both countries will probably decline as export markets become saturated. Corresponding demand growth in the United States is expected to be 4.5 to 5.5 percent per year.

Ethylene dichloride

Mexican consumption is expected to grow at a tremendous rate (as high as 40 percent per year) through 1985, now that PEMEX has brought on stream a huge new vinyl chloride monomer plant. If export markets are to be exploited, Mexican production could increase even faster. Corresponding growth rates in Canada and the United States are estimated to be 10 percent per year and 5.0 to 6.5 percent per year, respectively.

Vinyl chloride monomer

Demand for vinyl chloride monomer will continue to be closely tied to the polyvinyl chloride resins market. Consumption is expected to grow 13 percent per year. Corresponding growth rates for Canada and the United States are expected to be 13.5 percent per year and 6.5 percent per year, respectively. Growth rates for all three countries are expected to decline in the latter half of the 1980's.

Trade

In general, the first priority of the Mexican chemical industry is to expand rapidly enough to catch up with domestic demand and curtail its dependence on imports, especially of basic petrochemicals. In the course of expansion it is expected that some world-scale plants will result in substantial overcapacity for some chemicals. In those cases, Mexican producers will have to turn to export markets in order to get efficient utilization of their

plants. Likely candidates for export from the acyclic organic chemicals sector are acetaldehyde, ethylene dichloride, vinyl chloride monomer, methanol, ethylene oxide, and ethylene glycol.

CYCLIC INTERMEDIATES

Present Situation

Description and Uses

Mexico produces cyclic intermediates to serve as raw materials for a variety of finished organic products such as plastics, fibers, dyes, and synthetic rubbers. Since Mexico does not yet have the capacity to produce the more complex intermediate chemicals, most of the intermediates produced in this country are basic or commodity cyclic intermediates.

Some of these basic cyclic intermediates such as ethylbenzene, cumene, cyclohexane, and aniline are also used to produce other intermediates (e.g., styrene from ethylbenzene). Styrene is then used to produce finished chemical products such as plastics or resins.

In 1978, the principal large volume cyclic intermediates produced in Mexico were dimethyl terephthate, ethylbenzene, styrene, cyclohexane, and phthalic anhydride. Dimethyl terephthate/terephthalic acid (DMT/TPA) are used primarily in the production of polyethylene terephthalate. This polyester is used to make fibers for clothing and other textile uses. With Mexico's population expected to top 100 million by the year 2,000 1/, synthetic fiber production will continue to grow in the coming years.

Styrene and its precursor ethylbenzene will also benefit Mexico's increasing population. Products manufactured from styrene such as polystyrene and styrene-butadiene resins are used primarily in packaging, appliances, and construction. Styrene will also experience increased demand as the Mexican population and economy continue to grow in the coming years.

Other cyclic intermediates such as phthalic anyhydride, cyclohexane, toluene diisocyanate, and caprolactam are all used in the production of synthetic fibers, plastics, and synthetic resins. These chemical products should also benefit from an increasing Mexican population.

Customs Treatment

In 1979, the Secretariat of Commerce revised many import and export duties to bring the respective tariffs more in line with the prevailing rates in the world markets. Many cyclic intermediate duty rates have been reduced, but the rates on some large volume intermediate were increased possibly to protect the new domestic capacity for these products.

1/ Speech by Fernando G. Saldivar, "Competitiveness of the Mexican Chemical Industry," at the Second Chemical Congress of the North American Continent, Las Vegas, Nev., August 29, 1980.

Tariffs

Cyclic intermediates imported into Mexico are classified in Article VI, Products of the Chemical and Allied Industries, chapter 29, Organic Chemicals, of its tariff schedules. Most of the duty rates on cyclic intermediates are compound (e.g., current pesos per kilogram and an ad valorem percentage); however, recent duty rate reductions have eliminated the specific rate (e.g., current pesos per kilogram) for a number of cyclic intermediates.

Mexico does not have two rates of duty for each tariff item number as is found in the U.S. tariff schedules. Instead, Mexico has only one duty rate for each item number for all nations. Any limitation of imports is usually accomplished through import licensing.

Some of the current rates of duty for certain cyclic intermediates are found in table B-9.

Non-tariff barriers

Although Mexico has decided not to become a member of the General Agreement on Tariffs and Trade (GATT), it has adopted some of the rights and obligations of this international trading system. For example, in 1979 Mexico began to abolish the practice of import licensing on many products and hopes to eliminate this form of protectionism by 1982. 1/ The course of the Lopez Portillo administration in the area of protectionism, however, is still not clear. In early 1980, the administration reinstated many tariff items which were previously removed from the prior import licensing scheme. 2/ This reversal, especially with certain cyclic intermediates, is believed to be the result of Government and industry pressure to protect the domestic chemical industry and its new intermediates plants from import injury. Once these new world class intermediate plants become fully operational and competitive, industry sources believe these items will be removed from prior import licensing requirements.

Structure of the Industry

Ownership

Basic petrochemicals, including basic cyclic intermediates, are produced only by the Government-owned oil company, PEMEX, which decides what chemicals are to be thus classed. 3/ Some of these basic intermediates are ethylbenzene, styrene, cyclohexane, and cumene.

Cyclic intermediates classified in the secondary petrochemicals sector are produced by privately-owned firms with a required minimum of 60 percent Mexican ownership. As of 1978, there was only one producer for each of the

1/ Dean Rusk Center, Comparative Facts on Canada, Mexico and the United States: A Foundation for Selective Integration and Trilateral Cooperation, Athens, Georgia, 1979, p. 137.
2/ ANALISIS-79, op. cit., p. 87.
3/ The Dean Rusk Center, op. cit., p. 224.

following cyclic intermediates produced in the secondary petrochemical sector: aniline, phthalic anhydride, benzoic acid, caprolactam, dimethyl terephthalate, and phenol. Phthalic anhydride had four producers, while there were five producers of alkylphenols as of 1975.

There are approximately 100 chemicals classified as intermediates in the secondary sector. Cyclic intermediates account for approximately 50 chemicals. In 1978, approximately 50 percent of these intermediate chemicals were being produced in Mexico.

The United States is by far the largest foreign investor in secondary chemical plants in Mexico. Mexico's largest private chemical company, whose minority partner is a large U.S. chemical company, operates more than a dozen plants in nine Mexican states and has 7,000 employees.

Integration

In Mexico, vertical integration back to the starting raw materials is not possible for producers of finished chemical products (e.g., plastics) because PEMEX is the only producer of the so-called basic petrochemicals. The producers of secondary chemicals, in many cases, also produce the finished chemical products. For example, the producer of dimethyl terephthalate uses this intermediate to make the polyester fiber. The degree of horizontal integration achieved by the secondary chemical producers is entirely dependent on the Mexican Government. The production of a new chemical by a firm must first be approved by the Government which examines certain factors (e.g., current and future demand and overall capacity in Mexico for this chemical) before making a decision. The great majority of firms manufacturing secondary chemicals produce less than six chemicals 1/.

Foreign investment

Foreign investment figures for cyclic intermediates and for the secondary chemicals industries are not available; however, overall foreign investment in Mexico amounted to $400 million in 1979, an increase of 24 percent over 1978. 2/ The United States is, by far, the largest foreign investor with over $4.3 billion or 73 percent of the $6 billion total foreign investment in 1978. 3/

Despite increasing foreign investment over the past years, particularly in the secondary petrochemical sector, overall private investment remains small. In 1976, foreign investment was only 3 percent of total private investment. This small total is due to the restrictive policies of the present and past administrations regarding direct foreign investments. 4/

1/ ANUARIO, op. cit., pp. 63-125.
2/ ANALISIS-79, op. cit., p. 19.
3/ The Dean Rusk Center, op. cit., p. 224.
4/ The Dean Rusk Center, op. cit., p. 223.

Technology

R. & D. investment in the private chemical sector (secondary chemicals) is not significant at the present time. Firms with foreign minority ownership (e.g. United States, West Germany, and so forth) rely on the R. & D. work done by the parent company. This technology is then used in the Mexican firm if the opportunity arises.

Advanced technology in a particular area has also served to gain market access in Mexico. Recently, a U.S. firm licensed its technology in the production of dimethyl terephthalate/terephthalic acid to a Mexican firm which resulted in an increase in its capacity from 172,000 metric tons per year in 1977 to 326,000 metric tons per year in 1978. 1/

Government policies and involvement

Through PEMEX, the Mexican Government has direct control over the production and sales of oil, natural gas, basic petrochemicals, and some secondary chemicals. Other secondary chemicals, including cyclic intermediates, are indirectly controlled by the Government through licensing requirements for new chemicals and pricing of the feedstocks required to produce these chemicals.

Production

Production certain of cyclic intermediates in the basic chemicals sector amounted to 174,000 metric tons in 1978, which represented a 3 percent per year growth rate since 1975. This total includes the production of cyclohexane, dodecylbenzene, benzene, styrene, and ethylbenzene. The small annual growth rate was due to declines in the production of cyclohexane and dodecylbenzene.

Overall production of general-use intermediates in the secondary chemical sector which includes the remaining cyclic intermediates along with certain acyclic organic acids, amines, polymers, and other acyclic organic chemicals amounted to 185,000 metric tons in January-September, 1979. 2/ This was an increase of 15.2 percent over the same period in 1978. Some intermediates with increased growth rates were: toluene diisocyanate, 28 percent; phthalic anhydride, 15 percent; and phenol, 13.5 percent.

Production of dimethyl terephthalate/terephlhalaic acid increased from 39,000 metric tons in 1975 to 128,000 metric tons in 1978. Production of phthalic anhydride increased from 16,000 metric tons in 1975 to 23,000 metric tons in 1978. Another large volume cyclic intermediate, cumene, was not produced domestically until 1980 or 1981. Imports had satisfied the domestic demand until that plant was completed.

1/ Chemical Week, June 7, 1978, p. 50.
2/ ANALISIS-79, op. cit., p. 255.

Trade

Exports of many cyclic intermediates in the basic chemicals sector were nonexistent during the period 1975-78 despite increased production. For example, production of ethylbenzene rose from 32,000 metric tons in 1977 to 37,000 metric tons in 1978 while imports declined from 15,000 metric tons in 1977 to 10,000 metric tons in 1978. There were, however, no exports as domestic demand consumed all the production and the imports.

Imports

During the period 1975-78, imports of cyclic intermediates in the basic chemicals sector increased from 54,000 metric tons in 1975 to 99,000 metric tons in 1978, an annual growth rate of 28 percent. The values for these imports are not available.

Imports of secondary chemicals in 1975 amounted to 104,403 metric tons valued at $67 million. Some of the major cyclic intermediates imported in the group were terephthalic acid, 12,277 metric tons; phenol, 9,694 metric tons; and dimethyl terephthalate, 40,077 metric tons. 1/

During the period 1975-78, the United States was the major source for all chemical products including cyclic intermediates imported into Mexico. In 1978, Mexico imported approximately 650 million dollars worth of chemical products from the United States, over 52 percent of Mexico's total chemical imports. For some cyclic intermediates, the United States was essentially the only exporter. For example, in 1977 the United States accounted for nearly all the imports of cyclohexane, styrene, terephthalic acid, and dimethyl terephthalate.

Exports

Exports of cyclic intermediates from the basic chemicals sector during the period 1975-78 were virtually nonexistent except for cyclohexane exports of 12,000 metric tons. During this period, the remaining cyclic intermediates produced in Mexico were consumed domestically.

In 1975, exports of secondary chemicals amounted to 2,223 metric tons valued at $1.9 million. There were no significant amounts of cyclic intermediates included in this total for exports of secondary chemicals. In 1978, there were some exports of phenol, toluene diisocyanate, TPA, and phthalic anhydride. Terephthalic acid was the largest volume cyclic intermediate exported in 1978; exports accounted for 22,000 metric tons.

In 1978, the United States was the destination of approximately 180 million dollars worth of chemical products exported from Mexico, or 46 percent of total chemical exports. In 1977, all of the exports of dodecylbenzene (4,044 kg) went to the United States, while 77 percent of phenol exports went

1/ Institute Mexicano del Petroleo, Desarrollo y Perspectives de la Industria Petroquimica Mexicana, Mexico, 1977, pp. 386-7.

to the United States. Other cyclic intermediate exports were not specifically identified.

Consumption

During the 1975-78 period, consumption of cyclic intermediates in the basic chemicals sector increased from 131,000 metric tons in 1975 to 202,000 metric tons in 1978, for an annual growth rate of 18 percent. In 1978, imports accounted for 83,000 metric tons compared with 51,000 metric tons in 1975.

Apparent consumption of secondary chemicals in 1975 amounted to 568,510 metric tons with imports accounting for 104,403 metric tons. Consumption of terephthalic acid/dimethyl terephthalate increased from 95,000 metric tons in 1975 to 121,000 metric tons in 1978, or at an average annual growth rate of 9 percent. Imports represented a decreasing share of consumption falling from 56 percent in 1975 to 7 percent in 1978. Imports of these intermediates are expected to be eliminated in the near future as domestic capacity exceeds projected demand. The major use for these intermediates is in the production of polyester fiber primarily for clothing and other textile applications. Increased consumption of these products is expected in the future because of the increasing population of Mexico which is expected to reach 100 million people by 2000.

Future

Expansion Plans

Mexico plans to be self-sufficient in petrochemical including cyclic intermediates by mid-1980 and also to be a major factor in the world chemical market. PEMEX has stated that it would increase its basic petrochemical output goal to 23.5 million metric tons by 1982. In 1980, PEMEX expected to produce 8.0 million metric tons of petrochemicals. 1/

In the secondary petrochemical sector, Mexico's petrochemical plans call for an increase of 5 million metric tons of capacity by 1982. These plans will require an investment of nearly $500 million through 1982 2/. This investment will result in the completion of 52 projects, either new plants or expansions of existing plants, coming on stream by 1982. These projects will include the additional capacity of 153,100 metric tons in intermediates. 3/

PEMEX has been constructing several basic intermediate plants at Cangrejera which were scheduled to become operational in 1980. Some of these plants will produce styrene with a capacity of 150,000 metric tons per year, cumene with a capacity of 40,000 metric tons, and ethylbenzene with a capacity

1/ Jose Luis Garcia-Luna H., "Present and Future of the Mexican Petrochemical Industry," Paper presented at the Fifth International Petrochemical Conference, San Antonio, Texas, 1980, slide number 9.

2/ Chemical and Engineering News, Dec. 18, 1978, p. 43.

3/ Chemical Week, June 27, 1977, p. 38.

of 190,000 metric tons. Another plant scheduled for production in 1981 is a 70,000 metric tons dodecylbenzene facility at San Martin Texmelucan. 1/ The production from all of these plants is to be used initially by the domestic producers of finished and semifinished chemical products (e.g. plastics, resins, phenol, and so forth) to reduce dependence on imports. Any excess production will be exported to help reduce Mexico's balance of trade deficit.

The decision by the Mexican private sector and foreign investors to announce several new projects in the secondary petrochemicals sector over the next several years is due primarily to Mexico's readily available inexpensive supply of feedstocks and the incentives provided by the Mexican Government. These incentives (e.g. tax breaks, reduction in the price for feedstocks and fuel, and so forth) will result in most new plants being built on the Mexican coasts or in border regions close to the oil and gas producing regions of Mexico. As a result of these announced projects the installed capacity of phthalic anhydride will be tripled and methane diphenyl diisocyanate will be produced for the first time in Mexico. Also, a new 100,000 metric tons plant to produce caprolactam is scheduled for operation in 1983. This plant is estimated to cost $220 million. 2/

Demand

Future demand for cyclic intermediates produced in Mexico will depend on the growth of its economy in the coming years. An indication of Mexico's growing economy is the gross domestic product (GDP) which increased from $80 billion in 1975 to $82 billion in 1978. Also, personal consumption expenditures in Mexico, which were $50 billion in 1978, are expected to increase at an annual rate of 6 percent through 1990.

Demand for intermediate products is expected to increase from 267,000 metric tons in 1979 to 337,000 metric tons in 1982. 3/ Plant capacity for styrene, a major intermediate, is expected to rise to 190,000 metric tons in 1984 from 33,000 metric tons in 1979. Most styrene will be used in the production of polystrene (70 percent in 1981) and SBR (14 percent in 1981). These products will be used in Mexico's construction industry and its expanding automobile industry. Mexico's synthetic rubber industry is expected to increase its SBR capacity from 70,000 metric tons to 120,000 metric tons by 1981 to satisfy its increasing SBR requirements. Demand for SBR is expected to grow at an annual rate of 11 percent through the 1980's. 4/

Increased demand in the coming years for many intermediates produced in Mexico will depend primarily upon the growth of its plastics industry, which uses most of the production of these intermediates. Fortunately for the producers of cyclic intermediates, demand for the major plastics is expected to grow at an annual rate of 13 percent through 1985. Two of the more important plastics markets are now experiencing annual growth rates greater than 12 percent.

1/ ANALISIS-79, op. cit., p. 261.
2/ ANALISIS-79, op. cit., p. 265.
3/ "Competitiveness of the Mexican Chemical and Petrochemical Industry", op. cit.
4/ Chemical & Engineering News, Apr. 14, 1980, pp. 13-14.

Relationship to the United States

Mexico is now in the process of building several world-scale chemical plants. This new capacity will eventually reduce imports of chemicals, including cyclic intermediates from the United States. It is also believed that Mexico's growing economy will be able to utilize most of this new capacity despite problems of high unemployment and a low per capita gross national product ($1,055 in 1977).

The projected production growth rates for cyclic intermediates in both Mexico and the United States tend to reflect the development of each other's chemical industry. The annual growth rate of cyclic intermediates in Mexico with its developing chemical industry is expected to be around 12 percent through 1985, while the annual growth rate in the U.S. with its well-developed chemical industry is expected to be 5 percent through 1985.

Relationship to Canada

Canada now relies on oil imports to satisfy its energy demand especially in the Eastern provinces. It also must rely on export market to justify the world-scale chemical facilities it is building because its small population (23 million people) will not be able to absorb this increased capacity for some years. Mexico does not have these problems owing to its growing population and large oil and gas reserves.

Although Canada and Mexico are not significant trade partners, both include the United States as a major trading partner. It is expected that in the near future both countries will be competing for an increased share of the U.S. chemical market, including the market for cyclic intermediates, as new chemical plants in each country become operational.

Trade

As stated earlier, Mexico's primary goal is to become self-sufficient in petrochemicals by mid-1980. After this goal is accomplished, Mexico aims to become a major exporter of petrochemicals. Achievement of this goal is difficult to predict because of delays in the construction of several new plants.

In 1979, the value of Mexican imports of chemicals exceeded the value of exports by approximately $1.2 billion. Imports of chemical products, especially intermediates, are expected to increase for the next few years until domestic production increases to meet the demand for these products.

Likely new trading partners

When Mexico begins to export large volumes of cyclic intermediates, it will most likely ship increasing quantities to Central and South American countries, the Caribbean, and the Far East. Although Mexico will be competing with the United States and other industrialized exporting countries (e.g. West Germany, Japan, and the United Kingdom), it will have the advantages of lower cost feedstocks and of closer proximity to these export markets.

Another market which will experience increasing imports from Mexico is the United States. The United States is the world's largest petrochemical consumer and Mexico's largest chemical export market. It is expected, therefore, that Mexico will attempt to increase chemical exports, including cyclic intermediates exports, to the United States in the 1980's.

Impact on producers, consumers, and new uses

The future growth of cyclic intermediates in Mexico will be linked first to the domestic demand for major users of these products (e.g. plastics, synthetic fibers, resins, and synthetic rubber) and then to the demand in world markets.

Because of the availability of low-cost feedstocks, Mexico can produce intermediates at a lower cost than other world producers who must pay higher prices for their feedstocks. This cost advantage should benefit the Mexican consumer. It should also benefit Mexico in world markets and ultimately lower the trade deficit.

Mexico will probably not use its cyclic intermediates for new applications. It seems more likely that the end-products manufactured from intermediates (e.g. plastics and synthetic fibers) will be used to produce a large variety of products because of the low production costs. Increased use of synthetic fibers to make low cost clothing and increased use of plastics to make household appliances and goods to improve the quality of life of the increasing Mexican population are the probable end-use markets for these products in Mexico over the next several years.

PESTICIDES

Present Situation

Description and Uses

Pesticides is a generic term which covers a wide range of chemicals used to restrict or destroy pests. The three major categories are fungicides, herbicides, and insecticides.

Fungicides are primarily used on farm crops, although not as frequently and in smaller amounts compared to the use of insecticides and herbicides. A leading fungicide is pentachlorophenol (PCP).

Herbicides are used to kill plants or to interrupt their normal growth. Among the leading herbicides because of its selectivity is 2,4 dichlorophenoyacetic acid (2,4-D). Cotton, corn, and peanuts are some of the crops that benefit from the use of this chemical.

Insecticides are chemicals used to prevent, destroy, repel, or mitigate insects. In order to exert this control over a broad range of insects, different types of insecticides are used, each with a different method of attack. These types of chemicals have been used to control a wide range of insects which feed upon cotton, tobacco, corn, and most fruit and vegetable crops. The two most commonly used insecticides have been parathion and methyl parathion (parathions).

Pesticides are marketed either as technical grade chemicals or as formulated materials. The technical grade chemical pesticides are the active ingredients which restrict or destroy pests. These chemicals are the pesticide intermediates used by formulating companies to produce the formulated materials or formulated pesticides. The formulated materials combine active ingredients with materials such as diluents, extenders, emulsifiers, synergists, and wetting agents to increase the effectiveness of the pesticide.

Customs Treatment

Tariff

All categories of pesticides, including the three major categories--herbicides, insecticides, and fungicides--are dutiable at 10 percent ad valorem (table B-10). This rate also applies to the pesticides PCP, 2,4-D, and parathion which are representatives of the three major pesticide categories. The item numbers of the three major classes of pesticides are 38.11A001, 38.11A002, and 38.11A003 for insecticides, herbicides, and fungicides, respectively.

Non-tariff barrier

Mexico has a valuation system for pesticide imports based on the official price of each pesticide. Under this method of valuation, the duty levied on

pesticide imports is based upon a value not less than the official Government price.

Structure of the Industry

The Mexican pesticide industry is composed of about 15 producers 1/ operating about 24 plants with an employment force of approximately 2,000 employees. These plants are located in the Central and Northern portions of Mexico, in the States of Distrito Federal and Mexico, and in the Districts of Cajeme and Torreon in the Northern States of Sonora and Coahuila.

In 1979, the Mexican pesticide industry had a production capacity of about 83 million pounds per year. 2/ Insecticides accounted for over 68 percent of total industry capacity, with a production capacity totaling almost 57 million pounds per year. Herbicides and fungicides, had a smaller share of total industry capacity with about 20 percent and 11 percent, respectively. Furthermore, one producer controlled 38 percent of total industry capacity. The same producer accounted for over 22 million pounds per year of parathions production capacity. Likewise, another producer monopolized all PCP production capacity, although capacity for the production of this fungicide accounted for only 1 percent of total industry capacity. 2,4-D production capacity was controlled by 3 producers whose combined capacity totalled over 9 million pounds per year or about 11 percent of total industry capacity.

Ownership

Because pesticides are considered a secondary petrochemical by the Mexican Government, investments by private concerns in the pesticide industry are permitted. Government policy regulating ownership by the private sector mandates that foreign ownership be restricted to 40 percent of equity. 3/ This rule can be relaxed, however, if the plant is located in a region considered important to the country's development.

Of the estimated 15 producers in the pesticide industry, one is Government-owned, and at least two are affiliated with multinational parent companies. 4/ About 12 producers are believed to be small companies with joint Mexican-foreign ownership.

Integration

Those producers having integrated pesticide operations produce pesticide products such as PCP, 2,4-D, and parathions from intermediates such as acetaldehyde, benzene, cumene, and methanol.

1/ Instituto Mexicano del Petroleo, Desarrollo y Perspectivas de la Industria Petroquimica Mexicana, Mexico, 1978, pp. 196-197.

2/ Ibid., pp. 197-198.

3/ Business International Corporation, Mexico, New Look at a Maturing Market, N.Y., N.Y., 1978 p. 76.

4/ Instituto Mexicano del Petroleo, op. cit., pp. 195-198.

Very few, if any, domestic producers of pesticides are vertically integrated, although many pesticide producers in Mexico manufacture other petrochemical products such as plastics and fertilizers. These producers are usually affiliated with large multinational companies that supply the capital and technology needed for production. Other pesticide producers are usually smaller, local firms, that lack the technology and capital to integrate their operations and, consequently, are limited to the production of pesticides.

