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Technical Paper: Petrochemical Progress in the
Development of the Petrochemical Industries in
Low Income Countries

P.I.U. SYMP. 4/22

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DEVELOPMENT OF THE PETROCHEMICAL INDUSTRY

IN THE 1980s

by

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This industry starting from hydrocarbons is taking a top place in Ecuador and it is hoped that the installation of basic manufacture in this line of business will be carried out in the near future. The chief outlets for petrochemicals already established in Ecuador are:

1. Nylon fibre

Year	Demand Consumption in tons weight
1970	1,200
1973	1,700

In 1969 the total consumption of this group of fibres could be broken down as follows:

Type	Quantity in kg
Nylon 6/6	630,240
Nylon 6	320,680
Marlon	80,320
Others	49,530
	<hr/> 1,080,870

The importance of nylon for textile use: tyre cords and fishing nets absorb 94% of the imports of this product. The breakdown together with the projection of demand is shown in the table below:

All figures in tons				
Year	Yarn, Fibre and Cloth	Tyre cords	Nets, fishing lines etc.	Total
1969	589	349	161	1,090
1970	609	374	224	1,207
1971	630	412	341	1,383
1972	651	453	457	1,561
1973	673	498	556	1,727

2. Plastic sheets

The demand for plastic sheets during the year 1968 was 480 tons weight with a production capacity of 610 tons. Production capacity in 1969 is estimated at 800 tons. It is further anticipated that the demand for plastic sheets will reach 650 tons by 1973.

In practice Ecuador produces sheets as follows:

- (a) from polystyrene which is consumed to the extent of 20 tons for the production of tumblers, trays, linings for refrigerating cabinets etc.
- (b) from acrylic polymers consumed to the extent of some 10 tons and used for the manufacture of indicators and luminous signs.
- (c) from PVC to the extent of 10 tons which is used for the tacking of carpets, for book binding, plastic cloths, etc.
- (d) from polypropylene to the extent of 20 tons per annum for the production of baths, wash basins etc.
- (e) from low density polyethylene with an annual consumption of about 15 tons.

During the year 1968 there had been installed a capacity of 100 tons for furniture lining (artificial leathers, seats for motor cars, wooden floor coverings, table cloths, prints, stickers, signs, waterproofs, bath curtains, maps, letter films, etc.).

Projections for the demand of these sheets (estimated)

Year	tons
1969	370
1970	410
1971	441
1972	471
1973	499

Projection of the consumption of pressed sheets

Type of product	tons				
	1969	1970	1971	1972	1973
Signs	14	14	14	14	14
Refrigeration	46	53	61	70	80
Illumination	11	12	13	14	15
Others	50	45	45	41	38
	121	124	133	139	147

National production satisfies mainly the demand for sheets of polyethylene, PVC, polypropylene and to a less extent of acrylic and polyethylene.

c. Fertilizers

The minimum demand for products in terms of nutrients will be

Type	in tons	
	1970	1973
nitrogen	5,400	6,200
phosphorus	7,250	8,600
potassium	4,900	5,200
	17,550	20,000

The production of fertilizers in Ecuador was started in the middle of 1960 by the production of sulphuric acid starting from sulphur. Other processes are being installed for the manufacture of ammonium sulphate, chloroformic acid, potassium phosphate and superphosphate.

As it has been previously indicated, the petrochemical industry in Ecuador is in its infancy and is just beginning the process of installation and development.

Almost all types of products consumed in the country as well as starting material are of foreign origin. At the time when the oil crisis and the start of crude oil into production, which will take place in January 1974, the country will have available its own source of raw material for the development of a petrochemical industry which provides the country with products to meet its demand and at the same time to export to other parts of the excess in the Latin American Common Market.

Possibilities for Ecuador
(Petrochemical products)

Products	Uses	Raw materials	Origin of the raw materials
Polyester	fibres films	terephthalic acid ethylene glycol	Colombia
unsaturated polyester resins	thermosetting materials boards, sheets carriage bodies boats, etc.	maleic anhydride phthalic anhydride polyalcohols (glycol) styrene	Chile
Nylon 6	textile fibres ropes, films moulded plastic articles	caprolactam	Venezuela Colombia or Chile
Caprolactam	raw material for nylon 6	cyclohexane phenol, toluene aniline adipic acid	Venezuela Colombia or Chile
Alkyd resins	paints, lacquers adhesives	glycol, glycerine vegetable oil, anhydride	local or Chile
Formaldehyd. resins from phenol urea melamine aniline	adhesives and glues (plywood) thermosetting moulding powders, articles for domestic use, electrical goods blocks, sheets, foils, etc.	formaldehyde phenol urea melamine aniline	Colombia
Epoxy resins	adhesives and glues for joining metals, casting resins and moulding resins	phenol acetone epichlorohydrin	
Polyacrylonitrile	textile fibres	acrylonitrile (vinyl acetate methyl acrylate)	Chile
Polyvinylacetate emulsion	glues, paints	vinyl acetate	Chile

Possibilities for Ecuador (cont'd)

Product	Uses	starting material	origin of starting material
Polyvinylchloride emulsion	paints	vin chloride (+ vinylacetate)	Venezuela Chile
Cellulose acetate	plastic articles sheets films fibres lacquers paints	cellulose acetic acid acetic anhydride	Chile Chile (local) Chile
Cellulose nitrate	(celluloid) cellulose explosives	cellulose nitric acid	Chile Colombia (local)
Cellulose acetate butyrate	coloured plastic articles, pipes particularly for oil - gas	cellulose acetic acid butyric acid	Chile Chile (local)
Diocetylphthalate (DOP)	plasticisation of PVC	cetyl alcohol phthalic anhydride	Chile Chile
Dodecylbenzene	detergents	propylene benzene	local Colombia
Polypropylene	plastic articles (replacing polyethylene) films, fibres	propylene	local
Butylalcohol	solvent, raw materials	molasses	local
Acetic acid	raw material	ethylalcohol	local
Acetone	solvent	molasses	local
Ethyl acetate	solvent	ethyl alcohol acetic acid	local
Butyl acetate	solvent	butyl alcohol acetic acid	local local
Ammonia	raw material (fertilizers)	natural gas refinery gas kerosene, fuel oil	local
Nitric acid	raw material	ammonia	local (Colombia)
Ammonium nitrate	fertilizers explosives	ammonia nitric acid	local (Colombia) local (Colombia)
Ammonium sulphate	fertilizers	ammonia sulphuric acid	Colombia (local) local
Urea	fertilizers	ammonia carbon dioxide	local local