Foreign investments

Foreign investments, primarily from U.S. companies, account for at least 20 percent of the ownership in the Mexican pesticide industry. Companies in Germany, Japan, the United Kingdom, Canada, France, Sweden, and Spain also are important investors.

Technology

The technology used for pesticide production in Mexico is almost entirely of foreign origin, primarily from the United States. 1/ This technology was first introduced in Mexico in 1959, as a result of a U.S.-Mexican joint venture for the production of insecticides. During the 1960's, new technology for the production of certain fungicides and herbicides was incorporated into the Mexican pesticides industry. The pesticide technology employed by the Mexican industry consists of chemical processes which include halogenation (e.g., chlorine added to phenol), and distillation (e.g., the separation of alcohols from the reaction medium).

Pesticide production usually takes place in large jacketed kettles in what are called "batch" processes. Large volumes of products may be obtained depending upon the intermediates used and the type of chemical reaction employed. In the production of 2,4-D and parathions, halogenation reactions are used to obtain intermediates which are in turn purified through distillation and subjected to further reactions.

The Mexican pesticides industry is believed to be operating with somewhat outdated technology. The lack of new technology has had an adverse effect on the quality of pesticides manufactured in Mexico.

Government Policies and Involvement

Production facilities

The Mexican Government is involved in the production and marketing of pesticides through its wholly-owned company, Fertilizantes de Mexico. This Government firm is presently producing only insecticides; it is Mexico's only producer of parathions. In addition, Fertilizantes de Mexico produces dichloro diphenyl trichloroethane (DDT) and benzene hexachloride (BHC).

1/ Instituto Mexicano del Petroleo, op. cit., p. 166.

In 1978, Fertilizantes de Mexico produced nearly 11 million pounds of DDT, about 4 million pounds of BHC, and over 7 million pounds of parathions with the aid of production from its large plant in Salamanca, Galixto. Fertilizantes de Mexico controlled about 38 percent of all pesticide industry capacity in 1978, and is likely to increase its capacity by more than 5 million pounds per year by the early 1980's. 1/

Government-industry relationship

The Government is presently offering an incentive package to Mexican pesticide producers which includes relaxation of price controls, increasing export incentives, and lessening of import controls. 2/ Under present Government policy, goods produced by the secondary petrochemical industries, including pesticides will be granted incentives based on their value to the economy.

Export incentives, which in the past have been hampered by the overvaluation of the Mexican peso and export sales taxes, are less important under the new Government policy. Import controls will be somewhat abated by liberalization of Mexico's import licensing system. Under the former licensing system, imports that competed with locally-produced intermediates were not allowed. This was considered by many pesticide producers to be a setback since the imported intermediate was usually of a higher quality than the domestic intermediate. Mexican pesticide producers were thus obliged to use a lesser quality intermediate, and therefore were producing lower quality products downstream. 3/ Under the proposed licensing system, certain imports improving the quality of the final pesticides will be permitted to enter.

Other Government policies affecting the industry include environmental protection and work hazard regulations. Allowances are made with respect to these Government policies for the production of priority items such as pesticides and other farm chemicals which are considered vital to Mexican economic growth.

Production

Production of pesticides increased from about 34 million pounds in 1975 to almost 55 million pounds in 1978, and then decreased to approximately 48 million pounds in 1979 (table B-11). This decline in pesticide production was due partly to a decrease in domestic demand for insecticides. The value of pesticide production in 1975 was over $29 million. Pesticide production values for the period 1976-79 are not available.

Fungicide production totaled 3 million pounds in 1975, and was estimated to be 4 million pounds in 1979 (table B-12). In 1975, PCP production totalled approximately one-half million pounds and doubled to 1 million pounds in 1979.

1/ Instituto Mexicano del Petroleo, op. cit., p. 166.

2/ "Fourth State of the Nation Report," Delivered President Jose Lopez Portillo, Sept. 1, 1980, pp. 6-8.

3/ Business International, op. cit., p. 17.

Herbicide production totaled over 5 million pounds in 1975; production increased to 6 million pounds in 1978 (table B-13). Production of 2,4-D declined from 3.1 million pounds in 1975 to 2.6 million pounds in 1978.

Total insecticide production increased from 21 million pounds in 1975 to 30 million pounds in 1978 (table B-14). During this period, parathion production increased from 7.9 million pounds to 8.3 million pounds.

Trade

During the period 1975-77 pesticide imports declined while exports increased; however, increasing exports could not eliminate the Mexican trade deficits in pesticides (table B-11). Data during the period 1978 to 1979 were not available at the time of report preparation. One explanation given for the deficit in pesticide trade has been the overvaluation of the Mexican peso, along with poor quality Mexican pesticide exports.

Imports

Pesticide imports decreased during the period 1975-77. Mexican pesticide imports totaled 20 million pounds in 1975, compared with 6 million pounds in 1977. The value of these imports decreased from more than $30 million in 1975 to $16 million in 1977.

Fungicide imports decreased from 956,000 pounds in 1975 to 829,000 pounds in 1977 (table B-12). The value of these imports rose from $2.5 million to $4.7 million during the same period.

Herbicide imports also decreased during the period 1975-77 (table B-13). The quantity of herbicide imports decreased from 1 million pounds in 1975 to 637,000 in 1977. The value of herbicide imports decreased from $2.0 million in 1975 to $1.5 million in 1977.

During the period 1975-77 the quantity of insecticide imports decreased at a greater rate than the quantity of other pesticide imports (table B-14). Imports decreased from an estimated 18 million pounds in 1975 to approximately 4 million pounds in 1977. The value of imports decreased from $25 million in 1975 to $10 million in 1977. In 1977, the United States was the single most important source of imports into Mexico, supplying 31 percent of the total fungicide market, 43 percent of the total herbicide market, and 65 percent of the total insecticide markets. 1/

Exports

Mexican pesticide exports increased by 41 percent during the period 1975-77 (table B-11). These exports totalled nearly 2 million pounds in 1975 as compared with 3 million pounds in 1977, however, the value of pesticide exports decreased from $2.1 million to $1.9 million.

1/ S.I.C. Direccion General, op. cit., p. 135.

Mexican fungicide exports increased during the period 1975-77 (table B-12). In 1975, fungicide exports totalled 576,000 pounds; by 1977 exports had increased by 8 percent to 622,000 pounds. The value of these exports almost doubled, going from $288,000 in 1975 to $570,000 in 1977.

Herbicide exports decreased from 309,000 pounds to 46,000 pounds during the period 1975-77 (table B-13). Similarly, the value of these exports decreased from $315,000 to $39,000.

Insecticide exports rose 63 percent from 1.1 million pounds in 1975 to 1.8 million pounds in 1977 (table B-14). The value of insecticide exports increased from $324,000 in 1975 to $877,000 in 1977.

Mexican pesticide exports are less than those in certain other producing nations. Mexico's relatively low volume of exports are expected to continue until the peso stabilizes. The major markets for Mexican pesticides exports are likely to be Brazil, Guatemala, the United Kingdom, the United States, and Venezuela, together accounting for 80 percent of the total Mexican pesticides exports. 1/.

Consumption

The apparent consumption of pesticides in Mexico decreased by 10 percent from 52 million pounds in 1975 to an estimated 47 million pounds in 1977 (table B-11). This is, in part, attributable to a decrease in pesticide imports. In part, declining imports are a response to Mexico's policy of striving for self-sufficiency through increased domestic production. The decrease in apparent consumption is also attributable to a rise in pesticide exports during the period 1975-77, and to the decline in the production of agricultural crops, which is closely related to the consumption of pesticides.

The apparent consumption of 2,4-D decreased by 15 percent during the period 1975-78. 2/ In 1975, 2,4-D consumption to totalled 3.1 million pounds and decreased to 2.6 million pounds in 1978. During the period 1975-78, apparent consumption of 2,4-D equalled production indicating a trade balance in this market assuming constant inventory levels.

The consumption of parathions remained almost unchanged at about 11 million pounds during the period 1975-78; domestic production of methyl parathion provided for most of the consumption. 3/ Data on PCP are not available.

Future

Expansion Plans

The Mexican pesticide industry is striving for self-sufficiency through increased production which is in turn partly dependent on new and improved

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1/ S.I.C.-Direccion General, op.cit., p. 503.
2/ Associacion National de la Industria, op. cit., p. 305.
3/ Ibid., p. 302.

technology. Industry projections indicate low growth during the period 1980-85 for pesticides as a result of lessening investments. 1/

Future pesticide expansions are closely related to future agricultural production since agricultural users constitute the major market. In 1980, the Mexican pesticide industry was capable of supplying the domestic market, while exporting the remainder.

Who, what, when, why, where

The pesticide industry has planned only limited expansions by 1985. Construction of eight additional plants were initiated during the period 1976-78, while the construction of two additional plants were to be initiated in 1979. These plants produce primarily herbicides and insecticides. The plants are located in the industrialized regions of Distrito Federal and San Luis Potoso.

Impact on industry

The increase in pesticides capacity was expected to be 40-45 percent from 1976 to 1985. 2/ Capacity utilization was 50 percent in recent years, with little in the way of an upward trend anticipated in the near future. 3/ The lack of technology to produce "new" or better pesticides as well as the inability to utilize certain pesticide products have caused stagnation in the industry.

Demand

The growth in demand for pesticides in Mexico is directly related to the production of cotton. 4/ Between 77 and 85 percent of total Mexican insecticide production is used in the protection of cotton crops. Growth in the demand for cotton would therefore spur growth in the pesticides industry.

Forecast growth

Due to the poor year for Mexican agriculture in 1979, growth in demand for pesticides did not meet expectations. A growth rate of 1.7 percent for pesticides demand is expected in 1981. Demand for insecticides, such as parathions, for the period 1980-85 is likely to grow by about 70 percent.

1/ Instituto Mexicano, op. cit., pp. 200-201.
2/ Instituto Mexicano, op. cit., pp. 200-201.
3/ Ibid., p. 167.
4/ Ibid., p. 168.

Reasons for growth

Mexican pesticides are primarily used for agricultural crop protection, particularly for the protection of cotton crops. Cotton is in turn used by the textile industry whose products are in great demand, both in domestic and foreign markets. Since cotton growers depend on pesticide protection to rid their crops of harmful insect infestations and from the weeds and fungus that might threaten yield, pesticides are essential to Mexican cotton producers. As other crops are grown, demand for various pesticides in Mexican and foreign markets are expected to grow.

Relationship to the United States

The Mexican non-tariff barriers to pesticide imports were established to protect producers of 46 or more different pesticide products produced in Mexico. These non-tariff barriers do not allow imports of pesticides that are currently produced in Mexico. Mexican pesticide exports enter the United States free of duty since Mexico has been designated as being eligible for the Generalized System of Preferences (GSP) duty treatment. U.S. non-tariff barriers seldom affect imports of Mexican pesticides as, for the most part, these pesticides are registered with the EPA.

Relationship to Canada

There is little Mexican-Canadian pesticide trade. Mexico, with its policy of self-sufficiency, is promoting growth in the pesticide industry by curtailing imports.

Canada's pesticide industry is somewhat smaller than that of the United States, producing only a limited number of products. Canada is not likely to compete with Mexico for export markets, nor is it likely to supply Mexico with pesticide products.

Trade

At present, Mexico is striving for self-sufficiency in pesticides production. The industry has been displacing imports with domestically-manufactured pesticide products. Coterminously, Mexican exports of some pesticides are increasing.

Changes in imports and exports

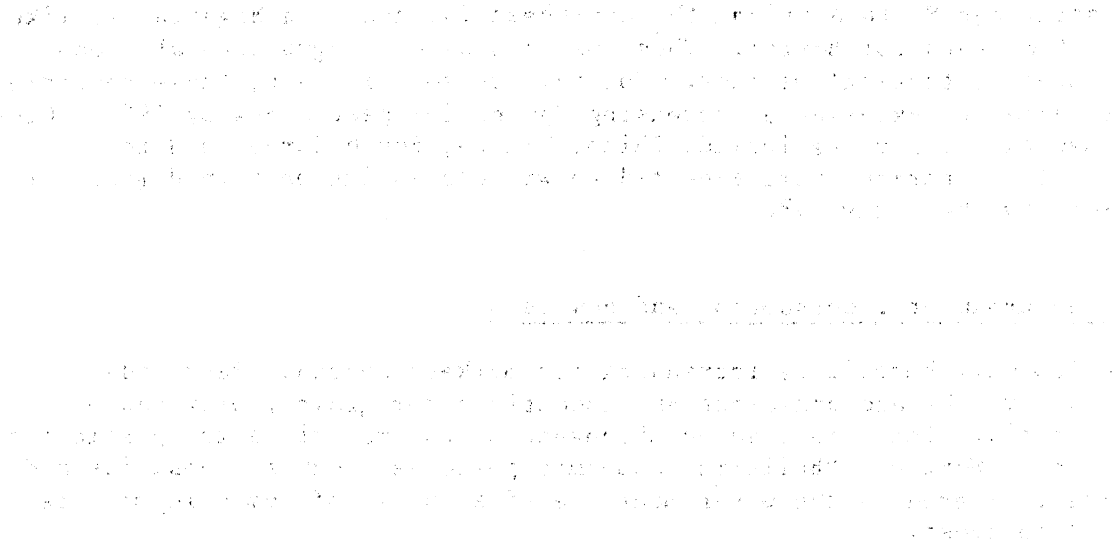
During the period 1975-77, there was a downward trend in Mexican pesticide imports. In general, Mexico has been able to systematically substitute imports with domestic production. Mexico is likely to achieve a more favorable pesticide export posture in the early 1980's.

Likely new trading partners

Central and South America, the Caribbean Islands, and Nigeria are likely new export markets for Mexico. These nations have an agricultural economy complemented by tropical weather. For this reason, in part, these countries were projected to experience increasing demand for pesticides by 1980. Other likely new export markets include China, France, South Korea, and the U.S.S.R. These nations were expected to witness an increase in demand for pesticides by the early 1980's.

Impacts on producers, consumers, and new uses

Mexico will benefit by increasing its markets abroad. Pesticide producers have the encouragement and incentives for growth, provided by Government aid. There is also an abundance of raw materials for pesticides production in Mexico. "Built-in" economic policies, such as subsidies and incentives, offered by the Government, require supply of domestic markets first and foremost.



ANHYDROUS AMMONIA AND NITROGENOUS FERTILIZERS

Present Situation

Description and Uses

The description and uses of anhydrous ammonia and nitrogenous fertilizers in Mexico are the same as those in the United States.

Customs Treatment

Mexico uses a variation of the Brussels Tariff Nomenclature for the structure of its tariff system. Anhydrous ammonia is, therefore, listed in what is equivalent to chapter 28 of the Brussels system while the ammonia derivatives that are principally used as fertilizers--ammonium nitrate, urea, ammonium sulfate, and so forth--are listed as fertilizers in the equivalent to chapter 31.

Tariff

All nitrogenous fertilizers enter Mexico duty free, except for sodium nitrate, which has a 5 percent ad valorem rate, anhydrous ammonia, with a 60 percent ad valorem duty rate, and ammonium hydroxide with a 35 percent ad valorem rate. Mexican duties on nitrogenous fertilizers are listed in table B-15.

Non-tariff barrier

Fertilizer imports, like other imports into Mexico, require an import license.

Structure of the Industry

All ammonia and nitrogenous fertilizer plants in Mexico are owned and controlled by the Government of Mexico. Ammonia is produced by the Government-owned company, PEMEX. Nitrogenous fertilizers are produced by the Government-owned company, Guanos y Fertilizantes de Mexico SA.

Technology

The technology used to produce ammonia and other nitrogenous fertilizers in Mexico is the same as is used to produce those chemicals in the United States.

Government Policies and Involvement

Production facilities

All of the ammonia and nitrogenous fertilizer plants in Mexico are owned and controlled by the Government of Mexico.

Production

Mexican production statistics are incomplete. Available production and trade statistics are recorded in tables B-16 to B-19. Production of anhydrous ammonia increased 97 percent during 1975-78.

The competitive position of the nitrogenous fertilizer industry is based largely on the economics of the ammonia industry. As previously stated, the major factors influencing ammonia production economics are the cost of natural gas feedstock and fuel, the capital cost of ammonia plants, and the distance to markets.

It is widely believed that the cost of natural gas within Mexico is low and that, in some areas, natural gas produced concurrently with oil is flared because of lack of markets or gathering and distribution systems for the gas. Mexico is believed, therefore, to have a substantial cost of production advantage, compared to the United States or Canada, because of its low-cost natural gas supplies. In addition, Mexico's ammonia plants are favorably located to export ammonia into the world market. For example, ammonia from Mexico can easily move into gulf and east coast markets of the United States and then can move inland in the extensive U.S. distribution system. The capital construction cost of a new ammonia plant in Mexico is probably slightly higher than in the United States.

Trade

The principal nitrogenous fertilizer material exported by Mexico has been anhydrous ammonia. The infrastructure of pipelines, tank cars, and storage facilities needed to distribute ammonia to Mexican consumers has not been developed as rapidly as the capacity to produce ammonia. Substantial quantities have, therefore, been available for export when large new plants started up without domestic market commitments for the total capacity. Ammonia that is in excess of Mexico's internal needs has generally been sold on the spot market rather than on long term contracts.

Imports

Mexico is, for the most part, self-sufficient in anhydrous ammonia and nitrogenous fertilizers. Mexico's high rate of duty, 60 percent ad valorem, on anhydrous ammonia serves to protect its ammonia industry from import competition.

Exports

Exports of anhydrous ammonia from Mexico increased from 4,550 short tons in 1975 to 739,000 short tons in 1978. About one-half of the ammonia exported by Mexico in 1978 entered the United States. Data for exports of nitrogenous fertilizers, other than ammonia, are incomplete or not available.

Consumption

Apparent consumption of anhydrous ammonia in Mexico increased 14 percent during 1975-78.

Future

Expansion Plans

The Mexican Government-controlled company, PEMEX, plans to increase anhydrous ammonia capacity from 2.3 million short tons per year in 1980 to 5.3 million short tons per year in 1985. Two new urea plants are under construction which will add about 1.0 million short tons per year to Mexico's urea capacity by 1983. 1/

Demand

The demand for direct-application anhydrous ammonia in Mexico is projected to be about 700,000 short tons per year by 1985, while urea consumption is projected to be 2.4 million short tons per year, ammonium nitrate 1.2 million short tons per year, and ammonium sulfate 400,000 short tons per year by 1985. Total consumption of nitrogenous fertilizers is projected to increase 56 percent during 1981-85, at an annual compound growth rate of about 12 percent. 2/

The increased demand will be due mostly to higher fertilizer application rates to meet the needs of the increasing population and a higher standard of living in Mexico.

Trade

Assuming an 85 percent capacity utilization rate in the production of anhydrous ammonia in Mexico, the difference between projected production and demand indicates that (if these projections are reasonably accurate) Mexico will have about 1.5 million short tons of anhydrous ammonia available for export in 1985. Ammonia is a fungible commodity and, since Mexico has deep-water ports, these potential exports are as likely to go to any one importing country as another because the excess ammonia is most likely to be sold in the spot market.

1/ Chemical Engineering News, Mexico Aims for Fertilizer Self-Sufficiency, Sept. 1, 1980, pp. 15-16.

2/ Mexican Petroleum Institute, Desarrollo y Perspectivas de la Industria Petroquimica Mexicana, pp. 149-162.

ANHYDROUS AMMONIA AND NITROGENOUS FERTILIZERS

Present Situation

Description and Uses

The description and uses of ammonia and nitrogenous fertilizers are the same in Trinidad and Tobago as in the United States. A larger percentage of their production, however, is exported rather than consumed domestically.

Customs Treatment

The rate of duty in 1980 on ammonium sulfate, urea, and ammonium nitrate was $14.76 (Trinidadian dollars) per metric ton. The rate of duty on anhydrous ammonia and other nitrogenous fertilizers was not available.

Structure of the Industry

A U.S. company owns a 1,000-ton-per-day ammonia plant in Trinidad and has a 49 percent interest in another large ammonia plant there. The remaining 51 percent interest is controlled by the Government of Trinidad and Tobago.

Technology

The production technology is basically the same as that used in the United States, Canada, and Mexico.

Government Policies and Involvement

Little information is available about the policies of the Government of Trinidad and Tobago, although the trend seems to be toward joint ventures in which the Government retains a substantial or controlling interest in the plants. The Government of Trinidad and Tobago may also exercise control over the natural gas feedstock used by the ammonia plants.

Production, Trade, and Consumption

Production, trade, and consumption statistics were not available for anhydrous ammonia. In January 1977-June 1978 production of ammonium sulfate in Trinidad and Tobago was only 65,000 short tons while urea production was 73,000 short tons. Imports of nitrogenous fertilizers were insignificant, as was consumption. 1/

Ammonia plants located in Trinidad and Tobago use natural gas from wells located in the territorial waters of that nation.

Future

Expansion Plans

A U.S. company and the Government of Trinidad and Tobago plan to open two ammonia plants in Trinidad and Tobago with a total of 600,000 tons of annual capacity in 1981 and 1982. Most of this ammonia is expected to enter the export market. 2/

Demand

The domestic demand for anhydrous ammonia and nitrogenous fertilizers in Trinidad and Tobago is insignificant.

Trade

Because the domestic demand for ammonia and nitrogenous fertilizers is insignificant, virtually all of these materials produced in Trinidad and Tobago are exported in international markets. Anhydrous ammonia is, by far, the most significant of the exported fertilizers or fertilizer materials.

Because of the proximity of Trinidad and Tobago to major U.S. markets and the investment by U.S. companies in plants in Trinidad and Tobago, the United States is likely to continue to be a principal market for anhydrous ammonia produced in that country.

1/ Food and Agriculture Organization of the United Nations, 1978 FAO Fertilizer Yearbook, Rome, Italy, 1979.

2/ U.S. International Trade Commission, Anhydrous Ammonia from the U.S.S.R., pub. 1051, April 1980, page A-34.

SYNTHETIC RUBBER 1/

Present Situation

Description and Uses

Synthetic rubbers are polymeric materials possessing physical properties characterized as "elastic." The Mexican tariff nomenclature 2/ defines the term "Synthetic Rubber" to mean--

> "Unsaturated synthetic substances which can be irreversibly transformed into non-thermoplastic substances by vulcanization with sulphur and which, when so vulcanized as well as may be (without the addition of any substances such as plasticizers, fillers or reinforcing agents not necessary for the cross-linking), can produce substances which, at a temperature between 18°C and 29°C, will not break on being extended to three times their original length and will return, after being extended to twice their original length, within a period of five minutes, to a length not greater than one and a half times their original length."

The three types of synthetic elastomers currently produced in Mexico are polybutadiene rubber, polybutadiene-acrylonitrile (nitrile) rubbers, and styrene-butadiene rubbers. 3/ Among the major types of general use synthetic rubbers not currently produced in Mexico are ethylene-propylene rubber, butyl rubber, and polyisoprene rubber. Nitrile rubbers are the only specialty synthetic rubbers currently produced in Mexico, although several other types, imported primarily from the United States, are used in the manufacture of Mexican fabricated rubber products.

Polybutadiene synthetic rubber is a stereo-regular elastomer with a molecular configuration similar to balata and gutta percha types 4/ natural rubbers. It is produced by the polymerization of butadiene and is characterized by good wear and abrasion resistance. It is primarily used in tires as part of the tread to increase tire life and reduce skidding.

Nitrile rubber is a term generally applied to all elastomers produced by the copolymerization of acrylonitrile and butadiene. These synthetic rubbers have very high resistance to deterioration in the presence of oils and organic solvents. Major uses of nitrile rubbers include hoses, gaskets and seals for

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1/ The terms "elastomer" and "synthetic elastomer" are used as synonyms for the term "synthetic rubber" in this paper.

2/ Based on the Customs Cooperation Council Nomenclature (CCCN).

3/ The Rubber Industry Statistical Report, by the International Institute of Synthetic Rubber Producers, 1980, Appendix A.

4/ These types of natural rubber consist primarily of the "TRANS" isomer of 1,4-polyisprene, which has a higher tensile strength and higher resistance to cutting, abrasion and scuffing than those types of natural rubber consisting primarily of the "CIS" isomer.

equipment exposed to oils and organic solvents. Footwear soles is another prominent use of nitrile rubbers.

Styrene-butadiene rubber is the largest volume synthetic rubber produced in Mexico, as it is in the rest of the world. It's properties do not exactly match those of natural rubber, but what it lacks in elongation, hot tear strength, hysteresis, resilience, and tensile strength it more than makes up for in better and easier processability, slightly better heat aging properties, and better abrasion resistance.

Some oil-extended polyisoprene, with imported polyisoprene solid or latex used as a starting material, is probably made in Mexico. Laboratory quantities of other types of synthetic elastomers are probably also produced, principally for experimentation purposes.

Customs Treatment

Tariff

The tariff rates on synthetic elastomers (table B-20) range from 5 percent to 60 percent ad valorem. These are high rates compared to the 2.6 percent ad valorem rate charged by the United States and the 2.5 percent ad valorem rate levied by Canada. The Mexican tariff schedules make a distinction between the latex form of synthetic rubbers, and the dry or solid form. This separation is not made in U.S. or Canadian tariff schedules. The latex form of synthetic elastomers are not generally traded in the world market. Latex is an emulsion of synthetic rubber in water and the cost of shipping water internationally is usually prohibitive. The amount of synthetic rubber latex entered into Mexico is probably small.

The duty rate for polybutadiene is 5 percent ad valorem in both the latex form and the solid form. This material is produced in amounts well below the demand in Mexico, which may account for the relatively low duty. In addition, special permission is required prior to importation of this material.

Polybutadiene-acrylonitrile (nitrile) rubbers are dutiable at rates of 20 percent ad valorem on the latex form and 60 percent ad valorem on the solid form. Permission to import these materials is required prior to actual entry. Nitrile rubbers are produced in significant amounts in Mexico although no where near the volume of styrene-butadiene rubbers.

Styrene-butadiene rubbers are the most important of the synthetic elastomers produced in Mexico. They are dutiable at rates of 5 percent ad valorem for latex and 40 percent ad valorem for solids, as shown in table B-20. Another type of styrene-butadiene rubber, in solid form, separately classified in the Mexican tariff schedules is material in which the styrene component is limited to a range of between 3 and 10 percent. This material probably competes primarily with polybutadiene rubbers and seems to be a relatively small volume item in world trade.

Non-tariff barriers

A major non-tariff barrier to trade with Mexico appears to be the advance permission (import license) required to import certain types of synthetic elastomers and the bureaucratic problems associated with obtaining this permission. This barrier is primarily applied to those types of elastomers commercially produced in Mexico.

There is also a problem in synthetic rubber trade between the United States and Mexico based on definitional differences as to what is synthetic rubber and what is a plastic material. There is little problem along this line with countries other than the United States since most other synthetic rubber producing countries use definitions based on the CCCN. This definitional difference pertains to material crosslinked with agents other than sulfur. Most countries other than the United States limit usage of the term "rubber" to materials crosslinked (vulcanized) with sulfur. Material vulcanized or crosslinked by other methods are usually classified as plastics outside of the United States, and generally have a higher rate of duty in most countries.

Structure of the Industry

There are currently three firms which produce synthetic elastomers in Mexico. Their combined capacity was estimated by the International Institute of Synthetic Rubber Producers to have been about 280 million pounds in 1980. Total 1980 production of all types of synthetic rubbers was estimated to have been about 209 million pounds.

Ownership

The largest synthetic rubber producer in Mexico accounts for about half of the Mexican synthetic rubber production capacity. Current synthetic rubber production capacities of this company include an estimated 154 million pounds of styrene-butadiene elastomers and an estimated 6.6 million pounds of nitrile rubbers annually. PEMEX owns 60 percent of this company and the largest Canadian producer of synthetic rubber owns the remaining 40 percent. A major United States petroleum company currently has a 39 percent interest in Mexico's second largest synthetic rubber company. Ownership of the remaining 61 percent is split among several Mexican interests. This company manufactures styrene-butadiene and polybutadiene type synthetic rubbers at its plant in Salamanca, Mexico. Total capacity of this plant is estimated to be about 99.2 million pounds, including about 39.7 million pounds of styrene-butadiene rubber and about 59.5 million pounds of polybutadiene rubber 1/. The third Mexican synthetic rubber producer is a major Mexican diversified chemical company. This firm produces styrene-butadiene and nitrile rubbers at a facility in Lerma, near Mexico City. Mexican interests control 100 percent of this company, although it has had technology and trade ties with several foreign concerns, primarily in the United States, and includes the former Mexican operations of a large U.S. chemical company. The total annual synthetic

1/ Mexican Rubber Industry Plan Big Growth, Chemical and Engineering News, Apr. 14, 1980, p. 13.

rubber production capacity of this plant is estimated to be about 20.3 million pounds, including about 18.7 million pounds of styrene-butadiene rubber and about 1.6 million pounds of nitrile rubbers.

Integration

All of the Mexican synthetic rubber producers are integrated both horizontally and vertically to some extent, primarily through their parent companies. Mexico's largest synthetic rubber producer is fully integrated, from primary feedstocks through finished rubber products (mostly automotive products) by virtue of it's attachments to PEMEX and the largest Canadian synthetic rubber producer. The second largest Mexican synthetic rubber producer also has links with parent companies which makes a complete line of products from primary feedstocks to a wide range of finished products. These parents include a large U.S. petroleum company, probably some attachment to PEMEX, and links with other Mexican manufacturers. The third, and smallest, Mexican synthetic rubber producer is a small part of a large diversified chemical company. This firm has no known direct links to either PEMEX or any other manufacturer of oil or primary petrochemical feed-stocks, although some attachment may exist. This firm is integrated horizontally, and forward from the secondary petrochemical level to finished products in several areas, of which synthetic rubber is one.

Foreign investment

American companies have a direct interest in one Mexican synthetic rubber manufacturer and technology agreements with least one of the other two. Canada is the only other foreign country with a comparable investment in the Mexican synthetic rubber industry. No other foreign countries have significant investments in any Mexican synthetic rubber manufacturer, although with the establishment and/or expansion of Japanese and European automobile assembly plants in Mexico, this situation may change.

Technology

All of the synthetic rubber plants currently in operation in Mexico began production during the period 1964-67, except one small facility, which has the capacity to make about 1.8 million pounds of styrene-butadiene latex per year and started production in 1978. As a result the Mexican synthetic rubber industry has younger, more modern plants than the U.S. industry, many of whose plants date prior to 1960, with some being constructed as far back as 1942. The basic technology in use in the Mexican Synthetic Rubber Production facilities is mostly American or Canadian. Canadian technology entered the Mexican synthetic rubber industry through the Canadian-Mexican joint venture which makes up Mexico's largest synthetic rubber manufacturer. The second largest Mexican synthetic rubber producer is partially owned by a major U.S. oil company and probably gets some technological assistance from this parent in both the production and processing of synthetic rubber. The third Mexican synthetic rubber producer, a diversified chemical company, has obtained technological assistance from several U.S. manufacturing firms in the past.

Additional technology was obtained in the absorption, previously mentioned, of the Mexican operations of a major U.S. chemical company. Thus, the level of technology in use at Mexican synthetic rubber plants is probably about the same as that in most U.S. or Canadian plants manufacturing the same products.

Government Policies and Involvement

The Mexican Government, through PEMEX, owns directly at least 25 percent, and possibly as much as 50 percent of the Mexican rubber industry, partly as a result of a 1962 law restricting foreign ownership in secondary petrochemical industries. Under this law foreign ownership in secondary petrochemical industries like the synthetic rubber industry, is restricted to a maximum of 40 percent. There are also regulations on the synthetic rubber industry (and other industries in Mexico) governing such things as the amount and payment of royalties, technical assistance fees, licensing agreements, patents for both products and processes, importation of spare parts, and employment of foreign personnal in both technical and managerial positions. The main thrust of these regulations is to maintain Mexican control of Mexican industries.

Environmental laws affecting the Mexican rubber industry are general laws primarily concerned with air and water discharges and also apply to industries other than synthetic rubber. How well these laws are enforced, and the impact of these laws on the synthetic rubber industry, is not known.

Production

Production of synthetic rubber in Mexico has more than doubled during the past decade, from 97 million pounds in 1970 to an estimated 209 million pounds in 1980. Mexico now accounts for about 1 percent of world production of synthetic elastomers and ranked 15th among the 29 producing countries in 1980. 1/ Current production data on the individual synthetic elastomers manufactured in Mexico, polybutadiene-styrene rubbers, polybutadiene rubber and polybutadiene-acrylonitrile rubbers, are not available. However, production capacities for each of these types of synthetic elastomers has increased over the period and it is reasonable to assume that production of these materials has also increased. Capacity utilization was estimated to be about 75 percent of nameplate capacity in 1980 compared to about 83 percent in the U.S., about 80 percent in Canada and about 82 percent worldwide. The level of Mexican synthetic rubber production has increased primarily as a result of developments in the transportation sector. Increasing consumption by Japanese and European automotive assembly operations, of tires and other automotive rubber parts, as well as an increasing demand for other fabricated rubber consumer goods, would seem to indicate continued growth for the Mexican synthetic rubber industry. Large capacity expansions currently underway should enable the Mexican synthetic rubber industry to meet most demands for those types of synthetic rubber produced domestically . However, a diversification of product types to include some synthetic rubbers not currently produced in Mexico will probably be necessary to reduce the level of imported material now being consumed.

1/ 1980 Rubber Industry Statistical Report, International Institute of Synthetic Rubber Producers, Inc., 1980, Table II.

Trade

Mexico is a net importer of synthetic elastomers. Many of these imports are types of synthetic rubber not manufactured in Mexico, such as neoprene, polyisoprene, ethylene-propylene, and butyl rubbers, among others. Overall, imports have been at least ten times as large as exports for several years.

Imports

The United States is the largest supplier of synthetic rubber to Mexico and in 1979 supplied more than 90 percent of the total. One reason is the proximity of U.S. synthetic elastomer manufacturers in Texas and Louisiana which reduces both shipping costs and lag time. About 30 percent of the estimated 42 million pounds of synthetic rubber imported into Mexico in 1980 consisted of styrene-butadiene rubbers, and about 12 percent were polybutadiene elastomers. Nearly all the rest, about 58 percent are types of synthetic rubber not currently manufactured in Mexico. Imports accounted for about 15 to 21 percent of consumption during the past five years, and ratios in this range are normal. 1/

Exports

Exports of synthetic rubber from Mexico are small, not exceeding 4 million pounds, or 3 percent of production, in any year since 1973. Nearly all Mexican synthetic rubber production is consumed domestically. Exports are probably mostly to the U.S. probably in the form of exchanges, or sales of convenience, and do not seem to represent a serious attempt to establish an international market position.

Consumption

As in most countries, the bulk of synthetic rubber consumed in Mexico goes into automotive applications. Consumption in both transportation and non-transportation sectors have been increasing steadily during the past decade, coinciding with the economic and industrial development of Mexico. Total rubber consumption in 1979 is estimated to have been about 229 million pounds, representing an increase of nearly 12 percent compared to the estimated 205 million pounds used in 1978. Imports are estimated to have accounted for about 16 percent of consumption in 1979. Current consumption figures for individual elastomers are not available, however, polybutadiene-styrene type rubbers probably account for the bulk of Mexican rubber consumption, since this product is the most versatile and widely used of the synthetics. Consumption statistics for individual elastomers for years prior to 1979 are also not available. Per capita consumption of all types of synthetic rubber in Mexico is estimated to be between 3 and 4 pounds. This is very low compared to rates of 20.4 pounds per capita in Canada and 23.4 pounds per capita in the United States. Per capita consumption of these materials should increase in the future, in line with Mexico's expanding industrial development.

1/ Mexican Rubber Industry Plans Big Growth, Chemical & Engineering News, Apr. 14, 1980, p. 13.

Future

Expansion Plans

Two of the three Mexican synthetic rubber producers have indicated expansion plans. Both manufacturers plan to increase capacity for styrene-butadiene rubber, and one firm also plans increased production of polybutadiene rubber. No new capacity construction to manufacture synthetic rubber types not now produced in Mexico has been announced.

Who, what, when, why, where

The largest Mexican synthetic rubber producer is increasing the capacity of the styrene-butadiene synthetic rubber facility at Tamaulipas from about 1.8 million pounds per year to about 6.6 million pounds per year. This new capacity is expected to be operational by 1982, and will increase this firm's total styrene-butadiene production capacity to about 158.7 million pounds per year. The second largest Mexican synthetic rubber producer is planning the largest overall increase of production capacity. Construction is currently underway at the facility located in Salamanca. This plant currently produces both polybutadiene and styrene-butadiene elastomers and expanded production of both products is expected. Total expansion of about 55 percent, from 92.6 to 143.3 million pounds per year is expected. Other expansions by this industry in the near future are probable in an effort to make Mexico more self-sufficient in these materials. A major trade association projects total synthetic rubber capacity expansions of about 21 percent by year-end 1983 compared with year-end 1980. These expansions are prompted by a burgeoning automobile industry and an expansion of the variety of fabricated rubber consumer goods. Synthetic rubber products are manufactured from feedstocks made from domestically produced petroleum and natural gas. The production and pricing of this oil and natural gas is controlled by the Mexican Government, a situation which could possibly result in a price advantage for Mexican synthetic rubber producers relative to producers in the rest of the world.

Impact on the industry

The planned expansions by the second largest Mexican synthetic rubber producer will make it nearly as large as the largest company and will create an industry consisting of two large companies and one small one. It is unlikely that the smaller company will withdraw from the market, however, since Mexico is, and will continue to be for some time, capable of consuming the entire domestic production of synthetic rubber.

Demand

Overall the demand for synthetic rubber in Mexico is increasing. This state of affairs should continue in line with Mexico's expanding industrial development. Several large capacity expansions are taking place to enable the Mexican synthetic rubber industry to meet the rising demand.

Forecast growth

One major publication 1/ has estimated that overall synthetic rubber growth will decline slightly, but will remain in the neighborhood of 11 percent per year throughout the 1980's. This is significantly above the 8 percent average annual growth rate projected for developing countries by several sources and well above the 4.5 percent per year rate of growth predicted for industrially developed countries like Canada and the United States. This growth rate would result in a doubling of Mexican consumption of synthetic rubber by 1987.

Reasons for growth

The principal reason for the continued rapid growth of demand for synthetic rubber in Mexico is that country's expanding industrial development. Continued industrial growth will require more and better forms of transportation. Several foreign automobile manufacturers have assembly plants in Mexico and these facilities will require increasing amounts of synthetic rubber in the forms of tires, hoses, belts, gaskets, and other parts.

An expanding economy based on industrial development should lead to increasing affluence in the general population. This new buying power should result in a rising demand for consumer goods including those made from, or containg parts composed of, synthetic rubber. This increase in demand for rubber consumer goods should be reinforced by a projected expansion of the Mexican population of nearly 30 percent, from about 70 million now, to more than 90 million by 1990 2/. This rise in population will not only require more consumer goods, but will also produce a need more and better public and private forms of transportation. Thus, demand for Mexican synthetic rubber will rise as the result of increasing requirements in both the transportation and non-transportation sectors spurred by increasing industrial development. The overall outlook for the Mexican synthetic rubber industry is made even better by Mexico's large proven oil and gas reserves and an expanding basic chemical industry which indicates that getting raw materials will probably not be a problem.

Relationship to Canada

The largest Canadian synthetic rubber producer owns 40 percent of the largest synthetic rubber company in Mexico. This currently gives the Canadian company ownership of more than 20 percent of all Mexican synthetic rubber production capacity. Mexico has high tariff rates and other strong barriers to trade particularly in those types of synthetic rubber produced domestically. Since the types of synthetic rubber produced in Canada are principally the same types most vigorously protected by Mexico, a reduction in tariff rates

1/ Mexican Rubber Industry Plans Big Growth, Chemical and Engineering News, Apr. 14, 1980, p. 14.

2/ Mr. Clayton F. Ruebensaal, "Global Review of Synthetic Rubbers," presented at the 21st Annual Meeting of the International Institute of Synthetic Rubber Producers, Apr. 1980, in Mexico City.

and relaxation of other trade barriers could open a significant new market to Canadian synthetic rubber producers. However, competition for this market, particularly from U.S. manufacturers, could be stiff.

Relationship to the United States

Mexico has a relatively small synthetic rubber industry compared with the United States, and produces only three types of synthetic elastomers. These items have high tariffs (40 to 60 percent ad valorem), strict import license controls, and other barriers which severely limit the ability of imported products to compete in the Mexican marketplace. On the rest of the array of elastomers, tariff rates are relatively low, although still higher than those of both the United States and Canada. Removal or lessening of restrictive trade barriers on those items produced in Mexico could lead to increased imports from the United States. Most of the Mexican imports of synthetic rubber now come from the United States. These imports consist, in large part, of types of synthetic rubber not now produced in Mexico. Thus, the United States will continue to be an important source of imported synthetic rubber for some time and will play a significant part in Mexico's industrialization.

Trade

Mexico is likely to continue to be a net importer of synthetic elastomers for at least several years. Mexican industry can now consume more than the total domestic production of those types of synthetic rubber produced in Mexico, and some imports of these types will probably continue, although the major plant expansions previously mentioned will probably reduce imports of the domestically produced types to low levels. However, the majority of the synthetic rubber Mexico now imports are types not produced domestically and there are no currently known plans to rectify this situation. Thus, imports, mostly from the United States, are likely to continue to supply 15 to 20 percent of Mexican synthetic rubber needs for some time.

Mexican exports of synthetic rubber are currently small and are likely to remain so. Nearly all domestic production is consumed domestically and with the expanding industrialization taking place this situation will probably continue. Profits in international trade are often eroded by such things as tariffs, high costs of international transportation, brokers fees, and the like. Thus, if a sale can be made domestically, it is usually easier and sometimes more profitable to sell in the home market.

MANMADE FIBERS FROM PETROCHEMICALS

Present Situation

Description and Uses

Mexico is the third largest producer of manmade fibers from petrochemicals in the Western Hemisphere, ranking far below the United States but producing only slightly less than Brazil. It manufactures virtually all the same fiber forms as the United States and by the same two major processes: single filaments or groups of continuous filaments (tow), or filaments cut into short lengths (staple). Six important types are produced: polyester, nylon (polyamide), acrylic, olefin (polypropylene and polyethylene), cellulosic (rayon and acetate), and glass. The discussion here will be concerned primarily with those fibers whose major ingredients are petrochemicals (polyester, nylon, acrylic, and olefin). A briefer discussion of cellulosic fibers will be found on page B-89.

Polyester fibers accounted for almost half, or 243 million pounds, of the 1979 Mexican output of manmade fibers from petrochemicals. Polyester yarn output is about three times that of polyester staple; both types are used predominantly in apparel (tables B-21 and B-22).

Acrylic fibers and yarns rank second in Mexican production of manmade fibers from petrochemicals (103 million pounds in 1979); they are used mostly in apparel and home furnishings (table B-23). Production of nylon fibers and yarns ranked third in 1979 and totalled about 93 million pounds (tables B-24, B-25, and B-26); nylon is used predominantly in filament form for tire cord and some apparel uses. Olefins, particularly polypropylene, accounted for most of remainder of the production; these fibers are used mainly in yarn form for carpet facing and backing (table B-27).

Customs Treatment

Tariff

Manmade fibers and yarns are dutiable under the Mexican Customs Tariff depending on whether they are of continuous or discontinuous fibers. The continuous fibers are also subdivided by fiber type (such as nylon, polyester, and so forth). The range of rates of duty on these products is shown in the tabulation below:

Description	Present rates of duty
Yarn of continuous polyamide and polyester filament fibers	0.50 or 2.00 Mex$ + 25 or 50% ad val.; free or 15% ad val.
Yarn of continuous polyurethane or vinyl-derivative filament fibers	4.00 or 8.00 Mex$ + 10 or 15% ad val.; free or 15 or 25% ad val.
Monofilaments, strip, and so forth	0.20 or 4.00 Mex$ + 3 or 8% ad val.
Discontinuous or tow of manmade fibers	0.20 or 1.00 Mex$ + 3 - 25% ad val.; free - 25% ad val.
Yarn of discontinuous manmade fibers	2.00 - 8.00 Mex$ + 7 - 50% ad val.

Note.--The symbol Mex$ refers to the peso, the Mexican standard of currency. 1 peso = U.S. $.0435.

Polyester and nylon yarns are generally dutiable at 0.50 Mexican pesos per kilogram plus 25 percent ad valorem; acrylic staple at 1.00 Mexican pesos per kilogram plus 25 percent ad valorem; and polyester staple at 0.50 Mexican pesos per kilogram plus 25 percent ad valorem. The yarn rates are 25 percent more than similar U.S. products; but the rates for staple fiber are six times that of the U.S. These four important types account for most of the Mexican production and foreign trade in manmade fibers and yarns from petrochemicals.

Non-tariff barrier

A specific import license is required in Mexico for manmade fibers and yarns from petrochemicals. At the writing of this section, no information was available on, particulars of this import license.

Structure of the Industry

Ownership

The Mexican Government restricts foreign ownership in some industries, including manmade fibers and yarns, to 49 percent. Foreign firms that have important interests in manmade fibers industries include several American companies and a Dutch firm. In total, those Mexican firms with foreign interests account for a substantial part of the domestic output of these products. Less than 20 firms manufacture raw fibers in Mexico, but over 50 manufacture yarns identified in Mexico made of "chemical fibers".

The leading firm producing manmade fibers and yarns is estimated to account for over one-fourth of the Mexican production capacity; the top four supply over one-half of the raw manmade fiber capacity; and the eight largest furnish most of the capacity for producing extruded fibers and about a fourth of the yarn capacity. The percentage of capacity accounted for by dominant

firms in the five principal types of manmade fibers and yarns is shown in the following tabulation:

Type of manmade fiber	Percentage of capacity accounted for by the leading--		
	1 firm	4 firms	8 firms
Polyester yarn	30	50	70
Acrylic staple	40	100	-
Nylon yarn	30	45	60
Polyester staple	40	100	-
Olefin fibers	20	40	50

Source: Estimated by U.S. International Trade Commission staff.

Integration

At least two of the leading firms producing manmade fibers in Mexico are integrated forward to making fabrics and carpets; however, many of the firms producing raw manmade fibers are integrated backward to making some of the intermediates not reserved for PEMEX. 1/ Many of the yarn firms are integrated forward to making fabrics, but one of the largest Mexican yarn firms also manufactures men's clothing. Few of the yarn firms, however, extrude fibers. Horizontal integration is negligible in Mexico as few manmade fiber companies seek to acquire firms making natural fibers.

Foreign investment

U.S. firms have a 40 percent or less interest in at least three Mexican companies making fibers while at least two U.S. firms have invested in the operation of Mexican yarn firms. Production facilities in foreign manmade fiber and yarn plants in Mexico are rarely used to make products for export to the nations where the parent company is headquartered or to countries where other company-owned plants are located.

Technology

Virtually all technology in manmade fiber production in Mexico has been purchased from consulting firms specializing in these processes or provided by the non-Mexican multinational firms which have interests in Mexican manmade fiber production.

1/ Government-controlled oil company.

Government Policies and Involvement

Production facilities

The Department of National Resources and Industrial Development of the Mexican government is involved in the manmade fibers and yarn industry by virtue of the following: (1) it regulates foreign investment; (2) it approves royalties, technical assistance, and management services for these and other products; and (3) it controls patents and trademarks authorized for use in the marketing of manmade fibers and yarns from petrochemicals.

Government-industry relationship

The Department of Commerce controls prices for essential commodities marketed in Mexico; some of the manmade fibers and yarns made from petrochemicals are subject to this price control legislation. Export promotion in Mexico is primarily handled by Government-owned banks which are encouraged to stimulate new industry. These banks also provide financing for Mexican exports, including manmade fibers and yarns from petrochemicals; they also guarantee Mexican export sales.

Production

From 1975 to 1979, Mexican polyester fiber production expanded about 25 percent (tables B-21 and B-22); acrylic staple fiber expanded 60 percent (table B-23); nylon fibers expanded over 40 percent (tables B-24, B-25, and B-26); and polypropylene (olefin) filament expanded over 300 percent (table B-27). Total Mexican production of manmade fibers increased annually from 353 million pounds in 1975 to 549 million pounds in 1979 (table B-28). The nylon and polypropylene increases are attributed principally to the increasing demand for carpets and rugs in Mexico; nylon is used basically as facing yarns in carpeting, while polypropylene is used mainly in carpet backing.