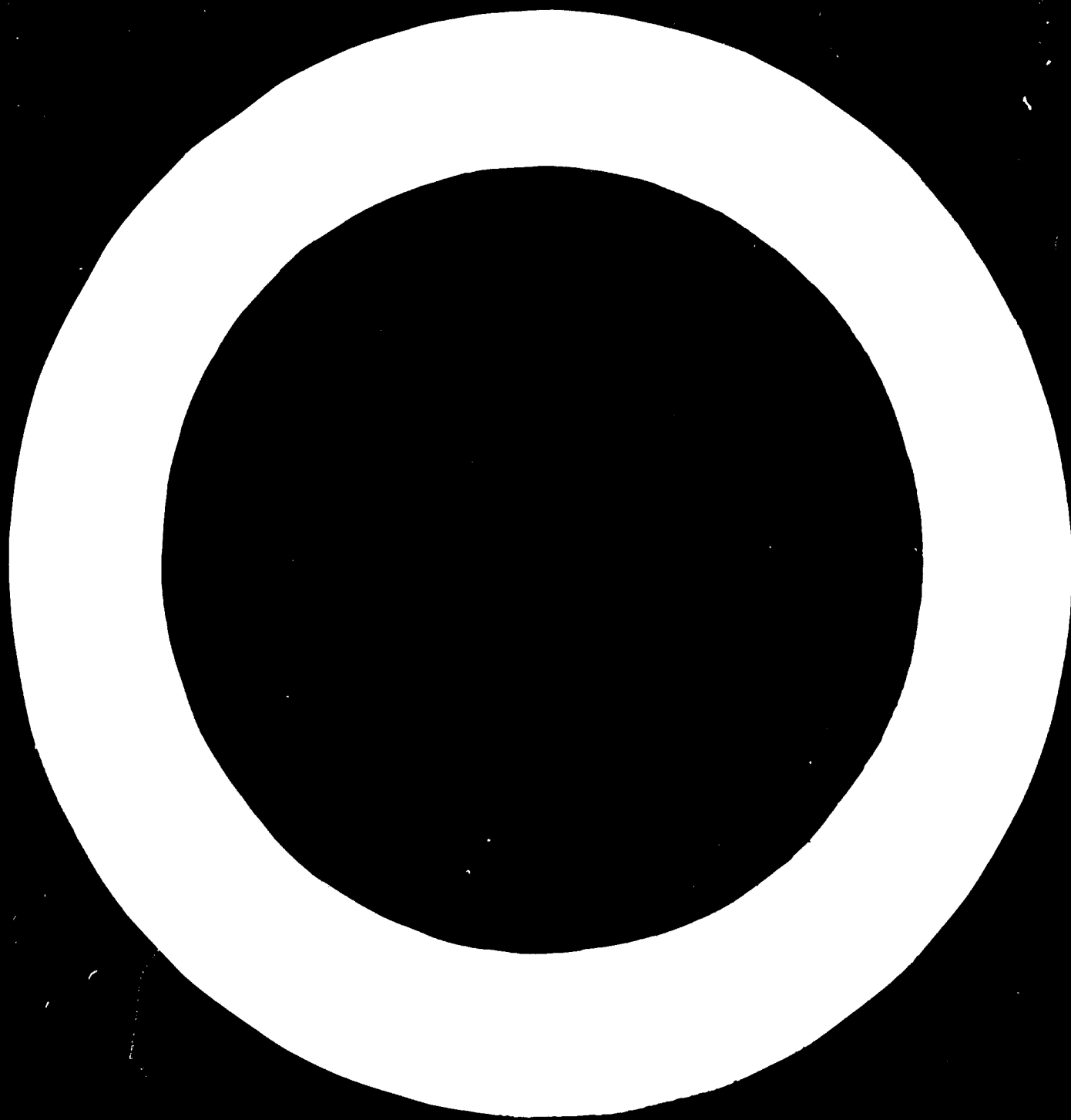
Source: National Council of Planning and Co-ordination

ECUADOR MARKET FOR PRODUCTS

PETROCHEMICAL PRODUCTS

(figures in tons)

Product	Uses	Consumption		Increase %
		1966	1968	
		1969	1970	1971
Polyvinylchloride (PVC)	moulding - extrusion processes in the plastics industry Paint industry when in emulsion form	1500	1700	13.33
Polyvinyl acetate (PVA)	Wood-paper industry as an adhesive Textile auxiliary and in various paint formulations	300	400	33.33
Urea formaldehyde	Plywood industry (adhesives) and a small proportion for plastics	312	406	30.00
Ammonia	production of fertilizers	6000		
Polyethylene low density	established for food container and miscellaneous articles	2000	2700	100.00
Polyethylene high density	producing moulded articles with good resistance to heat	100	400	25.93
Polystyrene, crystal high impact	producing moulded articles for packaging and refrigeration parts	590	360	300.00



EQUATOR MARKET FOR PRODUCTS, PHARMACEUTICAL PRODUCTS (continued)

Product	Uses	Consumption		1970	1971	Increase %
		1966	1968			
Polypropylene	production of finished articles by injection and other moulding manufacture of wrappings	190	228	1170		20.0
Alkylates (dodecyl, trilceyl benzene)	manufacture of detergents	330				245.00
Synthetic rubber	production of tyres	290	305			12.00
Carbon black	giving to rubber a greater resistance to abrasion	886		1170		32.00
Rubber softening agents	Increasing the absorption of carbon black by the rubber	225		300		33.00
Solvents	extractive chemical industry vegetable oils and pyrethrum	450		630		40.00
Alkyd resins	in paints	120	220			83.00

Source: COMDES



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