Capacity for producing manmade fibers in Mexico was estimated to have been almost 700 million pounds in 1979. In 1978, the latest year for which data are available, production as a percentage of capacity for the more important manmade fibers is shown below:

Type of fiber	Production as a percentage of capacity
Nylon textile filament	88
Nylon staple fiber	59
Nylon industrial filament	92
Polyester textile filament	82
Polyester staple fiber	63
Polypropylene (olefin) filament	91
Acrylic staple fiber	68

Source: Annuario de la Industria Quimica Mexicana.

Trade

Imports of manmade fibers furnished less than 5 percent of the consumption in every year of the 1975-79 period while exports averaged less than 5 percent of the Mexican production of manmade fibers. However, during the period, imports tripled from 8.3 million pounds in 1975 to 25.8 million pounds in 1979 while exports expanded fivefold from 2.2 million pounds in 1975 to an estimated 11.5 million pounds in 1979 (table B-28).

Imports

The leading imports during the 1975 to 1979 period were acrylic staple fiber imports which annually averaged about 1.8 million pounds (table B-23) followed by polyester textile filament imports which annually averaged about 1.6 million pounds (table B-21), and polyester staple fiber which annually averaged around 1.1 million pounds (table B-22). The imports were chiefly from the United States; other important sources included West Germany and Italy. Imports are not subject to quotas; however, all textiles require prior import licensing.

Exports

The leading exports during the 1975 to 1979 period were acrylic staple fiber which annually averaged approximately 3.1 million pounds (table B-23) followed by polypropylene (olefin) filament which annually averaged about 3.0 million pounds (table B-27), and nylon industrial filament which annually averaged around 2.0 million pounds (table B-25). The principal markets were the United States and Guatemala, Spain, and Italy.

Consumption

Apparent Mexican consumption of manmade fibers increased steadily from 359 million pounds in 1975 to 563 million pounds in 1979 (table B-28). The consumption of virtually all types of manmade fibers expanded in the 1975-79 period. Greatest consumption increases were recorded by polypropylene (olefin) filament which expanded about 200 percent (table B-27); polyester and nylon staple fibers, each of which increased over 60 percent (tables B-22 and B-26); and acrylic staple fiber which grew over 50 percent (table B-23).

Future

Expansion Plans

Who, what, when, why, where

There have been no official announcements of expansion plans for Mexican production capacity of manmade fibers. Unofficial sources have indicated that capacity for these fibers will increase modestly from 1980 to 1985. These sources place the capacity for the three major fibers for 1980 and 1985 as follows (estimates in millions of pounds):

Type	1980	1985
Nylon fibers	150	150
Polyester fibers	375	425
Acrylic fibers	175	200

Impact on industry

The expansion will be facilitated by the availability of supplies of oil and petrochemicals, an abundance of labor, and vigorous Government promotion.

Demand

Forecast growth

From 1980 to 1985, production of manmade fibers from petrochemicals in Mexico could grow at an annual rate of 12 percent; from 1985 to 1990, production is expected to grow at a yearly rate of 10 percent.

Reasons for growth

The increased production will be based primarily on continued displacement of all cotton fabrics with blends of polyester and cotton. Other factors which are expected to stimulate increased production are increased use of manmade fibers in automobile tires, population increase, some increase in per capita consumption of fiber, and possible increased exports.

Nylon fibers are expected to achieve an overall growth of 8 to 9 percent annually through 1985 and 8 percent yearly from 1986 through 1990; consumption could reach 175 million pounds in 1985 and 250 million pounds in 1990. The greatest growth areas for nylon fibers should be in industrial monofilaments at about 8 percent annually, in nylon staple at around 5 percent yearly, and in textile monofilaments at about 3 percent annually.

Polyester fiber consumption is projected to annually increase 15 percent from 1980 to 1985 and 13 percent from 1986 to 1990; consumption could be 600 million pounds in 1985 rising to 1.1 billion pounds in 1990. The growth is to be sustained principally by an increasing use of polyester staple in blends with cotton. It should also be supported by a larger consumption of industrial yarn in the automotive industry.

A continued high growth rate is anticipated in the demand for acrylic fibers; it is forecast at about 1.1 percent annually from 1980 to 1985 and 9 percent yearly from 1986 to 1990. Consumption of acrylic fibers is expected to attain 190 million pounds in 1985 and increase to almost 300 million pounds in 1990. The high growth rate is predicated on the continued substitution of acrylic fibers for wool in Mexican apparel, home furnishings, and other applications.

Relationship to the United States and Canada

The overall growth rate from 1980 to 1990 for Mexican consumption of manmade fibers could be about 10 percent yearly compared to 2 percent yearly for the United States, 3 percent yearly for the other countries in the northern portion of the Western Hemisphere, and 3 percent yearly for Canada. Per capita consumption is expected to rise to 18.5 pounds in 1990 for Mexico, 42.5 pounds for the United States, 3.6 pounds for other countries in North America, and 31.9 pounds for Canada. Mexico's per capita consumption is lower than that of the United States and Canada because of its overall lower standard of living and its current heavy reliance on domestically produced cotton.

Trade

Changes in imports and exports

Future expansion of producing capacity for manmade fibers is expected to annually increase at least 10 percent in Mexico in the next decade, while consumption of these products could grow between 10 and 12 percent annually in the same period. Most of the consumption increase will come from current unused production capacity and by an expansion in capacity. Little significant growth in imports is expected. Mexican producers will endeavor to increase exports to expand their individual businesses and also to meet Government objectives of improving the Mexican balance of trade.

Mexico is currently nearly self-sufficient in manmade fibers and it is anticipated that production increases will keep pace with increased consumption during the 1980's. Hence it is unlikely that the traditional low levels of imports, which are less than 5 percent of consumption, will change appreciably over the next 5 to 10 years.

Likely new trading partners

The Mexican Government is actively seeking new markets for its petrochemical fibers to achieve a better balance of payments and obtain much needed foreign currency to broaden its economic base. The Government's efforts may result in new export markets where Mexican fibers can compete and may include many of the South American countries and some Asian countries where the consumption of such fibers is increasing.

Impacts on producers, consumers, and new uses

Increased oil prices have raised the cost for petrochemicals used in producing manmade fibers. Further feedstock price increases are not expected over the next decade to unduly hamper Mexico's increasing manmade fiber production or consumption. Fiber costs remain a very small part of the total cost of the end-product. Other factors such as population growth, greater applications of manmade fibers both in industry and apparel, and the Government's desire for a larger industrial base, will result in increasing manmade fiber use in spite of higher prices.

OTHER NORTH AMERICA

Manmade Fibers from Petrochemicals

Introduction

The countries covered by this section can be divided into five major areas as shown in the following tabulation:

1. Central America
   - Belize
   - Costa Rica
   - El Salvador
   - Guatemala
   - Honduras
   - Nicaragua
   - Panama

2. Independent Island Nations
   - Bahamas
   - Barbados
   - Dominican Republic
   - Grenada
   - Haiti
   - Jamaica
   - Trinidad and Tobago

3. British Affiliates
   - Antigua
   - British Virgin Islands
   - Cayman Islands
   - Dominica
   - Montserrat
   - Saint Christopher-Nevis-Anguilla
   - Saint Lucia
   - Saint Vincent

4. French West Indies
   - Guadeloupe
   - Marie-Galante
   - Martinique
   - Saint Martin (pt)

5. Netherlands Antilles
   - Aruba
   - Bonaire
   - Curacao
   - Saba
   - Saint Martin (pt)

Excluded from this study are Bermuda, Cuba, and Greenland. Of all political divisions listed above only Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua, all in Central America, produce manmade fibers. However, many of the other countries listed above manufacture yarns from petrochemical manmade fibers; but the production of these yarns is insignificant compared to the United States, Mexico, and Canada. Cellulosic fibers are not produced in these countries so they are not dealt with in this study for this area.

Present Situation

Description and Uses

The Central American and Caribbean countries are minor producers of manmade fibers and yarn. Only three types of raw manmade fibers are produced presently in these nations, and all in Central America: polyester yarn, olefin monofilaments, and olefin film (strips). A nylon producing facility exists in Guatemala but it is now (1980) idle. The polyester yarn is used mainly in tire cord and textile products while the olefins are utilized in cordage and carpeting. Other types of manmade fibers from petrochemicals are imported, principally from the United States. Yarns are believed manufactured in most of these countries and used in many textile and apparel applications.

Customs Treatment

Tariff

Over 30 political divisions are represented here and each generally has its own tariff structure. Two customs unions exist--the Caribbean Common Market 1/ and the Central American Common Market. 2/ Only the former has been placed partially in effect with respect to imports.

In Central America, rates of duty for manmade fibers and yarns from petrochemicals range from 6 to 65 percent ad valorem (specific rates have been estimated as ad valorem equivalents). In the independent island nations they range from a low of 10 percent ad valorem to a high of 55 percent ad valorem. The rates of duty on such products for Caribbean Common Market nations, which include all the British Affiliates, range from 5 to 10 percent; however, these rates are not universally used by the members.

Non-tariff barrier

Generally throughout this area, imports of manmade fibers and yarns are subject to varying degrees of restriction. In the Central American nations, imports are restricted only if they affect national security and the safety and health of the people; but some imports are subject to a surcharge or tax. Among the independent island nations, import licenses are required and in effect can stop imports if they compete with domestic products. Other import controls in these island nations include emergency taxes (Bahamas), customs surtaxes (Barbados) and tonnage taxes (Jamaica). Because of their small size and lack of market, the British affiliated nations have no significant restrictions on imports of these products. And in the Netherlands Antilles, import competition is usually eliminated by imposing additional rates of duty on imports.

1/ Belize, Jamaica, St. Christopher-Nevis-Anguilla, Antigua, Montserrat, Dominica, Saint Lucia, Saint Vincent, Grenada, Barbados, Trinidad and Tobago, and Guyana. Only the last listed one is not included in this study.

2/ Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica.

Structure of the Industry

Ownership

There are seven firms producing raw manmade fibers in the nations covered here. Only one of them is known to be owned by a multinational firm. 1/

Integration

In many of the nations a firm producing manmade fibers and yarns from petrochemicals has a monopoly and only in El Salvador is there more than one firm producing the same raw manmade fiber (polypropylene monofilaments). 2/ The raw fiber firms are not generally integrated backwards to making petrochemicals, but the yarn firms are normally integrated forward to making fabric.

Technology

Manmade fiber technology is almost entirely provided by U.S., British, and Japanese firms. These firms are either consultants or multinational fiber producers.

Government Policies and Involvement

Production facilities

In Central America production is generally guided by commercial codes which govern establishment, operation, and discontinuation of firms and which limit or encourage foreign investment. In some independent island nations production firms are carefully watched (i.e., the Dominican Republic and Trinidad and Tobago) while in others such firms operate freely (i.e., the Bahamas and Jamaica); however, certain island nations like Trinidad require majority ownership or control by citizen residents.

Government-industry relationship

In all the countries, firms have to be licensed to manufacture the products covered here and all countries have industrial incentive laws to establish viable manufacturing facilities. In general all countries also offer tax holidays up to 10 years for new businesses.

Exports of manmade fibers and yarns in these countries are limited because of generally small-scale operations. The nations of Central America do place restrictions on exports that are controlled through various regional or international quota systems. Some nations listed here, such as Trinidad and Tobago, have export taxes which are reduced as exports expand.

Imports in these countries are generally controlled by nontariff barriers.

1/ Polymer, in Honduras, by United Brands from the United States.

2/ Filamentos y Perfiles, S.A. (Filpersa), and Salvaplastic, S.A.

Production

Production by type of manmade fiber and country is shown in the following table (in millions of pounds):

Type and country	1975	1976	1977	1978	1979
Polyester yarn:					
Costa Rica	0	1/	1/	4.4	4.4
Olefin fibers:					
El Salvador, Guatemala, Honduras	2.0	2.0	4.0	4.0	4.0
Nicaragua	1/	2.0	2.0	2.0	2.0
Total	2.0	4.0	6.0	10.4	10.4

1/ Less than 500,000 pounds.

Source: Textile Organon, a publication of the Textile Economics Bureau, Inc.

Production is extremely small compared to the United States, Mexico, and Canada but has been increasing since 1974.

The polyester yarn plant in Costa Rica operated at about 25 percent of capacity in 1979; the idle nylon yarn plant in Guatemala had a capacity of 2 million pounds in the same year.

Trade

Imports

In general imports of manmade fibers in Central America are from the United States; imports in the independent island nations, from the United States and the United Kingdom; imports in the British Affilates, from the United Kingdom; and imports in the French West Indies and the Netherlands Antilles, from France and the Netherlands, respectively. Imports of manmade fibers are believed substantial in all the Central American countries, the Dominican Republic, Haiti, Jamaica, and Trinidad and Tobago.

Exports

Few countries export manmade fibers (generally reexports) and yarns. 1/

1/ In recent years, exports of manmade fiber yarn from petrochemicals have been recorded by Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Dominican Republic, Jamaica, Trinidad and Tobago, and Haiti. Only the last two listed countries are believed to have exported large amounts of these yarns.

Structure of the Industry

Ownership

There are seven firms producing raw manmade fibers in the nations covered here. Only one of them is known to be owned by a multinational firm. 1/

Integration

In many of the nations a firm producing manmade fibers and yarns from petrochemicals has a monopoly and only in El Salvador is there more than one firm producing the same raw manmade fiber (polypropylene monofilaments). 2/ The raw fiber firms are not generally integrated backwards to making petrochemicals, but the yarn firms are normally integrated forward to making fabric.

Technology

Manmade fiber technology is almost entirely provided by U.S., British, and Japanese firms. These firms are either consultants or multinational fiber producers.

Government Policies and Involvement

Production facilities

In Central America production is generally guided by commercial codes which govern establishment, operation, and discontinuation of firms and which limit or encourage foreign investment. In some independent island nations production firms are carefully watched (i.e., the Dominican Republic and Trinidad and Tobago) while in others such firms operate freely (i.e., the Bahamas and Jamaica); however, certain island nations like Trinidad require majority ownership or control by citizen residents.

Government-industry relationship

In all the countries, firms have to be licensed to manufacture the products covered here and all countries have industrial incentive laws to establish viable manufacturing facilities. In general all countries also offer tax holidays up to 10 years for new businesses.

Exports of manmade fibers and yarns in these countries are limited because of generally small-scale operations. The nations of Central America do place restrictions on exports that are controlled through various regional or international quota systems. Some nations listed here, such as Trinidad and Tobago, have export taxes which are reduced as exports expand.

Imports in these countries are generally controlled by nontariff barriers.

1/ Polymer, in Honduras, by United Brands from the United States. B-87

2/ Filamentos y Perfiles, S.A. (Filpersa), and Salvaplastic, S.A.

of living, lack of manmade fiber production facilities, and the preference for cotton, a fiber grown commonly in many of these countries. Government controls are also an important factor; in a number of the nations covered here, imports of products manufactured from manmade fibers are severely restricted.

Trade

Changes in imports and exports

In the next ten years, future expansion for the production of manmade fibers from petrochemicals appears to be negligible among these nations. Consumption increases are predicated upon increasing imports when these nations permit them. Exports are unimportant since few countries produce manmade fibers in substantial quantities.

Likely new trading partners

The present countries supplying manmade fibers from petrochemicals will probably continue in the same patterns for the next ten years as in the past: that is, the United States, the United Kingdom, France, and the Netherlands. No new trading partners are anticipated currently since each market is small and operates independently. There is a possibility, however, that Mexico may make an effort to penetrate these markets in keeping with their overall plan for increased production and export.

Impacts on producers, consumers, and new uses

Feedstock price increases on petrochemical fibers will have little or no effect on their consumption in these countries. Manmade fibers are consumed in very small quantities in these nations; they are secondary to cotton which dominates textile fiber consumption in almost all the countries covered here. A lower feedstock price for manmade fibers would have little impact among them since most are economically poor and lack the resources to purchase manmade fibers elsewhere regardless of price.

CELLULOSIC FIBERS

Present Situation

Description and Uses

Cellulosic fiber production in Mexico ranks above acrylic and olefin fiber production but below polyester and nylon fibers production. The cellulosics are made in all the major fiber forms but are most popular as filament yarns which account for almost two-thirds of the cellulosic output. The cellulosic fibers are used primarily for apparel and home furnishings although substantial amounts are still used in Mexican tire production.

Customs Treatment

Cellulosic fibers and yarns are dutiable under the Mexican Customs Tariff depending on whether they are of continuous or discontinuous fibers. The range of rates of duty on these products is shown in the following tabulation:

Description	Present rates of duty
Yarn of continuous regenerated fibers	2.00 or 2.50 Mex $ + 45-70% ad val.
Monofilaments, strips, and so forth	0.20 Mex $ + 3% ad val.
Discontinuous or tow of regenerated fibers	0.15 or 0.50 Mex $ + 40 or 50% ad val; free or 25% ad val.
Yarn of cellulosic regenerated textile fibers	2.00 or 2.50 Mex $ + 45-55% ad val.

Note.--The symbol Mex $ refers to the peso, the Mexican standard of currency. 1 peso = U.S. $.0435

The yarn rates are 25 percent more than those of similar U.S. products; but the rates for staple fiber are six times that of the United States.

Structure of the Industry

Mexico has only two producers of cellulosic manmade fibers. One firm is 40-percent controlled by a U.S. firm while the other is wholly owned by Mexican interests. Both firms also manufacture chemicals.

Cellulosic yarn is produced by less than 25 firms in Mexico. Two of the yarn firms are known to be partly owned by U.S. firms.

The two fiber firms operated at about 80 percent of their cellulosic capacity in 1979. Capacity for the cellulosic yarn mills is unavailable; however, the spindles used in making "chemical fiber" yarns, which would

include the cellulosic yarns, increased from 346,000 in 1970 to 556,900 in 1978.

Technology

The largest cellulosic fiber firm in Mexico is partly owned by a U.S. firm which makes its technological development and discoveries available to its Mexican counterpart. This firm would therefore put aside very little of its funds for Mexican research and development. The other firm has limited capital resources and probably purchases most of the technological improvements used in making its cellulosic fibers. In general, the cellulosic yarn firms also purchase converting and spinning technology from foreign firms, especially from those located in the United States.

Government Policies and Involvement

In production, export promotion, and import control of cellulosic fibers and yarns, Government policies and involvement are the same as for the petrochemical fibers. 1/ As with the petrochemical fibers, Mexico requires permits for cellulosic fiber and yarn imports. The permits are issued or not issued depending on product demand and market sensitivity to Mexican-made products.

Production

Mexican production of cellulosic extruded yarn and monofilaments, and staple and tow, since 1974 is shown in the following table (in millions of pounds):

Cellulosic type	1975	1976	1977	1978	1979
Yarn and monofilaments	40.6	43.0	41.2	37.9	37.7
Staple and tow	26.0	25.1	19.4	23.1	22.7
Total	66.6	68.1	60.6	61.0	60.4

Source: Textile Organon.

The yarn and monofilament production is almost split evenly between acetate and rayon; however, Mexican production of acetate staple fiber is believed to exceed that of rayon staple.

Production of cellulosic fibers ranged between 60 and 70 million pounds annually during the 1975-79 period. Production of cellulosic extruded yarn dominates but it showed a decrease from 41 million pounds in 1975 to 38

1/ See the petrochemical fiber section of this report for a detailed discussion of Mexican government policies and involvement in manmade fibers.

million pounds in 1979. The decline in the use of these fibers is attributed principally to the substitution of the petrochemical fibers such as nylon and polyester in areas such as apparel, tire cord, and carpets, which formerly used the cellulosic fibers (table B-29).

Trade

Imports

Mexican imports of cellulosic fibers increased from 0.9 million pounds in 1975 to 8.0 million pounds in 1979 (table B-29). Imports were predominately cellulosic staple fiber, especially rayon, obtained mainly from the United States (table B-30).

Exports

Exports of cellulosic fibers remained between 7 and 9 million pounds during the 1975-79 period (table B-29). Exports of cellulosic yarn and staple were about the same in 1975 and 1976, but, beginning in 1977, cellulosic staple dominated the exports. The Mexican exports went mainly to Central America (table B-30).

Consumption

Apparent consumption of cellulosic fibers in Mexico remained between 55 and 65 million pounds annually during the 1975-79 period (table B-29). In recent years Mexican firms have investigated several new uses for cellulosic fibers in apparel and home furnishings. However, only the petrochemical fibers have made any significant inroads in the consumption of textile fibers in Mexico, while the cellulosic fibers have had difficulty ousting cotton when both can be used for the same purpose.

Future

Expansion Plans

There is no information on whether the two cellulosic fiber producers in Mexico will expand their producing capacity within the next few years. Textile Organon has estimated present capacity for some types of cellulosic fibers as follows (in million of pounds):

Cellulosic type	Capacity
High tenacity viscose rayon yarn	11
Regular plus intermediate tenacity viscose rayon yarn	15
Acetate plus triacetate yarn	22
Cellulosic (rayon and acetate) staple plus tow	26

Demand

Forecast growth and reasons

In spite of stymied cellulosic fiber production from 1975 to 1979, trade sources predict that demand for cellulosic fibers will pick up in Mexico in the next decade. They indicate that cellulosic fiber consumption may reach at least 70 million pounds by 1990. Part of this consumption is expected to be furnished by imports but most should be supplied by an increase in domestic production.

Relationship to the United States and Canada

Per capita consumption of cellulosic fibers in Mexico is presently relatively small at about 2.1 pounds. This is much lower than in the United States and Canada. Per capita consumption in Mexico is expected to rise at a faster rate than in the United States and Canada, reaching 3.5 pounds in 1990, but per capita consumption will still be lower than the 6.8 pounds expected in the United States by 1990, and the 9.9 pounds expected in Canada in 1990. Mexico's per capita increase is highly dependent on the Mexican consumer who generally continues to use large amounts of cotton, but an increasing population and a more knowledgeable consumer is expected to push up the use of cellulosic fibers in the next decade.

Trade

Unless the present Mexican producers expand their capacity for cellulosic fibers, the increase in consumption will necessarily have to be supplied by imports, probably from the United States. Similarly, the present large exports of these products, almost 15 percent of domestic production in 1979, would have to be reduced to supply the expanding consumption in Mexico. Present trade sources indicate that the future supplying countries will probably remain the same, with the United States still the largest exporter of cellulosic fibers to Mexico.

PLASTICS

Present Situation

Description and Uses

Of the leading commodity resins, Mexico has produced low density polyethylene (LDPE), polystyrene and polyvinyl chloride (PVC) in commercial quantities for a number of years. High density polyethylene (HDPE) facilities came on stream in 1978, 1/ Plants producing polypropylene are scheduled to come on stream in 1983. 2/ In 1978, polyethylene, polystyrene and PVC accounted for over three fifths of Mexico's total resin output. Polyethylene alone accounted for about 25 percent of the total domestic resin output in 1978 and 39 percent of consumption. The difference between domestic production and consumption was made up of nearly equal imports of HDPE and LDPE.

Mexico also produces about 15 other resins, including, melamine resins, acrylic (polymethyl methacrylate) resins, epoxy resins, urea resins, and unsaturated polyester resins. Mexico does not produce certain sophisticated, high performance resins such as polyacetal resins, polycarbonate resins, polyphenylene oxide resins and polysulfone resins, as its markets for these materials are limited. Also technology for these resins is not now available and would have to be licensed from the major producers in developed countries.

Packaging is the leading use for plastics in Mexico, as it is virtually worldwide, with 37 percent of production used in packaging 3/ versus over one-fourth in the United States in 1976. In some aspects, plastics in packaging are more advanced in Mexico than in the United States. For example, cereals are packaged in polyethylene film without the familiar cardboard box, as are all detergents to lower the cost. (The cardboard box often costs more than detergent). Because of shelf space requirements, this type of packaging is not used in the U.S. The second most important plastics market in Mexico in 1976 was the sports and toys sector with 17 percent of the total consumption, followed by building and construction with 13 percent and household goods with 12 percent. The sports and toys share is unusually high. In the United States these goods represent less than 2 percent of plastics consumption. There are two possible explanations. One reason is that the plastics industry is much less mature in Mexico than in the United States and plastics have not penetrated some markets as fully. A second factor is the disproportionately large number of toy consuming children in Mexico as roughly one-half the population is under 15 years of age. 4/

1/ Asociacion Nacional de la Industria Quimica, Anuario de la Industria Quimica Mexicana en 1978, Mexico, 1979, p. 199.

2/ Speech by Jose Luis Garcia-Luna H., Manager of Petrochemical Development, Petroleos Mexicanos, "Present and Future of the Mexican Petrochemical Industry," at the National Petroleum Refiners Association Meeting, San Antonio, Texas, March-April, 1980.

3/ The most recent year end-use analysis data available are supplied by Asociacion Nacional de Industrias del Plastics, A.C. (ANIPAC) to the Plastics Associations Directors in a study, Status Report 1976 Mexico, p. 5.

4/ Richard B. Mancke, Mexican Oil and Natural Gas Political, Strategic, and Economic Implications, New York, 1979, p. 107.

Customs Treatment

Mexico has reasonable rates of duty on plastics entering its borders which are in line with other nations' duties. However, non-tariff barriers are a part of Mexico's strategy to limit imports to help industrial development. Therefore duties have had little bearing on the volume of plastics imports. This method of limiting imports via import licensing has been a third-world favorite and often is used by developing countries to protect important domestic industries against imports.

Tariff

The rates of duty on plastics are usually compound (e.g., pesos per kilogram plus an ad valorem percentage). Mexico's rates on plastics, like those of many countries, vary for the same plastics on the basis of its physical state and form (i.e., liquids or pastes versus blocks, lumps and similar bulk forms). Mexico shows only one rate column and has no most favored nation rate of duty (see table B-31 for rates of duty on specified plastics.) The tariffs contain quotas which control the absolute quantity of a good that will be allowed into the country. A license is required in order to import a good. 1/

Non-tariff barriers

Import licensing has been used effectively by Mexico to control imports. This system allows the Government to prohibit the importation of any material that is produced in Mexico simply by refusing the prior license. Industry sources believe there is every likelihood that in time Mexico will completely remove plastics from the prior licensing requirements as it becomes a key factor in the world plastics market with competitive world class plastics facilities. 2/

Structure of the Industry

Among Canada, Mexico, and the United States, the structure of the plastics industry in Mexico is unique. The Mexican Government through PEMEX, hereinafter referred to as the national oil company, is the sole producer of certain leading plastics such as polyethylene and polypropylene. Private industry produces the other plastics including the other leading commodity resins such as polysytrene and PVC. In order to operate in the secondary petrochemical industry in Mexico it is necessary to obtain a government grant. 3/

1/ John H. Rooney, Jr., the United States-Mexico Trade Agreement of 1977, Texas International Law Journal, Vol. 13, 435, 1978, p. 453.

2/ ANALISIS, . . . Op. Cit. pp. 87, 97, 99, 101. This observation also was made by industry sources during field work.

3/ A speech by Fernado Gutierrez Saldivar, the Sociedad Quimica de Mexico, "Competitiveness of the Mexican Chemical and Petrochemical Industry," at the second Chemical Congress of the North American Continent, Las Vegas, Nevada, Aug. 24-29, 1980.

In 1978, there were 11 producers of polystyrene resins and 5 producers of PVC resins. 1/ Industry sources report that the two leading polystyrene producers represented about three-fifths of the total industry capacity with about one-third of the capacity controlled by the leading firm. The leading PVC producer accounted for about 30 percent of the capacity. The top two PVC producers held over one-half the PVC capacity in 1978.

In 1977 there were 50 producers of plastics in Mexico 2/ operating in over 56 plants (1976) 3/ with 29,200 employees (1976). 4/ The plastics industry represented 9 percent of the value of production and 10 percent of the total employment of the chemical industry in 1977. It is reported that in 1979-80 plastics represented 13 percent of the secondary petrochemical industry. 5/

Ownership

The "Law to Promote Mexican Investment and to Regulate Foreign Investment" 6/ reserves certain activities to the state (article 4). Basic petrochemicals are one such activity, and the Government's national oil company decides what constitutes a basic petrochemical. HDPE, LDPE, and polypropylene are included in the national oil company's definition of basic petrochemicals. The law allows foreign investment in secondary petrochemicals up to 40 percent and up to 49 percent ownership is permitted in other chemicals (e.g., sodium carbonate, hydrochloric acid). Polystyrene resins and PVC resins are among the items classified as secondary petrochemicals.

Integration

The national oil company is not only the one source of oil and natural gas in Mexico, but is also the only producer of benzene, ethylene, propylene, ethylbenzene, ethylene dichloride, styrene, and vinyl chloride, the petroleum-derived starting materials for the major commodity resins. Therefore, backward integration is not possible for the private producers of plastics. The sequence from source through intermediates to the plastics is as follows:

1/ Associacion Nacional de la Industria Quimica, Anuario . . . op. cit., pp. 191 and 195. Twelve firms have petrochemical permits for polystyrene in Mexico; 6 firms have such permits for PVC.

2/ Anuario . . ., op. cit., p. 185.

3/ Status Report 1976 Mexico . . . op. cit., p. 2.

4/ Ibid., p. 2.

5/ A speech by Fernando Gutierrez Saldivar, op. cit.

6/ Published in the Diario Oficial on March 9, 1973, the law became effective 60 days later.

Source	Starting material	Intermediate (if any)	Product
Oil and natural gas	Ethylene	----------	HDPE, LDPE
	Propylene	----------	Polypropylene
	Ethylene and benzene	Ethylbenzene, styrene	Polystyrene
Salt (sodium chloride)	Ethylene and Chlorine	Ethylene dichloride, vinyl chloride monomer	PVC

The producers of polystyrene and PVC are totally dependent on the national oil company for their starting materials and are subject to the national oil company's decisions concerning price, quantity and delivery schedule.

Foreign investment

There is very little information on foreign investment in the plastics industry in Mexico. Foreign investment data for all industries and for the petrochemical industries in Mexico may be found in that part of this study called "Relative Advantages." In petrochemicals, foreign investment is limited to secondary petrochemicals with an upper limit of 40 percent of foreign ownership. Separate data are not available for foreign investment in the petrochemical industry alone. However, total foreign investment in 1979 amounted to about $400 million or about 24 percent above the $323 million of foreign investment in 1978. 1/ Total public and private investment in 1979 amounted to about $28 billion, compared to $24 billion in 1978. Public spending amounted to $13.4 billion in 1979, or about 22 percent over $11 billion invested in 1978.

New technology 2/ is the surest way for foreign firms to enter the Mexican market. Mexico, with its new-found wealth, does not need the $400-$500 million annually in investment funds from the United States which accounts for more than 70 percent of foreign holdings. However, Mexico is unlikely to ignore innovative technology as the basis for foreign investment.

Foreign participation in total private fixed investment amounted to 4 percent in the early 1970's and only 3 percent by 1976. 3/ This downward trend, which has continued, is a result of official policies instituted during the early to mid 1970's. Total foreign direct investment is a declining entry

1/ ANALISIS, op. cit., p. 19. An article, "Mexico: Ownership Limited, Profits are not," which appeared in Chemical Week on June 7, 1978 (pp. 49-50 and 53) reported that direct foreign investment in Mexico amounted to only $198 million in 1978.

2/ Ibid., p. 69.

3/ The Dean Rusk Center, Comparative Facts on Canada, Mexico and the United States, op. cit. pp. 222-223.

in Mexico's long term capital account. It was 40 percent of the net long term capital inflow in 1970, and fell sharply to only 9.3 percent by mid-decade.

Technology

Most of Mexico's technology for plastics production comes from the United States, with a lesser proportion from Europe and Japan. This technology has been traditionally obtained when U.S. or other foreign firms formed minority joint ventures with private Mexican firms; however, Mexico is now in a position to offer its oil in exchange for technology from any of the developed countries. In fact, Mexico and France have already signed long-term arrangements for exchange of oil and technology. 1/

A major concern of U.S. businessmen operating in Mexico is the Mexican patent and trademark law. This law does not include the same protection of confidential information and patents generally available in the rest of the industrialized world. The law is intended to give the Government comprehensive control over foreign participation in the Mexican economy by registering all contracts in Mexico involving the transfer of technology. 2/

There is apparently very little research and development (R. & D.) investment in the private sector in Mexico. Most U.S. firms involved in joint ventures conduct the bulk of their R. & D. in the United States 3/ and Mexican affiliates had 2.5 percent or less of their revenues assigned to R. & D. Of the firms that do invest in R. & D., it is typically the local Mexican firm, a major shareholder in joint venture, that determines how much will be spent in this area.

The national oil company, PEMEX, has its own R. & D. affiliate, the Mexican Petroleum Institute (IMP). 4/ It is an independent research and training organization, founded in 1966, that provides a number of technical services for the national oil company. The IMP's work includes: training, geophysical exploration, production, refining, economic planning and studies in petrochemical technology and project engineering. In 1977, IMP had 3,041 employees. This represented 3.2 percent of the total employment of the national oil company. 5/ Of these, technical personnel amounted to 948 (31 percent) and investigators to 1,080 (35 percent).

1/ Report prepared by Subcommittee on Investigations and Oversight and the Subcommittee on Science, Research, and Technology of the Committee on Science and Technology, U.S./Mexico Relations and Potentials Regarding Energy Immigration, Scientific Cooperation and Technology Transfer, Serial P, July 1979, p. 6.

2/ The Dean Rusk Center, Comparative Facts on Canada, Mexico and the United States, . . . op. cit., p. 178.

3/ Edited by Barry W. Paulson and T. Noel Osborn, U.S.-Mexico Economic Relations, Boulder, Colorado, 1979, pp. 115-117.

4/ Report prepared by the Subcommittee on Investigations and Oversight . . . op. cit., p. 27.

5/ Secretaria de Programacion y Presupuesto, La Industria Petrolera en Mexico, Mexico, 1979, pp. 377 and 382.

Government Policies and Involvement

Production facilities

The Mexican Government, as mentioned previously in this study, is involved in every facet of the domestic petroleum industry from the exploration for oil and natural gas at the Reforma and Campeche reserves to the production, marketing, and trading of all primary and certain secondary petrochemicals.

Government-industry relationship

The Government extends various credits for operations which are undertaken in those areas (zones) 1/ with high levels of unemployment or in product areas which have high priority.

Differential pricing is an incentive provided for by the National Industrial Development Plan (NIDP) and is especially important for the secondary petrochemical industry, including polystyrene and PVC. Under differential pricing, qualified firms are entitled to discounts on basic petrochemicals supplied them by the national oil company in addition to tax breaks. These differential prices vary with the zone in which the firm is located. Firms, by locating in those zones with the highest unemployment rates, become entitled to as much as a 30 percent discount on primary petrochemicals as well as on natural gas, fuel oil, and power rates. 2/ They are also exempt from paying for contract charges for electrical power. These benefits vary in accordance with the needs of the zone in which the firms locate. No incentives or aid such as fiscal credits applied against Federal taxes are granted for expansions in those zones which already are heavily industrialized. In order to obtain differential rates, it is also necessary for the firm to produce what the government considers to be priority items of the secondary petrochemical industry. There are certain other requirements that have to be met, such as maintaining a certain level of exports and providing a favorable price structure to Mexican firms.

Private producers of plastics are among those entitled to fiscal incentives under the National Industrial Development Plan (NIDP). These credits, conveyed via fiscal promotion certificates (ceprofis), vary from 10 percent to 15 percent on plant expansions depending on location. Secondary petrochemical producers, in a priority industry, also are entitled to a 20 percent employment credit (allowed for each job created) and a 5 percent credit on purchases of equipment made in Mexico. These credit certificates, as stated above, may be applied against the payment of any federal tax. These payments are made at rates tabulated in accordance with the regional and

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1/ The national oil company divides Mexico into 3 principal zones, Northern zone, Poza Rica, and the Southern zone. The Southern zone is the principal source of oil and gas at four-fifths and two-thirds, respectively, of the total output in 1978. The Northern zone extends from Tuxpan North (including Baja California). From the Department of State "Industrial Outlook Report: Petroleum--CERP-0425," Airgram No. A-59, U.S. Embassy Mexico, June 18, 1979, p. 4.

2/ ANALISIS . . ., op. cit., pp. 45, 47, 249, 251, 265 and 267.

sectorial priorities established by the Mexican government. The certificates may not be used in combination with any other incentives program, except in certain cases involving import taxes and incentives based on the federal income tax law.

The NIDP calls for exports of a wide range of products and does not depend on petroleum exports alone to reduce the deficit in the current account. The deficit is not supposed to exceed 2 percent of Gross Domestic Product in any one year. One factor hindering greater exports of plastics is the need to use domestic capacity to meet local needs. As recently as 1978, LDPE capacity could not satisfy demand and sizable imports were required. One Mexican source 1/ claimed that most Mexican industries are not export oriented and do not think of exports as an end market.

The Mexican government started a new federal agency in early 1980, the National Foreign Trade Cabinet, to help organize Mexico's export efforts, as well as to oversee the dismantling of its prior import licenses. It is also the policy of the Mexican government to purchase primary petrochemicals which are in short supply locally at world prices, and then to sell them to petrochemical producers at a price predetermined by the government and frequently below world levels. 2/ This policy has often led to designed losses by the government, in order to keep the petrochemical industry competitive. However, in 1980, the Secretariats of Commerce, and Patrimony and Industrial Development, set prices of basic petrochemicals sold to secondary petrochemical producers at current international levels. 3/ For items deemed essential to the economy, the input price was kept well below world price levels.

Mexico has strong environmental laws. Industry sources report that so far these laws have not had adverse impact on the plastics industry. Many joint ventures incorporate the latest emission controls which are often the same as those used by the foreign venture partners in their home countries.

Production

The production of plastics increased from 655 million pounds in 1975 to 888 million pounds in 1978 (table B-32). This represents an average annual rate of growth of 11 percent (table B-33). The production value of all polymers and synthetic resins was $676 million in 1979. 4/

LDPE represented all of the production of polyethylene resins through 1977, and 97 percent of the volume in 1978. The production of polyethylene resin barely increased from 1975 to 1978, going from 219 million pounds only to 220 million pounds (tables B-33 and B-34).

1/ National Manufacturing Industry Chamber (Canacira)--ANA'LISIS, op. cit., p. 85.

2/ "Mexico: Ownership Limited, Profits are not," Chemicals Week, June 7, 1978, pp. 49, 50 and 53. Also based on information obtained by staff during field visits to leading multinational companies which have operations in Mexico.

3/ ANALISIS-79, op. cit., p. 269.

4/ Speech by Jose Luis Garcia-Luna H., op. cit.

The low growth resulted from a lack of capacity expansion. Since 1973 nominal capacity for LDPE has remained constant at about 220 million pounds per year. 1/ As a result of this capacity limitation, polyethylene production represented a decreasing share of total plastics production going from one-third of the total in 1975, to one-fourth of the total in 1978.

The output of polystyrene resins (95 percent homopolymer) increased from 85 million pounds in 1975 to 113 million pounds in 1978 (table B-35), or at an average annual rate of 10 percent from 1975-78 (table B-33). The output of PVC resins increased from 109 million pounds in 1975 to 215 million pounds in 1978 (table B-36) or at an average rate of 25 percent annually (table B-33). Polypropylene, the remaining large volume commodity resin, will not be produced domestically until 1983. 2/ Imports (table B-37) now satisfy local demand.

Mexico has an ample supply of oil and natural gas to provide feedstocks for its petrochemical industry. Mexico's petroleum discoveries include both oil and natural gas, which allows the manufacture of a complete spectrum of primary petrochemicals. In contrast, Canada's major discovery in Alberta is natural gas which provides the petrochemical feedstock for olefins manufacture but cannot be used for aromatics manufacture.

Officials of the national oil company estimate proven reserves 3/ of oil and natural gas to be 40 billion barrels (oil and natural gas equivalents on a British Thermal Units (BTU) basis). Probable reserves are estimated at an additional 44.6 billion barrels; possible reserves, which include both the proven and probable, total 200 billion barrels. 4/ Because of the enormous size and productivity of Mexico's oil fields, the total cost of producing the great bulk of Campeche's and Reforma's crude oil will almost certainly be less than $3 per barrel. 5/

Trade

During the period 1975-78, the percent of the volume of synthetic resins and plastics materials imports to the volume of exports declined inregularly from 4,394 percent to 838 percent (table B-38). Exports approach imports in volume as the ratio approaches 100 percent; when the ratio drops below 100, exports then exceed imports. By comparison, this ratio was about 10 percent in the United States in 1978.

Exports of polyethylene have been virtually nonexistent during the period 1975-78. In 1978 exports of polyethylene amounted to 12,000 pounds, while imports exceeded 261 million pounds or 54 percent of consumption (table B-39).

1/ ANUARIO, op. cit., p. 197.
2/ Speech by Jose Luis Garcia-Luna H., op. cit.
3/ Airgram No. A-59, op. cit., pp. 4 and 5.
4/ The Washington Star, (Sept. 2, 1980, p. C-7) in an article entitled "Mexico's Gas, Oil Reserves Rise 20 Percent" said that President Portillo put actual reserves of gas and oil and 60.1 billion barrels, a 20 percent increase over the 50.02 billion announced in March. Possible overall reserves stand at 250 billion barrels, a 25 percent increase over the March figures.
5/ Richard B. Mancke, op. cit., p. 12.

For polystyrene the ratio of imports to exports declined irregularly from 800 percent in 1975 to 752 percent in 1978; there were no exports in 1977 (table B-40).

PVC has the lowest ratio of imports to exports of any of the big volume resins. From 1975 to 1978 this ratio plummeted from 514 percent to 8 percent (table B-41). As the import-to-export ratios for the other major resins approach this level, Mexico will become a world class plastics exporter and similar to Japan, the United States and West Germany. For some of the major resins, however, such as HDPE and polypropylene, this status is years away.

Imports

Plastics imports increased from 174 million pounds in 1975 to 391 million pounds in 1978 (table B-32) or at an average annual rate of growth of 34 percent (table B-33)--3 times as fast as the rate of increase in production. The ratio of imports to consumption increased from 21 percent in 1975 to 32 percent in 1978 (table B-38).

Imports of polyethylene climbed from 93 million pounds in 1975 to 261 million pounds in 1978 (table B-34) or at an average annual rate of 41 percent (table B-33). In 1977, imports from the United States 1/ represented 67 percent of the volume and 84 percent value for HDPE, and up to 95 percent in terms of volume and value, for a specialty grade of polyethylene.

Polypropylene demands are served solely by imports which climbed from 58 million pounds in 1975 to 115 million pounds in 1978 (table B-37) or at an average annual growth rate in excess of 25 percent (table B-33). In 1977, the U.S. supplied about 95 percent by volume and value of these imports. 2/

Polystyrene imports increased irregularly from 2.1 million pounds in 1975 to about 5 million pounds in 1978 (table B-35) or at an average annual rate of 34 percent (table B-33). The United States was a minor source 3/ in 1977, supplying less than 10 percent of the imports in terms of volume and value. Japan, with two-thirds of the quantity and value, was the leading source of polystyrene resins in 1977.

PVC imports declined irregularly during the period 1975-78 from 14 million pounds in 1975 to 4 million pounds in 1978 (table B-36) or by about 74 percent overall. The United States accounted for about three-fifths in terms of volume and value for imports of PVC in liquid or paste form, but only about one-third in terms of volume and value of PVC in block, lump, or granular form. Colombia was of equal importance to the United States in this latter market.

1/ Secretaria de Programacion y Presupuesto, Anuario Estadistico del Comercio Exterior de los Estados Unidos Mexicanos 1977, Mexico, 1979.

2/ Ibid.

3/ Ibid.

Exports

Plastics exports increased from 4 million pounds in 1975 to over 46 million pounds in 1978 (table B-32) or at an average rate of growth of 126 percent a year (table B-33). Exports of polyethylene are negligible, and those of polypropylene are nil.

Mexico provides export statistics by importing country for only two major resins, polystyrene and PVC. 1/ Exports of polystyrene did not exceed 662 thousand pounds during the period 1975-78 (table B-35) and grew at an average annual rate of 37 percent (table B-33). The ratio of exports to production never reached 1 percent any year during the period 1975-78 (table B-40). In 1977, El Salvador accounted for virtually all of these polystyrene exports and the United States received less than one percent of the total volume and value. Exports of PVC resins climbed from 3 million pounds in 1975 to 43 million pounds in 1978 (table B-36) for an average annual growth rate of 151 percent (table B-33). The ratio of exports to production climbed from 2 percent in 1975 to 11 percent in 1977 and then jumped to 20 percent in 1978, showing more than adequate capacity for local needs (table B-41). The United States as a market for PVC exports 2/ from Mexico was of minor importance, receiving about 7 percent in terms of volume and value of the exports in 1977. Brazil was the leading market for PVC resins that year, accounting for four-fifths of the volume and three-fourths of the value.

Consumption

The consumption of plastics in Mexico increased from 825 million pounds in 1975 to 1,232 million pounds in 1978 (table B-32) or at an average annual rate of 14 percent (table B-33) which is faster than the average annual gain in production. Imports have accounted for an increasing share of consumption (table B-38), rising from 21 percent in 1975 to 32 percent in 1978.

The apparent consumption of polyethylene increased from 312 million pounds in 1975 to 481 million pounds in 1978 (table B-34), or at an average annual rate of 16 percent (table B-33). Imports represented an increasing share of polyethylene's apparent consumption, going from 30 percent in 1975 to 54 percent in 1978 (table B-39). Polypropylene consumption is equal to imports (table B-37). Polysytrene consumption climbed from 87 million pounds in 1975 to 118 million pounds in 1978 (table B-35) or at an average annual rate of growth of 11 percent (table B-33) which is about the same as the growth rate for production. Imports increased irregularly from 2 percent of apparent domestic consumption in 1975 to 4 percent in 1978 (table B-40). The apparent consumption of PVC resins increased from about 120 million pounds in 1975 to about 176 million pounds in 1978 (table B-36) or at an average annual rate of 14 percent (table B-33), about one-half of production's growth rate. The ratio of imports of PVC resins to consumption declined sharply from about 11 percent annually in 1975-76 to 3 percent in 1977 and fell further to 2 percent in 1978 (table B-41).

1/ Secretaria de Programacion y Presupesto, op. cit.
2/ Ibid.
3/ "Looking for the Formula in Chemicals," Mexican-American Review, April 1980, p. 11. There is no footnote 3 notated.

Future

Expansion Plans

Mexican Government policy makes self-sufficiency in plastics by the early to mid-1980's an important goal. In order to achieve this independence, the national oil company as well as the private sector must significantly increase capacity for most of the leading commodity resins. Analysts have forecast that between 1979 and 1985 plastics production will grow 13 percent per year. 1/ Unfortunately the forecast start-up dates for major petrochemical operations usually have been optimistic in the past by about two years. If future expansions run late, Mexico could still be import-dependent for a portion of its needs for key resins especially LDPE and polypropylene, into the second half of the 1980's. For example, the petrochemical complex at Cangrejera in Vera Cruz (529 million pounds capacity for LDPE) is behind schedule (originally planned for 1979) and probably will not be completely operational until 1981 or 1982. The next major operation is planned for Morelos. The national oil company claims the Morelos complex will be operational in 1982, a major trade journal claims 1983, while knowledgeable industry sources put start-up at 1985 or 1987. 1/ Morelos is scheduled to include 220 million pounds annual capacity of HDPE and 220 million pounds annual capacity of polypropylene. The delay in start-up at Morelos will come from the Government's decision to participate in greater oil and natural gas exports in order to earn foreign currency for investment to upgrade the poor infrastructure system.

Who, what, when, why, where

The national oil company of Mexico plans on increasing the installed capacity for HDPE and LDPE over the next few years, and also bringing polypropylene on stream. The following tabulation shows the nominal 2/ capacity for these three resins in 1978 and the 1978 utilization rate, as well as the proposed future aggregated capacity.

1/ Based on information developed during field interviews.

2/ Terminology used in Mexican source material to describe capacity figures. Also from "Mexico and Brazil Have Ambitions Chemical Plans," Chemical and Engineering News, Dec. 24, 1979, p. 38.

Year	Nominal capacity				
	HDPE	Utilization	LDPE	Utilization	Polypropylene
	1,000 pounds	Percent	1,000 pounds	Percent	1,000 pounds
1978 1/	220,500	3.2	220,500	9.6	0
1985 2/	441,000		1,100,295		3/ 220,400
Increase (1978-85)	220,500		879,795		220,400

1/ ANUARIO, op. cit., pp. 197 and 199.
2/ Speech by Jose Luis Garcia-Luna H. op. cit.
3/ 1983.

The national oil company will own all the new capacity, most additional capacity will be installed adjacent to the source of feedstock and in the proximity of current facilities. By installing new capacity near current operations, the need for new infrastucture such as roads, railroads, and power generating units is greatly reduced. Much of the installed capacity for polyethylene resins is located in Veracruz, as is most of the proposed capacity for both polyethylene resins and polypropylene resins. Most of the feedstock will come from the Campeche and Reforma oil and natural gas fields.

The national oil company has also proposed additional annual capacity of 220 million pounds for HDPE, 529 million pounds for LDPE, and 220 million pounds for polypropylene at sites not yet chosen. 1/ Industry sources project probable start up dates for these facilities between 1986 and 1988. According to industry sources one major facility, the Ostion complex, will not begin production until 1990.

Private firms producing polystyrene resins and PVC resins have to coordinate their expansion with the national oil company which supplies the starting materials for these resins. The capacity for these resins in 1978 as well as the 1978 utilization rates and future aggregate capacities are shown below. 2/

1/ Secretaria de Patrimonio y Fomento Industrial, Industria Petroquimica Secundaria, Nov., 1978.
2/ Fernado Gutierrez Saldivar, op. cit. in his speech (August 1980) stated that the current authorized capacity for polystyrene is 360 million pounds per year and for PVC the current authorized capacity is 594 million pounds per year. For both polystyrene and PVC the authorized capacity exceeds the nominal or operational capacity for 1978.

Year	Polystyrene	Utilization	PVC	Utilization
	1,000 pounds	Percent	1,000 pounds	Percent
1978 1/	215,000	53	275,625	78
1982 2/	479,600		363,825	
Increase (1978-82)	264,600		88,200	

1/ ANUARIO, Op. cit.
2/ Speech by Jose Luis Garcia-Luna H., op. cit.

Most polystyrene capacity is located in the vicinty of Mexico City, Puebla and Veracruz. PVC facilities generally are also located in this area. The intermediate materials (e.g., styrene monomer) for these resins are produced in the Mexico City, Tampico and Veracruz triangle that contains the bulk of Mexico's petrochemical production. The leading firm in polystyrene is also the leader in PVC resins. It recently started up both a polystyrene unit and a PVC unit at Tlaxcala, near Mexico City. 1/

Generally, it is the major private Mexican firms, frequently participants in joint ventures with non-Mexican multinational firms, that are expanding. Naturally, the restrictions on foreign ownership (discussed earlier) prevent non-Mexican firms from being the sole benficiaries of any capacity expansion programs.

Impact on industry

The capacity expansions should allow Mexico's plastics industry to become self-sufficient in the leading commodity resins. The expansions proposed through the mid-1980's will use world class plastics facilities, with most having a capacity in excess of 100 million pounds per year. These facilities, with low cost government-owned feedstocks from Campeche and Reforma, should allow Mexico to become export competitive 2/ once the local needs are satisfied.

Since plastics and, in fact, all petrochemicals are capital intensive, they will not help Mexico with its main problems of unemployment. Mexico could alleviate at least a small part of the unemployment problem by using low

1/ "Mexico: Ownership Limited, Profits are not," Chemical Week, June 7, 1978, pp. 49, 50 and 53. Also, ANA'LISIS-79, op. cit., p. 259.
2/ Jose Luis Garcia-Luna, H., Op. cit. In his paper he states that LDPE lists at 24.4 cents per pound in Mexico, 39 cents per pound in the United States, 38 cents per pound in West Germany, 42 cents per pound in Japan, and 40 cents per pound in the United Kingdom. The price for HDPE is reported at 34 cents per pound in Mexico, 39 cents per pound in the United States, 47 cents per pound in West Germany, and 42 cents per pound in Japan. No price was shown for HDPE for the United Kingdom. The period was not stated, but probably represents list prices for 1979 or early 1980.

cost plastics to upgrade the local plastics fabricating industry which adds more value to the basic resin and is labor intensive. 1/

Demand

The growth in demand for plastics in Mexico is predicated on a growing economy. This includes an increasing standard of living, which is reflected in gains in the level of employment, increases in personal consumption expenditures, and a growth in per capita gross domestic product (GDP).

Forecast growth

Between 1980 and 1985, the demand for each of the five leading thermoplastics is forecast to grow at average annual rates of growth which range from 12 percent to 15 percent as shown below: 2/

(Plastics demand)

Product	1980	1985	Average annual growth rate
	1,000 pounds	1,000 pounds	Percent
HDPE	154,350	308,700	14.9
LDPE	374,850	661,500	12.0
Polypropylene	132,300	231,525	11.8
Polystyrene	176,400	330,750	13.4
PVC	253,575	452,025	12.3
Total	1,091,475	1,984,500	12.7

Reasons for growth

As stated, growth of the plastics industry is predicated on a growing economy. During the period 1975-79, the gross domestic product (GDP) of Mexico in terms of U.S. dollars increased irregularly as shown on the following page.

1/ Status Report 1976 Mexico, op. cit., p. 3, lists 1200 plants and 112,000 employees in the plastics processing industry in 1976. The value of turnover was $1,090 million, while the turnover per employee was $9,694.

2/ Speech by Thomas H. McGreevey, SRI International, Chemical Industries Centre, "World Outlook on Thermoplastics," at First Annual Canadian Outlook Conference on Resin Supply/Demand, Toronto, Ontario, Nov. 15, 1979.

(Based on current pesos)

Item	1975	1976 1/	1977	1978	1979 2/
Total GDP------(million dollars)--	$80,100	$84,400	$67,500	$81,800	$88,200
Per Capita GDP--(dollars)---------	1,331	1,355	1,045	1,266	1,298
Petrochemicals as percent of total GDP----------(percent)--	0.6	0.6	0.6	0.6	0.7
Real GDP growth--------(percent)--	4.1	2.1	3.3	7.0	8.0

1/ Peso devalued in August, 1976 to about half its original value.
2/ Unofficial estimates for first three items.

Source: ANA'LISIS-79, op. cit., pp. 57 and 61. Original source is Banco de Mexico, S.A. GDP real growth (percent) is from "Mexico: Learning to live with Big Oil Bucks," Citibank, May 1980, pp. 9-11. Orginial source is also Banco de Mexico, S.A., and Mexican Government publications.

These data are indicative of an overall growing economy (total and petrochemicals), once an allowance is made for the peso devaluation. The average annual growth rate in total GDP was 2.5 percent from 1975-79 (19 percent in current pesos). Although the per capita GDP showed a 2.5 percent overall decline in U.S. dollars from 1975-79 (a 15 percent average annual growth rate in current pesos), it is forecast 1/ to grown to $1,466 in 1985 (in 1977 U.S. dollars) and to $1,719 in 1990 (1977 U.S. dollars). This represents a 2.6 percent average annual growth rate from 1979-1990. In terms of 1977 U.S. dollars, personal consumption expenditures 2/ in Mexico increased from $46 billion in 1976 to $50 billion in 1978 and is projected to grow at an average annual rate of 6 percent through 1990 (to over $105 billion).

The plastics industry in Mexico is far from mature with per capita consumption of less than 20 pounds in recent years as compared to 200 pounds per person in the world leader, West Germany, in 1978 3/. Therefore, plastics have a long way to go in Mexico as substitutes for natural products before they begin to saturate any major markets. For example, transportation is a major market for plastics and the number of automobiles sold in Mexico climbed irregularly from 230,928 in 1975 to 266,906 in 1979, 4/ or by 16 percent overall or at an annual rate of 4 percent. In fact, Mexico now is the fastest growing automobile market in the world and by 1990 will be producing more than a million cars and trucks annually 5/. Mexico's oil economy is a major factor behind this projected surge. Although Mexico would not have to substitute plastics for metal as an energy-saving factor, it would consider substitution

1/ Predicasts, Inc. WORLD-Regional-CASTS, Cleveland, Sept. 19, 1979.
2/ Ibid.
3/ Plastics & Rubber Weekly, Croyden, England, Sept. 28, 1979, p. 2. Industry sources claim that the term per capita consumption of plastics really has no meaning for Mexico since so many of its people are outside of the money economy.
4/ ANA'LISIS, op. cit., p. 227.
5/ "Mexico's Automobile Market is Booming," The Washington Star, August 22, 1980, pp. E-1 and E-3.

as a means of preserving other natural resources. Further, this would help to expand the market for the Mexican plastics processing industry. In 1977, Mexico set a minimum of 50 percent local content by value for cars and 65 percent for trucks. The output of another important plastics market, television sets, increased from 565,000 units in 1975 to 911,000 in 1979 or by 61 percent overall for an average annual growth rate of 13 percent. On a cost performance basis, plastics are used extensively in the manufacture of television sets for such items as the cabinet and component parts. Some markets now held in Mexico by natural materials could shift to plastics at a more rapid rate than now anticipated if the national oil company maintains prices for primary petrochemicals (feestocks and plastics) at low levels.

Finally, the plastics industry will grow because the government via the national oil company has targeted the petrochemical industry for priority expansion from 1977 through 1982 and $1 billion was spent in 1977 alone. 1/ The investment budget is set at $390 million in 1980 and at $2.3 billion total for the 1980-85 period. 2/

Private investment in secondary petrochemicals, including polystyrene and PVC, was greater in 1979 than in any of the prior 4 years. 3/ Through October 1979 investments of $653 million had been approved which will increase total secondary petrochemical capacity by 4.4 billion pounds a year.

Relationship to the United States

Mexico had a population in 1978 that was one-third the size of the United States but which was sufficiently large to sustain several world class plastics facilities in an economically efficient manner. However, Mexico has a rate of unemployment or underemployment which has been reported as high as 49 percent by the Government 4/ as compared to the United States with a rate of 6.0 percent in 1978. 5/ Therefore, this means that many in Mexico live "outside" the economy and cannot benefit from an increase in the availability of plastics end-products. Industry sources report that Mexico is now educating many of its best students at leading U.S. engineering and business schools. Trade sources report that Mexico's best engineers work for the national oil company. These sources report that there is more prestige and status working for the national oil company than there is in working for a private firm. Mexico has problems with its infrastructure, particularly transportation poor secondary roads, antiquated port facilities, shortage of freight cars and poor delivery schedules. 6/ Finally, Mexico suffers from a shortage of engineering firms

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1/ Richard B. Mancke, op. cit., p. 263.

2/ "Mexico has plans to Channel 10 Percent of Its Hydrocarbons into Big Petrochemical Buildup," Chemical Marketing Reporter, April 7, 1980, pp. 3 and 57.

3/ ANA'ISIS-79, op. cit., p. 263.

4/ The Dean Rusk Center, Comparative Facts on Canada, Mexico and the United States . . ., op. cit. pp. 213-214.

5/ Bureau of Census, Statistical Abstract of the United States, 1979, p. 407.

6/ For plastics the infrastructure problems are most acute in transporting the resins from the petrochemical complexes to the fabricating facilities and, subsequently, in moving the goods to the market place.

capable of handling the huge investment going into the petrochemical industry between 1980 and 1985 estimated at 69 new petrochemical plants valued at $2.4 billion, and additional expansions valued at $2.1 billion. In general, the United States does not suffer from these problems. However, Mexico has one very important advantage over the United States, it is self-sufficient in oil and gas reserves for the foreseeable future. The United States relies heavily on imports of both oil and natural gas.

In 1978, Mexico's per capita consumption of all plastics was 18 pounds and only 13 pounds for the 5 leading commodity resins. By comparison, these figures for per capita consumption of plastics in the United States during 1978 were 165 pounds and 102 pounds, respectively.

Plastics demand in the United States is projected to grow at about 6-7 percent per year through 1985 versus 13 percent in Mexico. From 1980-85, the 5 leading plastics are forecast to grow at about the same rates. 1/ For the United States, the projected growth rates for 1980-85 range from a low of 5 percent per year for LDPE and polystyrene to a high of 8 percent per year for polypropylene. For Mexico these growth rates range from 12 percent for LDPE and polypropylene to 15 percent for HDPE during the same period.

Relationship to Canada

Canada is disadvantaged in comparison to Mexico in that its eastern provinces have to import part of its oil needs. Canada had net imports of 19 percent of its crude oil needs in 1979. Canada's smaller population will not be able to sustain as many world class plastics plants as well Mexico's. Once a plant comes on stream, Canada will have to export until the demand catches up, or operate at reduced, inefficient rates. This will be less of a problem in Mexico, especially once it gets the bulk of its population into its money economy.

The per capita consumption of plastics in Canada was calculated at 84 pounds in 1978 versus 18 pounds in Mexico. For the 5 major resins, Canada's per capita consumption in 1978 was calculated at 79 pounds versus 13 pounds in Mexico.

Finally, consumption of the 5 leading plastics in Canada is forecast 1/ to grow at a rate of 9 percent per year from 1980-85 compared to 13 percent per year for this period in Mexico. The range of growth rates for Canada is from a low of 7 percent average annual growth for LDPE to a high of 11 percent for HDPE and polypropylene. For Mexico this range is from 12 percent for LDPE and polypropylene to 15 percent for HDPE.

Trade

Industry sources believe that Mexico should become self-sufficient in the major resins during the 1980's. Optimistically this will occur during the first half of the decade but realistically it is expected only by the second

1/ Thomas H. McGreevey, op. cit.

half. Self-sufficiency will reduce import requirements. Trade sources report that Mexico eventually will be supplying some of the plastics needs of the United States, Japan, and Western European especially the major grades of the large volume resins. However, in spite of its overwhelming feedstock advantage, Mexico will not be a significant factor in the international markets until early in the next decade partly because of its domestic growth in developing and consolidating better standards of living for the Mexican people. 1/ This belief is also based on the fact that Mexico's total chemical imports have exceeded total chemical exports by more than two to one up thru 1977. 2/

Changes in imports and exports

Mexico's plastics exports will increase once local needs are satisfied. However, Mexico will continue to receive certain resins from the United States, even when its current round of expansions is completed in about 1983-85. These will include speciality resins, such as polycarbonate, for which Mexico's needs do not justify local production, special grades of the large volume resins, and general exports to fill unforeseen shortages, such as delays in plant expansions. Also, until an economical supply of propylene becomes available, imports of polypropylene and other propylene-based products will increase at least through 1983.

Likely new trading partners

Mexico will, in turn, export the large-volume resins in increasing quantities to Central America and South America, and lesser amounts to the Far East. Central America is currently a major market for the United States and West Germany. Mexico, with its world class plants, its feedstock advantage and its proximity will have distinct advantages over the two plastics superpowers, especially in this region. Also, developing countries, because of foreign exchange problems, will attempt to modify lower cost plastics to meet their own end-uses which are typically not as sophisticated as in the United States. 3/ This tendency will prove to be an added advantage to Mexico.

The United States has a natural freight advantage, and presently enjoys a raw material advantage because of price controls on natural gas and crude petroleum, and a price advantage due to the devalued U.S. dollar over Japan and Western Europe vis-a-vis Mexico. Therefore, it is highly unlikely that the United States will be displaced as that nation's principal source of high performance plastics.

1/ Speech by Fernado Gutierrez Saldivar, op. cit.

2/ Speech by George B. Hegeman, Arthur D. Little, Inc., Cambridge, Mass., "Trade Trends in Chemicals - The Outlook for the United States, Canada, and Mexico," at the Chemical Marketing Research Association Meeting, New York, N. Y., May 8, 1979.

3/ Speech by R.G. Dodge, Shell Chemical Comapny, Houston, Tex., "International Plastics Markets and Trends," at the Society of Plastics Engineers Meeting, Lousiville, Kentucky, Mar. 27, 1980.

Impacts on producers, consumers and new uses

It has been estimated 1/ that it costs Mexico less than $3 to produce a barrel of oil. Therefore, Mexico's petrochemical producers will have a distinct economic advantage over the major plastics producers who are paying Persian Gulf prices. The lower feedstock costs will allow Mexican plastics fabricators to produce products at significantly lower costs than in the United States. The Mexican consumer could benefit from these savings. The U.S. consumer could also benefit from these savings as Mexican plastics processors may enter certain markets in the United States. These would mainly involve certain uses where price is the overriding factor such as, baby diapers, drinking straws, and shower curtains.

1/ Richard B. Mancke, op. cit., p. 12.

OTHER PETROCHEMICAL DERIVATIVES

Present Situation

Description and Uses

The major petrochemicals produced in Mexico other than those already discussed include dyes, organic pigments, carbon black, medicinal chemicals, flavors and perfumes, rubber processing chemicals, plasticizers, and surface-active agents. However, not all of the items in each of these categories is a petrochemical, since some may be based on natural products, at increased expense.

The principal feedstock for carbon black is natural gas. For every thousand cubic feet of methane (CH_4), 33 pounds of carbon black can be produced; an equivalent volume of ethane (C_2H_6) would produce double the amount of carbon black owing to the higher percentage of carbon in ethane. 1/ Natural gas normally contains between 10 and 20 times as much methane as it does ethane. Carbon black, essentially no more than elemental carbon powder (the same product found on one's finger tip if held over a burning candle), is used as a filler pigment and component in inks. Over 90 percent of its production is used in rubber products, principally tires; its price as a filler pigment is low compared to its reinforcing power. News ink accounts for the majority of carbon black's use as an ink. It is also used in protective coatings, phonograph records, paper, carbon paper, concrete (for coloring), plastics, and synthetic fibers.

Surface-active agents, organic chemicals which reduce the surface tension of water (or other solvents), are routinely incorporated into packaged soaps and detergents, both for household and industrial use. Other industrial uses of surface-active agents include textile processing, ore flotation and petroleum production. Consumer products in which surfactants appear include cosmetics, food, paints, and pharmaceuticals.

Dyes and organic pigments, other than carbon black, are derived from benzenoid chemicals and cyclic intermediates, both petrochemical sources. The textile industry consumers the majority of the dyes used in Mexico to color fibers and fabrics; the remainder is used for coloring paper, for dyeing leather and plastics, and in the production of organic pigments.

Organic pigments, which differ from dyes in that they are insoluble, are used when the situation requires the color to remain insoluble. The largest consumer of organic pigments in Mexico is the printing ink industry; the paints and coatings industry is the second largest consumer of organic pigments. Other industrial users include color plastics and textiles.

Organic pigments are made directly from dyestuffs. Although natural dyestuffs could be used in their manufacture, economic reasons have forced the use of almost 100 percent synthetic dyestuffs.

1/ E.A. Apps, Printing Ink Technology, Chemical Publishing Co., Inc., New York, N.Y., 1959, p. 140.

There are two final forms which the pigments may take; color lakes are prepared by the precipitation of a dye onto an insoluble inorganic compound. Toners or full strength colors do not require a substrate or a base. Toners make up more than 95 percent of the present market for pigments, and are marketed either full strength or diluted by the addition of a solid diluent.

Glyceryl nitrate (nitroglycerin) and 2-4-6 trinitrotoluene (TNT) comprise the majority share of petrochemical explosives. Nitroglycerin, a component of dynamite, is used by industry as a tunnel explosive, mining explosive, and as an aid in the metal processing industry. Military uses for these explosives include producing fragmentation, air blast, underwater shock, armor penetration, and demolition. Nitroglycerin and TNT are favored for these applications because of their "noninitiating" nature. This means that they are not likely to self-detonate by impact, friction, or the brief administering of heat.

In addition to its use in explosives, nitroglycerin is also used as a medicinal for patients suffering from angina pectoris. This medicinal chemical functions as a drug in relieving chest pains occurring from heart muscle strain.

Other pharmaceutical petrochemicals include aspirin and its analogs, analgesics used universally to relieve general sensations of pain. Aspirin is not only marketed as a drug in its pure form, but also is combined with various other pharmaceuticals.

Other petrochemical related products which are found in Mexico include flavor and perfume chemicals plasticizers, and rubber processing chemicals. The major petrochemicals found within these categories are saccharin (flavor), artificial musk (perfume), phthalic acid esters (plasticizers), and thiazole derivatives (rubber-processing chemicals). Saccharin, originally discovered accidentally and synthesized for the first time over a century ago in the United States, is an intensely sweet, white crystal. Its commercial form is the sodium salt, which is used as a sugar substitute in diet soft drinks and as a replacement for table sugar.

Although artifical musk (actually several chemicals) is not produced in great quantity, it's strong aromatic qualities guarantee an ever-increasing demand. Natural musk is only available in extremely limited quantities, since it is obtained from the male musk deer which are found in the Atlas and Himalayan mountains of China and Tibet. The difference between the demand for the musk fragrance and the supply of natural musk is supplied by the synthetics. Musk xylol, the first of the synthetics, is used in soap perfumery and in low cost and ordinary fragrances for household products.

Musk ketone is another of the most frequently used synthetics. It is often used along with musk ambrette (a similar synthetic) as a fixative in various perfurmes. Musk ketone most nearly approaches the odor of the natural product among all synthetics.

Musk ambrette is considered by some to be the most important artificial fragrance, it is often used as a base for synthetic musk perfume. Musk ambrette is also used in certain flavorings, including toothpastes. One minor

disadvantage is its tendency toward discoloration in daylight. Musk ambrette is the only nitromusk recognized as safe for use in food flavorings in the United States.

Among the thirty or more members of the family of phthalic acid esters employed as plasticizer, dioctyl phthalates are by far the most widely used. Phthalate esters have maintained their global market share of total plasticizer consumption ranging from 60 percent to 70 percent, over the past 10 year period, while the plasticizer di(2-ethylhexyl)phthalate has maintained a majority share of dioctyl phthalates (approximately 85%). Di(2-ethyl-hexyl)-phthalate is the plasticizer generally used in polyvinyl chloride as it is highly compatible with the properties of PVC resins and is available at a lower price than other common phthalates.

Similar in use to plasticizers, rubber processing chemicals are added both to natural and synthetic rubber in order to impart chemicals needed in specific finished products and to facilitate handling during production. The range of rubber-processing chemical compounds include accelerators, activators, vulcanizing agents (involved in production procedures), antioxidants, antionants, and stabilizers (to prevent product deterioration).

Customs Treatment

The dutiable rate for mixtures of two or more odoriferous substances, both natural and synthetic, is 50 percent ad valorem equivalent (AVE) (table B-42). Other tariffs for items containing synthetic flavors or perfume chemicals range from 75 percent AVE to 100 percent AVE. The average duty and tariff on all surface-active agents is 80 percent AVE, tariffs average higher in order to prevent the Mexican market from being flooded with less expensive imported materials.

Synthetic dyes are dutiable at a much lower rate than are surface-active agents, comparable with the rates negotiated in the GATT. Duties have ranged from 7 percent AVE to 25 percent AVE. Duties imposed on synthetic organic pigments entering Mexico are slightly higher than those on dyestuffs. Rates range up to 50 percent AVE for certain items which Mexico deems more competitive.

Other petrochemical-dependent products such as pharmaceuticals are dutiable at rates ranging from 15 percent AVE To 60 percent AVE, generally depending upon whether the item is currently being produced by Mexico's domestic industry.

Structure of the Industry

The Mexican government, in 1925, chartered a public agency - the National Petroleum Administration (NPA) - to control oil production and refining operations. In 1934 the functions of the NPA were assumed by a semi-private organization, Petroleo de Mexico (Petromex). Petromex was owned 40 percent (minimum allowed) by the Mexican government and the remainder was owned by Mexican private business.

However in March, 1938 the Mexican government nationalized the petroleum industry and replaced Petromex with the General Administration of National Petroleum. In order to make retribution to the owners of the nationalized facilities and to muster the knowledge and ability to manage the oil industry, on June 7, 1938 two public agencies were created. These two agencies were Petroleos Mexicanos (PEMEX) and Distribuidora de Petroleos Mexicanos; together these agencies jointly handled the full operational responsibility for the industry. Within two years, Distribuidora was abolished and PEMEX became the sole controlling body of the Mexican petroleum industry.

Ownership

In 1962, the Mexican government enacted a law restricting foreign and private investment to 40 percent of ownership in the secondary petrochemical industry such as dyes, pigments, plasticizers, and surfactants. PEMEX, the only entity allowed ownership of primary petrochemical facilities and a required partner in the secondary petrochemical sector, is involved in various joint venture establishments.

The 40 percent ownership that is now permitted is proportioned in different ways. Several large subsidiaries of established U.S. firms were already involved in Mexican joint ventures before the petrochemical boom of 1977. Other major U.S. based companies have remained in the Mexican petrochemical market by merging with wholly owned domestic companies. Now, foreign investors may enter the Mexican market by entering into minority partnerships with Mexican investors.

The ownership of facilities producing other petrochemical derivatives in Mexico is split between PEMEX and the private sector, few of the subject chemicals are primary petrochemical.

Integration

Due to the Government control of the primary and secondary petrochemical industries, there is very little private ownership in these industries. Private ownership of the few active production facilities for the manufacture of petrochemicals discussed in this section are spread among various foreign and domestic owners. Outside investment in the Mexican petrochemical industry is largely dominated by technologically advanced foreign firms which are completely vertically integrated in their own domestic economies.

Foreign investment

In proportion to the limited foreign investment permitted in Mexico's petrochemical industry, there is much international interest. Four of the six largest chemical producers in Mexico are U.S. based and have the benefit of U.S. technological and financial backing.

Technology

Mexico's secondary petrochemical industry is based predominantly upon imported technology. The majority of the skilled technicians operating both the primary petrochemical plants and the secondary petrochemical plants are brought in from the United States and other developed countries. Mexico is aware that the attraction of its natural resources and readily available feedstocks can attract the technology to further develop its industry.

The research and development for PEMEX is controlled by the Institute Mexicano del Petroleo (IMP). The IMP provides Pemex with technical assistance in adapting foreign technology to the Mexican petroleum industry. IMP has been unable to fill all the needs of the petrochemical industry; Mexico is still relying upon technology developed by the U.S. and other industrialized nations.

U.S. technology is particularly apparent in the production of certain secondary petrochemical products such as explosives, organic pigments and dyes (produced by subsidiaries of a Mexican joint venture with a large U.S. based firm). Certain other contributors of petrochemical technology in Mexico include several West German firms.

A future problem for the domestic application of technology is the recently adopted Mexican patent law. The law does not provide the motivation for registering new patents or inventions.

Government Policies and Involvement

The production facilities of the Mexican secondary petrochemical industry are owned primarily by PEMEX. PEMEX would like to develop a program to assist producers of secondary petrochemicals, such as surface active agents, organic dyes, and pigments in the marketing of their goods in export markets. Presently, there are no significant exports of any of these petrochemicals, despite Government incentives.

Production

Of the secondary petrochemical products discussed in this section, the following categories showed significant production in 1979: pigments and dyes, drugs and pharmaceuticals (only a small part petrochemical in nature), plasticizers, and other petrochemicals (explosives, perfumes, etc.). 1/ Production values for all of the Mexican petrochemical industry in 1979 can be found in the following tabulation: 1/

1/ Jose Luis Garcia-Luna H., Present and Future of the Mexican Petrochemical Industry, presented at National Petroleum Refiner's Association Meeting, San Antonio, Texas, March-April 1980.

Categories	Value	Percentage of total
	Million U.S. dollars	
Polymers and synthetic resins 1/	676.5	18.5
Synthetic fibers	671.7	18.3
Synthetic rubber and rubber processing chemicals	85.4	2.3
Fertilizers and pesticides	890.0	24.3
Organic pigments and dyes	74.3	2.0
Drugs and pharmaceuticals	296.7	8.1
Plasticizers	91.3	2.5
Other (including explosives, perfumes, surface-active agents, and so forth	878.2	24.0
Total	3664.1	100.0

1/ Polyethylene and polypropylene are not considered secondary petrochemicals by PEMEX.

Production of certain individual product classes of petrochemicals has been increasing. The production of plasticizers in Mexico has increased steadily during the past decade, as can be seen in the following tabulation of projected production statistics: 1/

Year	Quantity
	Million pounds
1975	1/ 43.1
1976	65.4
1977	74.0
1978	83.8
1979	94.5

1/ Actual production.

The program undertaken by PEMEX in 1976 would have had production increasing according to the schedule detailed in the previous tabulation. Statistics have not yet been gathered which would verify the success of the program.

Over the past 15 years, actual production of other secondary petrochemicals has increased greatly. The following tabulation details the expected growth in the production of certain secondary petrochemicals: 1/

1/ Instituto Mexicano del Petroleo, Desarrollo y Perspectivas de la Industria Petroquimica Mexicana, 1980.

Year	Surface-active agents	Dyes and organic pigments	Basic materials for pharmaceuticals
	Million pounds	Million pounds	Million pounds
1964	65.6	1/	1.1
1970	127.4	6.7	3.2
1975	188.9	10.5	3.0
1980	291.3	25.1	7.6

1/ Not available.

Production of surface-active agents grew without interruption between 1970 and 1975, increasing by 48 percent overall from 127.4 million pounds in 1970 to 188.9 million pounds in 1975. The projected overall growth in production for the next five year period (1975-1980) is 54 percent, with production in 1980 expected to approach 300 million pounds.

The Mexican dyestuff and organic pigment producers have also made great strides. Between 1970 and 1975, there was a 57 percent increase in production, from 6.7 million pounds to 10.5 million pounds. The projected increase in production from 1975 to 1980 is 139 percent, from 10.5 million pounds to 25.1 million pounds, more than twice the growth of the previous five year period.

Trade

Although PEMEX would like to make Mexico self-sufficient in the production of these other petrochemical derivatives, its technology is lacking. Therefore, Mexico imports much of its secondary petrochemicals for industrial uses as well as for use in the manufacture of consumer products. Mexican imports of certain secondary petrochemicals can be seen in the following tabulation: 1/

	Surface-active agents	Dyes and organic pigments	Plasticizers 1/
	Million pounds	Million pounds	Million pounds
1964	-	-	7.7
1970	5.4	3.8	4.0
1975	3.0	2.3	11.1

1/ Plasticizers chemically derived from phthalic anhydride.

1/ Instituto Mexicano del Petroleo, op. cit.

In the 1960's, the Mexican secondary petrochemical industry began to develop and mature. As producers of consumer products manufactured from these secondary petrochemicals demanded more petrochemical feedstocks in the 1960's, the domestic industry found that it was unable to supply the needs of these producers. Although an insignificant amount of surface-active agents, organic pigments, and dyestuffs were imported in 1964, imports increased substantially by 1970. In 1970, there were imports of 5.4 million pounds of surface-active agents and 3.8 million pounds of organic pigments and dyestuffs. Because several domestic production facilities came on stream between 1970 and 1975, imports decreased during that five year period. Surface-active agent imports decreased by 44 percent to 3.0 million pounds in 1975; organic pigments and dyes increased by 39 percent to 2.3 million pounds in 1975. 1/

Mexico, which imported significant quantities of plasticizers for a new plastics industry in 1964 (7.7 million pounds), had experienced considerable growth in its production of plasticizers by 1970. Imports decreased by 48 percent between 1964 and 1970 to 4.0 million pounds. Stimulated by the growth in other petrochemical industries, imports of plasticizers again increased by 178 percent by 1975 to meet the plastics industry's demands. 1/

Imports of the secondary petrochemicals discussed in this section from the United States increased between 1978 and 1979 as seen in the following tabulation: 1/

Petrochemical	1978	1979
	1,000 dollars	1,000 dollars
Synthetic dyes	1,909	2,054
Organic pigments	848	910
Explosives	2,451	3,495
Surface-active agents	14,999	20,872
Total	20,207	27,331

Mexican imports from the United States increased in these designated items by 35 percent in 1979. Individually, imports of synthetic dyes increased by 8 percent; organic pigment imports increased 7 percent; imports of explosives increased by 43 percent; and surface-active agent imports increased by 39 percent.

Consumption

Mexican consumption of plasticizers has grown consistantly and steadily during the decade. Apparent consumption of plasticizers in Mexico between 1964 and 1979 can be seen in the following tabulation: 1/

1/ Instituto Mexicano del Petroleo, op. cit.

Year	Apparent consumption	Percentage change from previous data
	Million pounds	
1964	12.2	-
1970	26.6	118.0
1975	38.9	46.2
1976 1/	59.7	53.5
1977 1/	67.8	13.6
1978 1/	76.9	13.4
1979 1/	86.9	13.0

1/ Estimated.

With continued growth in the Mexican plastics industry, the consumption of plasticizers will also grow. PEMEX would like to see the domestic industry meet that demand, but it is unlikely that the industry will succeed.

Mexican consumption of surface-active agents has also increased by 60 percent between 1964 and 1970, and by 32 percent between 1970 and 1975. The consumption of surface-active agents in detergents has increased faster than its consumption in other products. This is reflected in the increasing ratio of surface-active agents used in detergents to their total consumption. This data can be seen in the following tabulation relating to apparent consumption of surface-active agents in Mexico: 1/

Year	Surface-active agents Use in detergents (1)	Total consumption (2)	Ratio (1)/(2)
	1,000 pounds	1,000 pounds	
1964	321.7	551.8	.583
1970	526.8	882.2	.597
1975	794.1	1,161.8	.684

Apparent consumption of organic pigments and dyestuffs has increased steadily since 1967, as can be seen in the following tabulation: 1/

1/ Instituto Mexicano del Petroleo, op. cit.

Year	Apparent consumption	Percentage change from previous data
	Million pounds	
1967	6.8	-
1970	10.5	54.4
1975	12.1	15.2
1976 1/	17.8	47.1
1977 1/	19.4	9.0
1978 1/	21.2	9.1
1979 1/	23.1	8.9

1/ Estimated.

The five year period of 1975 through 1979 showed a 91 percent increase in the apparent consumption of organic pigments and dyes, a much greater increase than the 15 percent between 1970 and 1974.

Future

Expansion Plans

The Mexican petrochemical industry has been expanding and bringing new plants on stream throughout the 1970's. Considerable further expansion in the secondary petrochemical industry has been slated for the early 1980's.

Who, what, when, why, where

The growth in production during 1979 in secondary petrochemicals was at least partly due to the start-up of new plants. At least six major Mexican producers are either bringing new plants on stream or are in the midst of construction. Several new projects are detailed by product in the following tabulation: 1/

Product	Annual capacity	Start-up date
	1,000 pounds	
Methyl benzoate (flavor)	2,200	1980
Sodium benzoate (flavor)	2,200	1982
Dyestuffs	6,600	1980
Dyestuffs	6,600	1980
Dyestuffs	6,600	1982
Dyestuffs	33,060	1983

All told, there are about 30 petrochemical plants now under construction. In 1981, a plant for the manufacture of dodecylbenzene (a surface-active agent intermediate) will come on stream. The plant will have a 70,000 ton capacity. 1/

Impact on industry

Because of the unique nature of the Mexican petrochemical industry, individual firms will feel very little change during future development. PEMEX stands to make profits from selling raw materials from its primary petrochemical plants, which it owns completely, to secondary petrochemical plants which are at least majority owned by PEMEX.

The present goals of the Mexican Government are to cut down on imports by developing all of the necessary petrochemical industries at home. This program is designed to provide the Mexican domestic industry and consuming public with all of the petrochemically derived goods that are demanded. Planned reductions of exports of Mexican-produced petrochemicals will tend to strengthen the supply market for the petrochemical products discussed in this section.

Demand

Forecast growth

The expected growth rate for the secondary petrochemical industry ranges from about 8 percent to 13 percent. Projected demand for representative petrochemicals discussed in this section are detailed in the following tabulation: 2/

	1980	1981	1982	1983	1984	1985
Dyes and organic pigments	25.12	27.36	29.40	31.60	33.98	36.53
Sodium benzoate (flavor)	1.80	1.90	2.02	2.14	2.29	2.43
Nonionic surface-active agents	55.00	63.20	72.60	83.60	96.00	110.40
All surface-active agents	291.28	313.58	342.12	373.06	400.35	435.21

Varying rates of growth have been predicted by PEMEX. All surface-active agents are predicted to grow at a rate of approximately 8 percent per year while the production of non-ionic surface-active agents is projected to grow

1/ Jose Luis Garcia-Luna H., Present and Future of the Mexican Petrochemical Industry, presented at National Petroleum Refiners Meeting, San Antonio, Texas, March-April, 1980.

2/ Instituto Mexicano del Petroleo, op. cit.

at a rate of over 15 percent per year. Growth in organic dyes and pigments is projected to range between 7 and 9 percent per year between 1980 and 1985.

Reasons for growth

There are two important reasons for growth in all of the Mexican petrochemical industries. Expected improvements in the efficiency of production is one reason; the most likely method to implement improvement in efficiency is through advances in technology. Although the recent (1979) changes in the foreign investment rule might encourage imports of new technology, the bargaining power PEMEX can wield to obtain the technology it needs rests in Mexico's raw materials advantage. Mexico can become, if it wishes to, a source for the petroleum which is so badly needed in most of the developed nations of the world.

A second stimulant for growth is the profit motive of private foreign investors, which is an important consideration but not a critical one in Mexico, since the majority ownership of the petrochemical industry resides in PEMEX, which is a non-profit Government organization.

Relationship with Canada

As of the present time, both Mexico and Canada are attempting to strengthen their own domestic petrochemicals' markets. Although Canadians have worked together with the Mexicans as partners in the production of certain petrochemicals (carbon black and synthetic rubber), only a limited degree of cooperation is actually planned for the near future. 1/ Joint studies are now being performed in order to expand the number of shared projects between Mexico and Canada.

As far as trade in petrochemicals discussed in this section is concerned, Mexico is beginning to make an effort to cut down on exports to all countries, including the United States and Canada, in order to provide the Mexican domestic market with a higher percentage of Mexican produced goods. Despite these nationalistic goals, Mexican leaders realize that "no country on earth is self-sufficient, we all need each other." 1/

Relationship with the U.S.

The United States is Mexico's major source of supply for the technology which goes into Mexican plants for the production of the petrochemicals discussed in this section. In the near future, Mexico will continue to be able to obtain needed technology from the United States in exchange for the raw material feedstocks the United States needs for its own petrochemical industry. An arrangement beneficial to both countries would be the ultimate goal.

1/ Chemical and Engineering News," Chemical Cooperation in Resources of the North American Continent", pages 34-36, Sept. 22, 1980.

Trade

Changes in imports and exports

According to the plans of the Mexican Government, the Mexican petrochemical industry should one day become a net exporter of all petrochemicals, instead of a net importer. The goals set by the Government and PEMEX are for the Mexican economy to become as self-sufficient as possible as regards petrochemicals, including those discussed in this section.

Likely new trading partners

Realistically, Mexico is hoping to increase production enough to meet its own demands in the early 1980's. Mexican hopes of a large export market for secondary petrochemicals exist, but these hopes are not expected to be realized anytime within the next decade, according to most sources.

Impacts on producers, consumers, and new uses

The Mexican industry will be strained to supply its own demand for goods if all of the international trade possibilities are realized. This would greatly increase the pressure upon producers of the petrochemical final products discussed in this section. However, consumers will likely not be wanting, as Mexican imports would likely make up for the slack in domestic production. It is likely that there will be no new uses for any of the secondary petrochemicals produced domestically, as Mexican producers have not yet satisfied Mexico's own market demand for the items now being produced.

1/ Chemical and Engineering News," Chemical Cooperation in Resources of the North American Continent", pages 34-36, Sept. 22, 1980.

Statistical Tables

Table B-1 --Olefins: Mexican rates of duty, by tariff numbers

Item No.	Description	Duty rate
29.01	Hydrocarbons	
A 004	Butadiene	5% ad val.
A 999	Ethylene, propylene butylene, and others	5% ad val.

Source: Informacion advanera De Mexico, S.A., Tarifa Del Impuesto General De Importacion, Mexico, 1978.

Table B-2--Butadiene: Mexican production, imports, exports, and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	48,481	47,348	1/	95,829
1976	41,008	60,410	1/	101,418
1977	108,900	1/	1/	108,900
1978	121,000	1/	1/	121,000

1/ Not available.

Source: Instituto Mexicano del Petroleo, Desarrollo y Perspectivas de la Industria Petroquimica Mexicana, Mexico, 1977.

Table B-3 --Ethylene: Mexican production, imports, exports, and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	468,600	1/	4,400	464,200
1976	501,600	1/	4,400	497,200
1977	506,000	1/	1/	506,000
1978	567,600	1/	1/	567,600

1/ Not available, however, imports or exports of ethylene were negligible.

Source: Instituto Mexicano del Petroleo, Desarrollo y Perspectivas de la Industria Petroquimica Mexicana, Mexico, 1977.

Table B-4--Propylene: Mexican production, imports, exports, and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	204,600	13,200	1/	217,800
1976	250,800	4,400	1/	255,200
1977	301,400	4,400	1/	305,800
1978	303,600	6,600	1/	310,200

1/ Not available.

Source: Instituto Mexicano del Petroleo, Desarrollo y Perspectivas de la Industria Petroquimica Mexicana, Mexico, 1977.

Table B-5--Aromatic hydrocarbons: Mexican rates of duty, by tariff numbers

Item No.	Description	Duty rate (ad valorem equivalent)
29.01 B 001	Benzene	5% ad val.
B 003	Toluene	5% ad val.
F 004	Xylenes (including para-xylene)	5% ad val.
F 005	Naphthalene	5% ad val.

Source: Informacion advanera De Mexico, S.A., Tarifa Del Impuesto General De Importacion, Mexico, 1978.

Table B-6--Selected miscellaneous acylic organic chemicals, Mexican tariff rates, by individual chemicals

Tariff item No.	Description	Duty rate
2927 A 004	Acrylonitrile	5% ad val
2923 A 001	Monoethanolamine	40% ad val
2923 A 002	Diethanolamine	40% ad val
2923 A 004	Triethanolamine	30% ad val
2922 A 001	Methylamine	10% ad val
2922 A 002	Dimethylamine	10% ad val
2922 A 003	Trimethylamine	10% ad val
2914 A 999*	Acetic acid	5% ad val
2914 A 076*	Acetic anhydride	50% ad val
2911 A 017	Formaldehyde	30% ad val
2913 A 013	Acetone	60% ad val
2913 A 999*	Methyl ethyl ketone	5% ad val
2913 A 999*	Methyl isobutyl ketone	5% ad val
2904 A 001*	Methanol	5% ad val
2208 A 001*	Ethanol	35% ad val
2208 A 002*		
2904 A 003*	Isopropanol	10% ad val
2904 A 015*	1-Butanol	10% ad val
2904 A 016*	2-Butanol	10% ad val
2904 A 027	Ethylene glycol	60% ad val
2904 A 033	Propylene glycol	60% ad val
2914 A 027	Methyl acetate	40% ad val
2914 A 028	Vinyl acetate	60% ad val
2914 A 999*	Ethyl acetate	5% ad val
2914 A 999*	Propyl acetate	5% ad val
2914 A 999*	Butyl acetate	5% ad val
2914 A 039	Ethyl acrylate	40% ad val
2914 A 040	Butyl acrylate	40% ad val
2914 A 042	Methyl methacrylate	60% ad val
2909 A 001*	Ethylene oxide	5% ad val
2909 A 002*	Propylene oxide	5% ad val
2902 A 001-	Halogenated hydrocarbons	5% ad val
2902 A 999*		
2931 A 002-2931 A 006	Organo-sulfur compounds	10% ad val
2931 A 013-2931 A 014		
2934 A 006*	Organo-silicon compounds	10-30% ad val
2934 A 010		
3814 A 001	TEL preparations	30% ad val

* denotes part of a "basket" classification.

Source: Government of Mexico, Tarifa del Impuesto General de Importacion.

Table B-7 --Miscellaneous acyclic organic chemicals: Mexican production, imports, exports, and apparent consumption, by chemicals, 1975-79

(In thousands of pounds)

Year	Production	Imports	Exports	Apparent consumption
	Total sector			
1975	938,370	204,905	1,124	1,142,151
1976	1,110,598	328,681	13	1,439,266
1977	1,136,568	390,878	4,795	1,522,651
1978	1,399,769	493,333	71,854	1,821,248
1979	1,650,587	514,944	102,146	2,063,385
	Acrylonitrile			
1975	43,973	23,395	1,124	66,244
1976	48,578	34,453	0	83,031
1977	42,615	56,372	0	98,987
1978	42,203	74,083	0	116,286
1979	51,352	1/ 67,000	0	1/ 118,352
	Ethanolamines			
1975	7,337	0	0	7,337
1976	10,132	0	0	10,132
1977	11,351	0	0	11,351
1978	12,714	0	0	12,714
1979	13,858	0	0	13,858
	Ethylenediaminetetraacetic acid, sodium salt			
1975	1/ 1,400	0	0	1/ 1,400
1976	1,627	0	0	1,627
1977	1,821	0	0	1,821
1978	2,028	0	0	2,028
1979	2,249	0	0	2,249

1/ Estimated.

Table B-7--Miscellaneous acyclic organic chemicals: Mexican production, imports, exports, and apparent consumption, by chemicals, 1975-79--Continued

(In thousands of pounds)

Year	Production	Imports	Exports	Apparent consumption
	Acetic acid			
1975	63,016	1,164	0	64,180
1976	75,986	1,400	0	77,386
1977	79,615	4	353	79,266
1978	125,927	0	377	125,550
1979	149,853	0	0	149,853
	Acetic anhydride			
1975	36,000	10	0	36,010
1976	44,749	0	0	44,749
1977	48,462	0	0	48,462
1978	56,246	0	0	56,246
1979	60,183	0	0	60,183
	Acetaldehyde			
1975	70,024	20,181	0	90,205
1976	102,657	9,068	0	111,725
1977	97,095	30,657	0	127,752
1978	99,871	36,806	0	136,676
1979	107,503	1/ 50,000	0	157,503
	Formaldehyde			
1975	71,826	0	0	71,826
1976	87,302	0	0	87,302
1977	93,475	0	0	93,475
1978	105,642	0	0	105,642
1979	124,658	0	0	124,658

1/ Estimated.

Table B-7-Miscellaneous acyclic organic chemicals: Mexican production, imports, exports, and apparent consumption, by chemicals, 1975-79--Continued

(In thousands of pounds)

Year	Production	Imports	Exports	Apparent consumption
	Acetone			
1975	17,895	311	0	18,206
1976	32,935	2,101	13	35,023
1977	34,921	143	0	35,064
1978	46,658	597	33	47,222
1979	49,924	1/ 782	1/ 0	1/ 50,706
	Methyl ethyl ketone			
1975	1/ 11,500	1/ 500	0	1/ 12,000
1976	1/ 11,500	922	0	1/ 12,422
1977	1/ 11,500	2,407	0	1/ 13,907
1978	1/ 11,500	4,072	0	1/ 15,572
1979	1/ 11,500	5,624	0	1/ 17,124
	n-Butanol			
1975	6,614	0	0	6,614
1976	8,818	0	0	8,818
1977	11,023	0	0	11,023
1978	13,228	0	0	13,228
1979	17,637	0	0	17,637
	2-Ethylhexanol			
1975	18,104	243	0	18,347
1976	29,376	140	0	29,516
1977	34,756	0	0	34,756
1978	39,418	485	0	39,903
1979	48,484	0	0	48,484

1/ Estimated.

Table B-7--Miscellaneous acyclic organic chemicals: Mexican production, imports, exports, and apparent consumption, by chemicals, 1975-79--Continued

(In thousands of pounds)

Year	Production	Imports	Exports	Apparent consumption
	Isopropanol			
1975	17,086	12,758	0	29,844
1976	7,948	31,464	0	39,412
1977	8,318	30,368	0	38,576
1978	3,148	47,319	0	50,468
1979	14	1/ 57,500	0	1/ 57,514
	Methanol			
1975	69,646	13,084	0	82,730
1976	71,043	85,040	0	156,053
1977	72,968	80,175	0	153,142
1978	226,545	34,504	67,901	193,148
1979	383,647	1/ 400	102,146	281,901
	Methyl methacrylate			
1975	0	12,516	0	12,516
1976	4,806	12,531	0	17,337
1977	11,243	4,817	0	16,060
1978	15,280	3,091	0	18,371
1979	16,655	1/ 2,000	0	1/ 18,655
	Vinyl acetate monomer			
1975	22,965	127	0	23,092
1976	28,338	245	0	28,583
1977	30,900	0	0	30,900
1978	37,846	743	0	38,589
1979	1/ 45,000	0	0	1/ 45,000

1/ Estimated.

Table B-7.--Miscellaneous acyclic organic chemicals: Mexican production, imports, exports, and apparent consumption, by chemicals, 1975-79--Continued

(In thousands of pounds)

Year	Production	Imports	Exports	Apparent consumption
	Acetate esters, other than vinyl acetate			
1975	13,047	838	0	13,885
1976	21,385	0	0	21,385
1977	23,810	0	0	23,810
1978	26,676	0	0	26,676
1979	29,762	0	0	29,762
	Ethylene glycol			
1975	98,934	12,787	0	111,720
1976	92,708	68	0	92,776
1977	108,570	0	4,442	104,128
1978	124,276	181	3,543	120,913
1979	126,761	1/ 15,238	0	1/ 142,000
	Ethylene oxide			
1975	60,179	42,350	0	102,529
1976	53,902	37,139	0	91,041
1977	59,185	64,804	0	123,989
1978	57,891	77,855	0	135,746
1979	53,567	1/ 76,500	0	1/ 130,067
	Propylene oxide			
1975	0	37,478	0	37,478
1976	0	44,092	0	44,092
1977	0	48,501	0	48,501
1978	0	55,115	0	55,115
1979	0	1/ 77,000	0	1/ 77,000

1/ Estimated.

Table B-7 --Miscellaneous acyclic organic chemicals: Mexican production, imports, exports, and apparent consumption, by chemicals, 1975-79--Continued

(In thousands of pounds)

Year	Production	Imports	Exports	Apparent consumption
	Chlorofluorocarbons			
1975	12,978	2,736	0	15,714
1976	14,131	0	0	14,131
1977	15,542	0	0	15,542
1978	17,108	0	0	17,108
1979	18,475	0	0	18,475
	Ethylene dichloride			
1975	197,444	2,205	0	199,649
1976	230,050	28,660	0	258,710
1977	216,503	30,864	0	247,367
1978	212,649	33,069	0	245,718
1979	214,505	1/ 30,000	0	1/ 244,505
	Vinyl chloride monomer			
1975	98,402	22,222	0	120,624
1976	132,627	41,358	0	173,985
1977	122,895	41,766	0	164,661
1978	122,915	125,413	0	248,328
1979	1/ 125,000	1/ 132,900	0	1/ 257,900

1/ Estimated.

Source: National Chemical Industry Association (ANIQ), Annuario de la Industria Quimica Mexicana.

Table B-8 --Selected acyclic organic chemicals: Estimated Mexican production capacities in 1980 and projected production capacities in 1985, by chemicals

Chemical	Estimated capacity (1980)	Projected capacity (1985)
Basic:		
Acetaldehyde	317.5	537.9
Acrylonitrile	163.1	383.6
Ethylene dichloride	1,073.6	1,073.6
Ethylene oxide	282.2	723.1
Isopropanol	52.9	52.9
Methanol	401.2	401.2
Propylene oxide	-	132.3
Vinyl chloride	595.2	595.2
Secondary:		
Acetic acid	145.5	178.4
Acetic anhydride	54.0	71.4
Acetone	60.1	73.3
Ethylene glycol	388.0	498.2
2-Ethylhexanol	39.7	61.7
Formaldehyde	162.3	184.3
Methyl methacrylate	26.5	37.5
Propylene glycol	1/ 39.7	132.3
Vinyl acetate	39.7	55.1

1/ Overlaps with ethylene glycol production capacity.

Source: National Chemical Industry Association (ANIQ), Annuario de la Industria Quimica Mexico; IMP, Desarollo y Perspectives de la Industria Petroquimica Mexicana, 1st Edition, 1977.

Table B-9 --Cyclic Intermediates: Mexican rates of duty, by tariff numbers

Item No.	Description	Duty rate (ad valorem equivalent)
29.01 C 004	Cyclohexane	5% ad val.
F 002	Styrene	5% ad val.
29.06 A 001	Phenol	60% ad val.
29.13 A 008	Cyclohexane	10% ad val.
29.15 A 009	Terephthalic acid	60% ad val.
A 019	Dimethyl terephthalate	60% ad val.
A 023	Phthalic anhydride	40% ad val.

Source: Informacion Advanera de Mexico, S.A., Tarifa del Impuesto General de Importacion, Mexico, 1978.

Table B-10--Pesticides: Mexican rates of duty, by tariff numbers

Item No.	Description	Duty rate (ad valorem equivalent)
38.11 A 001	Insecticides	10% ad val.
A 002	Herbicides	10% ad val.
A 003	Fungicides	10% ad val.

Source: Informacion advanera de Mexico, S.A., Tarifa Del Impuesto General De Importacion, Mexico, 1978.

Table B-11-Pesticides: Mexican production, imports, exports, and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	33,976	19,868	1,991	51,853
1976	1/	1/	1/	
1977	1/	5,988	2,811	2/ 46,826
1978	55,125	1/	1/	
1979	48,510	1/	1/	
	Value (1,000 dollars)			
1975	29,377	30,058	2,140	57,295
1976	1/	1/	1/	
1977	1/	16,313	1,861	
1978	1/	1/	1/	
1979	1/	1/	1/	
	Unit value (per pound)			
1975	$0.86	$1.51	$1.07	-
1976				-
1977		2.72	.66	-
1978				-
1979				-

1/ Not available.
2/ Estimated.

Source: Instituto Me icano Del Petroleo, Desarrollo y Perspectivas ela Industria Petroquimica Mexicana, Mexico, 1978, pp. 196-197; Publicaiones Ejectivas De Mexico, S.A., Analysis-79, LA Economia Mexicana, Mexico, 1980, p. 277; and S.I.C.-Direccion General de Estadistia, Anuarios Estadisticos de Comerico Exterior, Mexico, 1979, pp. 135 and 503.

Table B-12--Fungicides: Mexican production, imports, exports, and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	3,316	956	576	3,696
1976	1/	1/	1/	
1977	1/	829	622	
1978	1/	1/	1/	
1979	2/ 4,000	1/	1/	
	Value (1,000 dollars) 2/			
1975	1/	2,518	640	
1976	1/	1/	1/	
1977	1/	4,675	558	
1978	1/	1/	1/	
1979	1/	1/	1/	
	Unit value (per pound)			
1975		$2.63	$1.11	-
1976				-
1977		5.64	.90	-
1978				-
1979				-

1/ Not available.
2/ Estimated.

Source: Instituto Mecicano Del Petroleo, Desarrollo y Perspectivas Dela Industria Petroquimica Mexicana, Mexico, 1978, p. 196-197; Publicaciones Ejecutivas De Mexico, S.A., Analysis-79, LA Economia Mecicana, Mexico, 1980, p. 277; and S.I.C.-Direccion General de Estadistica, Anuarios Estadisticos de Comercio Esterior, Mexico, 1979, pp. 135 and 503.

Table B-13 --Herbicides: Mexican production, imports, exports, and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	5,276	1,216	309	6,183
1976	1/	1/	1/	
1977	1/	637	46	
1978	2/ 6,000	1/	1/	
1979	1/	1/	1/	
	Value (1,000 dollars)			
1975	1/	2,010	702	
1976	1/	1/	1/	
1977	1/	1,463	39	
1978	1/	1/	1/	
1979	1/	1/	1/	
	Unit value (per pound)			
1975		$1.65	$2.27	-
1976				-
1977		2.30	.85	-
1978				-
1979				-

1/ Not available.
2/ Estimated.

Source: Instituto Mecicano Del Petroleo, Desarrollo y Perspective Dela Insustria Petroquimica Mexicana, Mexico, 1978, p. 196-197; Publicaciones Ejecutivas De Mexico, S.A., Analysis-79, LA Economia Mexicana, Mexico, 1980, p. 277; and S.I.C.-Direccion General de Estadistica, Anuarios Estadisticos de Comercio Exterior, Mexico, 1979, pp. 135 and 503.

Table B-14 --Insecticides: Mexican production, imports, exports, and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	20,891	18,514	1,106	42,351
1976	1/	1/	1/	
1977	1/	4,225	1,808	
1978	2/ 30,000	1/	1/	
1979	1/	1/	1/	
	Value (1,000 dollars)			
1975	1/	25,059	722	
1976	1/	1/	1/	
1977	1/	9,755	859	
1978	1/	1/	1/	
1979	1/	1/	1/	
	Unit value (per pound)			
1975		$1.35	$0.65	-
1976				-
1977		2.31	.48	-
1978				-
1979				-

1/ Not available.
2/ Estimated.

Source: Instituto Mexicano Del Petroleo, Desarrollo y Perspectivas Dela Industria Petroquimica Mexicana, Mexico, 1978, p. 196-197; Publicaciones Ejecutivas De Mexico, S.A., Analysis-79, LA Economia Mexicana, Mexico, 1980, p. 277; and S.I.C.-Direccion General de Estadistica, Anuarios Estadisticos de Comercio Exterior, Mexico, 1979, pp. 135 and 503.

Table B-15--Nitrogenous fetilizers: Mexican rates of duty, by tariffs numbers

	Description	Duty rate
28.16		
A 001	Ammonia, liquified	60% ad val.
A 003	Ammonium, hydroxide	35% ad val.
31.02	Mineral or chemical fertilizers, nitrogenous	Free
A 001	Ammonium nitrate	Free
A 002	Calcium nitrate	Free
A 003	Ammonium sulphate	Free
A 004	Sodium nitrate	5% ad val.
A 005	Urea	Free
A 999	Other	Free

Source: Information advanera De Mexico, S.A., Tarifa Del Impuesto General De Importacion, Mexico, 1978, and the Mexican Embassy.

Table B-16--Nitrogenous fertilizers: Mexican production, imports, exports and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (short tons)			
1975	1,055,365	96,660	4,549	1,147,476
1976	1,191,520	116,925	1/	1,308,445
1977	1,281,543	96,050	33,308	1,344,285
1978	1,969,059	94,793	738,675	1,325,177
1979				
	Value 1/			
1975				
1976				
1977				
1978				
1979				
	Unit value 1/			
1975				
1976				
1977				
1978				
1979				

1/ Not available.

Source: Secretaría de Programacion Y Persupuesto, La Industria Petrolera en Mexico, 1979.

Table B-17 --Ammonia: Mexican production, imports, exports and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (short tons)			
1975	883,365	1/	4,549	878,813
1976	953,404	1/	1/	953,404
1977	1,040,530	1/	33,308	1,007,222
1978	1,741,116	1/	738,675	1,002,441
1979				
	Value (1,000 U.S. dollars)			
1975	33,848	1/	1,504	32,344
1976	40,206	1/	1/	40,286
1977	65,138	1/	3,371	61,767
1978	108,142	1/	64,110	44,032
1979				
	Unit value (per short ton)			
1975	$38.32	1/	$330.62	-
1976	42.25	1/	1/	-
1977	62.60	1/	101.21	-
1978	62.11	1/	86.79	-
1979				

1/ Not available.

Source: Secretaria de Programacion y Persupuesto, La Industria Petrolera en Mexico, 1979.

Table B-18--Ammonium nitrate: Mexican production, imports, exports and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (short tons)			
1975	56,715	33,332	1/	90,046
1976	54,521	38,883	1/	93,404
1977	56,711	28,771	1/	85,482
1978	40,681	50,670	1/	91,351
1979				
	Value (			
1975				
1976				
1977				
1978				
1979				
	Unit value (			
1975				
1976				
1977				
1978				
1979				

1/ Not available.

Source: Associacion Nacional de la Industria Quimica, Anuario de la Inudstria Quimica Mexicana en 1978, Mexico, 1979.

Table B-19 -Ammonium sulfate: Mexican production, imports, exports and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (short tons)			
1975	115,289	63,328	1/	178,617
1976	183,595	72,042	1/	255,137
1977	184,303	67,279	1/	251,582
1978	187,262	44,123	1/	231,385
1979				
	Value (			
1975				
1976				
1977				
1978				
1979				
	Unit value (			
1975				
1976				
1977				
1978				
1979				

1/ Not available.

Source: Associacion Nacional de la Industria Quimica, Anuario de la Inudstria Quimica Mexicana en 1978, Mexico, 1979.

Table B-20--Synthetic rubber: Mexican rates of duty, by tariffs numbers

Item No.	Description	Duty rate
40.02	Synthetic rubber latex; pre-Vulcanized synthetic rubber latex; and synthetic rubber:	
A 001	2-Chlorobutadiene-1, 3, polymer	1/ 5% ad val.
A 002	Styrene-butadiene	1/ 5% ad val.
A 003	Nitrile	20% ad val.
A 004	Thioplasts	5% ad val.
A 999	Other	1/ 5% ad val.
40.02	Solid form:	
B 001	2-Chlorobutadiene-1, 3, polymer	5% ad val.
B 002	Polybutadiene	1/ 5% ad val.
B 003	Styrene-butadiene, except that contained in 40.02 B 010	40% ad val.
B 004	Ethylene-propylene	10% ad val.
B 005	Polybutadiene-acrylonitrile (Nitrile) containing less than 45 percent acrylonitrile	60% ad val.
	Polyisoprene	
B 006	Oil extended	60% ad val.
B 007	Other	1/ 5% ad val.
B 008	Thioplasts	5% ad val.
B 009	Butyl rubber not containing carbon black	5% ad val.
B 010	Styrene-butadiene containing 90 to 97 percent butadiene	5% ad val.
B 011	Polybutadiene-acrylonitrile (Nitrile) containing 45 percent or more acrylonitrile	5% ad val.
B 999	Other synthetic rubber	1/ 5% ad val.

1/ Advance permission of the Secretary of Commerce must be obtained before importing products described in this classification.

Source: Informacion advanera De Mexico, S.A., Tarifa Del Impuesto General De Importacion, Mexico, 1978.

Table B-21--Polyester textile filament: Mexican production, foreign trade, apparent consumption, and ratio of imports to consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity (1,000 pounds)				
1975	155,622	2,765	-	158,387	1.7
1976	152,094	1,438	4	153,528	0.9
1977	181,829	1,074	584	182,319	0.6
1978	180,029	975	77	180,927	0.5

Source: Annuario de la Industria Quimica Mexicana.

Table B-22- -Polyester staple fiber: Mexican production, foreign trade, apparent consumption, and ratio of imports to consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity (1,000 pounds)				
1975	39,000	926	-	39,926	2.3
1976	46,883	1,111	-	47,994	2.3
1977	59,566	1,109	-	60,675	1.8
1978	63,202	1,279	-	64,481	2.0

Source: Annuario de la Industria Quimica Mexicana.

Table B-23--Acrylic staple fiber: Mexican production, foreign trade, apparent consumption, and ratio of imports to consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity (1,000 pounds)				
1975	64,212	1,473	181	65,504	2.2
1976	79,001	1,762	3,850	76,913	2.3
1977	83,706	1,826	3,475	82,057	2.2
1978	102,588	2,179	4,864	99,903	2.2

Source: Annuario de la Industria Quimica Mexicana.

Table B-24.--Nylon textile filament: Mexican production, foreign trade, apparent consumption, and ratio of imports to consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity (1,000 pounds)				
1975	43,136	816	-	43,952	1.9
1976	53,525	611	-	54,136	1.1
1977	52,232	313	-	52,545	0.6
1978	58,810	1,409	-	60,219	2.3

Source: Annuario de la Industria Quimica Mexicana.

Table B-25--Nylon industrial filament: Mexican production, foreign trade, apparent consumption, and ratio of imports to consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity (1,000 pounds)				
1975	21,545	-	216	21,329	0.0
1976	26,021	-	1,658	24,363	0.0
1977	29,234	-	4,123	25,111	0.0
1978	32,422	220	1,881	30,761	0.7

Source: Annuario de la Industria Quimica Mexicana.

Table B-26 --Nylon staple fiber: Mexican production, foreign trade, apparent consumption, and ratio of imports to consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity (1,000 pounds)				
1975	1,158	306	-	1,464	20.9
1976	1,241	602	-	1,843	32.7
1977	1,354	829	-	2,183	38.0
1978	1,550	798	-	2,348	34.0

Source: Annuario de la Industria Quimica Mexicana.

Table B-27 --Polypropylene filament: Mexican production, foreign trade, apparent consumption, and ratio of imports to consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity (1,000 pounds)				
1975	4,357	445	1,830	2,972	15.0
1976	8,434	485	1,777	7,142	6.8
1977	10,692	551	3,603	7,640	7.2
1978	13,294	282	4,723	8,853	3.2

Source: Annuario de la Industria Quimica Mexicana.

Table B-28--Manmade fibers from petrochemicals: Mexican production, foreign trade, apparent consumption, and ratio of imports to consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity (1,000 pounds)				
1975	352,700	8,300	2,227	358,773	2.3
1976	373,500	7,500	7,289	373,711	2.0
1977	447,000	6,400	11,785	441,615	2.7
1978	479,300	11,000	11,545	478,755	2.3
1979	549,000	25,800	E 11,500	563,300	4.6

Source: Production and imports from Textile Organon, a publication of the Textile Economics Bureau, Inc.; exports from Annuario de la Industria Quimica Mexicana.

Table B-29 --Cellulosic manmade fibers, including filament yarn: Mexican production, imports, exports, and apparent consumption, 1975-79

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	66,600	900	8,800	58,700
1976	68,100	2,400	7,000	63,500
1977	60,600	7,200	8,400	59,400
1978	61,000	4,100	9,300	55,800
1979	60,400	8,000	8,600	59,800

Source: Textile Organon.

Table B-30 --Cellulosic manmade fibers, including filament yarn: Mexican imports, and exports, by types, 1975-79

Type	1975	1976	1977	1978	1979
	Quantity (1,000 pounds)				
Imports:					
Cellulosic yarn	200	200	200	400	700
Cellulosic staple	700	2,200	7,000	3,700	7,300
Total	900	2,400	7,200	4,100	8,000
Exports:					
Cellulosic yarn	4,400	3,300	3,100	2,700	2,400
Cellulosic staple	4,400	3,700	5,300	6,600	6,200
Total	900	2,400	7,200	4,100	8,000

Source: Textile Organon.

Table B-31--Synthetic resins and plastics materials: Mexican rates of duty, by tariffs numbers

Item No.	Description	Duty rate
	Polymerization and Copolmerization products	
39.02 A 003	Polyvinyl chloride	60% ad val.
A 006	Styrene copolymer emulsion	15% ad val.
A 010	Low-density polyethylene	15% ad val.
A 011	High-density polyethylene	30% ad val.
A 999	Other	10% ad val.
39.02 B 005	Polystyrene	15% ad val.
B 006	Pigmental polystyrene	40% ad val.
B 007	Styrene-vinyl and Styrenemaleic copolymers	50% ad val.
B 010	Polyvinyl chloride	10% ad val.
B 014	Polypropylene not containing lamp black	6% ad val.
B 026	Styrene-acrylonitrile	15% ad val.
B 027	Acrylonitrile-butadiene-Styrene copolymer	15% ad val.

Source: Informacion advanera De Mexico, S.A., Tarifa Del Impuesto General De Importacion, Mexico, 1978.

Table B-32--Synthetic resins and plastics materials: Mexican production, imports, exports, and apparent consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	654,517	174,382	3,969	824,930
1976	738,710	214,397	16,403	936,704
1977	752,531	284,572	17,141	1,019,962
1978	887,592	390,792	46,632	1,231,752

Source: Asociacion Nacional de la Industria Quimica, Anuario de la Industria Quimica Mexicana en 1978, Mexico, 1979.

Table B-33 --Synthetic resins and plastics materials: Average annual growth rate of Mexican production, imports, exports, and apparent consumption, by key resins and by an overall average, 1975-78

(In percent)

Product	Production	Imports	Exports	Apparent consumption
Polyethylene	0.1	41	1/	15.6
Polypropylene	2/	25	2/	3/ 25
Polystyrene	10.2	34	37	10.8
Polyvinyl chloride (PVC)	25.0	4/	151	13.5
Average, all resins	10.7	34	126	14.3

1/ Exports in 1978 only.
2/ No production or exports.
3/ Same as imports.
4/ Imports declined by about 74 percent overall from 1975-1978.

Table B-34--Polyethylene resins: Mexican production, imports, exports, and apparent consumption, 1975-78

Year	1/ Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	218,928	92,659	----	311,587
1976	206,620	115,878	----	322,498
1977	209,570	191,079	----	400,649
1978	219,788	261,315	12	481,091

1/ LDPE accounted for 100 percent of 1975-77 production; 97 percent of 1978 production.

Source: Asociacion Nacional de la Industria Quimica, Anuario de la Industria Quimica Mexicana en 1978, Mexico, 1979.

Table B-35--Polystyrene and styrene copolymers and terpolymers: Mexican production, imports, exports, and apparent consumption, 1975-78

Year	1/ Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	84,716	2,064	258	86,522
1976	91,673	849	55	92,467
1977	107,492	2,386	---	109,878
1978	113,341	4,979	662	117,658

1/ Polystyrene homopolymers represent about 95 percent of the annual output.

Source: Asociacion Nacional de la Industria Quimica, Anuario de la Industria Quimica Mexicana en 1978, Mexico, 1979.

Table B-36----Polyvinyl chloride (PVC) resins: Mexican production, imports, exports, and apparent consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	109,412	13,642	2,655	120,399
1976	148,183	16,621	15,459	149,345
1977	144,555	3,508	16,002	132,061
1978	215,283	3,579	43,004	175,858

Source: Asociacion Nacional de la Industria Quimica, Anuario de la Industria Quimica Mexicana en 1978, Mexico, 1979.

Table B-37 --Polypropylene resins: 1/ Mexican production, imports, exports, and apparent consumption, 1975-78

Year	Production	Imports	Exports	Apparent consumption
	Quantity (1,000 pounds)			
1975	-	58,141	-	58,141
1976	-	74,970	-	74,970
1977	-	82,859	-	82,859
1978	-	114,790	-	114,790

1/ Polypropylene will not be produced domestically until 1983 according to official Mexican sources.

Source: Asociacion Nacional de la Industria Quimica, Anuario de la Industria Quimica Mexicana en 1978, Mexico, 1979.

Table B-38.--Synthetic resins and plastics materials: Mexican ratio of imports to consumption, exports to production and imports to exports, 1975-78

Year	Ratio (percent) of--		
	Imports to consumption	Exports to production	Imports to exports
	Quantity		
1975	21.3	0.6	4,394
1976	22.9	2.2	1,307
1977	27.9	2.3	1,660
1978	31.7	5.3	838

Source: Compiled from data in table B-32

Table B-39----Polyethylene resins: Mexican ratio of imports to consumption, exports to production and imports to exports, 1975-78

Year	Ratio (percent) of--		
	Imports to consumption	Exports to production	Imports to exports
	Quantity		
1975	29.7	-	-
1976	35.9	-	-
1977	47.7	-	-
1978	54.3	1/	2,177,625

1/ Less than .05 percent.

Source: Compiled from data in table B-34

Table B-40 --Polystyrene and its copolymer and terpolymer resins: Mexican rates of imports, to consumption, exports to production and imports to exports, 1975-78

Year	Ratio (percent) of--		
	Imports to consumption	Exports to production	Imports to exports
	Quantity		
1975	2.4	0.3	800.0
1976	.9	.1	1544.6
1977	2.2	-	-
1978	4.2	.6	752.1

Source: Compiled from data in table B-35.

Table B-41 --Polyvinyl chloride (PVC) resins: Mexican ratio of imports, exports to production and imports to exports, 1975-78

Year	Ratio (percent) of--		
	Imports to consumption	Exports to production	Imports to exports
	Quantity		
1975	11.3	2.4	513.8
1976	11.1	10.4	107.5
1977	2.7	11.1	21.9
1978	2.0	20.0	8.3

Source: Compiled from data in table B-36.

Table B-42.--Other petrochemical derivitives: Mexican rates of duty, by tariff number

Item No.		Description	Range of duty rate
32.05	A	Synthetic organic dyestuffs:	
	A 001-A 072, A 999	Acidic azoic dyes	15%-20% ad val.
	A 001-A 002, A 999	Basic azoic dyes	20%-25% ad val.
	E 001-E 007, E 999	Direct azoic dyes	15%-20% ad val.
	F 001-F 013, F 999	Solvent azoic dyes	7%-25% ad val.
32.06	A	Organic pigments (color lakes and toners):	
	A 002	Concentrated dispersions in cellolose acetate	15% ad val.
	A 099	Other	25% ad val.
34.02	A	Compositions composed of oxyethylated polyalkyl-phenolformaldehyde and/or oxyethylated polyoxyproplylene:	
	A 004	Products of the condensation of ethylene oxide or propylene oxide with alkyles, phenols, or fatty alcohols	Free
	A 005	Sulpholeates and sulphoresinolates	0.10% ad val.
	A 010	Octene and iso-octene sulphonate sodium salt	7% ad val.
	A 019	Quaternary methyl polyethanolamine in aqueous solution	15% ad val.
	A 020	Iodo-nonylphenoxy poly(ethylene-oxy) ethanol complex	15% ad val.
	A 021	C_{12} to C_{18} chain hydrocarbon sodium sulphonates	20% ad val.
	A 023	Stearyl-dimethyl-benzylammonium chloride containing isopropanol, in the form of an aqueous solution	25% ad val.

Source: Informacion advanera De Mexico, S.A., Tarifa Del Impuesto General De Importacion, Mexico, 1978.