BRAZILIAN PETROCHEMICAL INDUSTRY : FACTORS OF INVESTMENT

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GENERAL SURVEY OF THE BEGINNING OF THE PETROCHEMICAL INDUSTRY IN BRAZIL

The petrochemical industry in Brazil only found real conditions for implantation after the construction of the "Refinaria Presidente Bernardes" in 1954, in the vicinity of Santos, State of São Paulo. To attend this purpose, the cracking low pressure process was employed, foresseing a larger production of residual gas, a raw material in the petrochemical industry.

This was the first big iniciative of the Government in creating in the petroleum refining field a plant with the capacity of 70 000 daily barrils (today with 120 000 b/d) aiming principally at the market of São Paulo. Before the instauration of the "Refinaria Presidente Bernardes", there existed a small governamental refinery that started with 5000 b/d and augmented shortly afterwards to 10 000 b/d (Refinery of Mataripe), in the State of Bahia, right in the Brazilian petroleum producing area.

The organ of the Brazilian government responsible for the entertaining of these enterprises was the "Conselho Nacional do Petróleo" (National Petroleum Board) created in April 29th, 1938 with the purpose of establishing a general petroleum policy in Brazil and in coordinating the development of its petroleum industry. Substitutuing inchoate private iniciatives it was responsible for a large scale petroleum production in the country. The constitution of this executive group consisted of a Presidente, nominated by the President of the Republic and representatives of the various State

Departments such as: Ministry of War, Airforce, Ministry of Financ Ministry of Agriculture, Ministry of Labor, and, Ministry of Industry and Commerce.

In October 3rd, 1953 - PETROBRÁS - Petróleo Brasileiro S.A was created instituing, thus, a monopolium in the land for the production and refining of petroleum. Thus, there was established the following express monopolys of PETROBRÁS:

1 - Monopoly of research and production of petroleum and other fluid hydrocarbons.
2 - Monopoly of refining
3 - Monopoly of maritime transport of petroleum and by products, as well as transport by means of pipelines, of petroleum by products and rare gases.

The monopoly was to be enforced by the "Conselho Nacional do Petróleo" (Petroleum National Board), however, since the above activities were taken up by Petrobrás, which also absorbed a number of the Board's most representative technicians, this organ remained significant only as an executive centre for orientation and fiscalization, having the following principle activities:

1 - Authorize, regulate and control the importation and exportation as well as the construction of pipelines; the distribution and commercialization of petroleum and its by products within national bounderies.
2 - Authorize the installation of refineries, as well as the establishment of its capacities, localization, nature and quantity of the products.
3 - Determine sales prices of the refined products.
4 - Authorize concessions for the research and industrialization of petroleum, gases, betuminose and pyrobetuminose rocks.

5 - Propound iniciatives to the Government in the sense of incentivating the industries of distilation, betuminose and pyrobetuminose rocks and solid fuels.

6 - Propound duties and taxes on petroleum derivates.

However with time, part of these functions were transfered to Petrobrás, since the Conselho Nacional do Petróleo dispersed itself technicaally and administratively in other directions, loosing great part of its force as an organ of orientation and fiscalization in the petroleum policy. Today the Brazilian Government intends the extinction of this executive group.

The Governamental decree that institutionalized the monopoly for the refining of petroleum maintained, however, the concessions already given before the date of the decree for the three refineries of low capacity already in existence, belonging to private enterprises without the allowence however, of an expansion beyond that size and capacity already existant.

Thus it was given the CNP the responsability of the signing of contracts for the construction of the "Refinaria Presidente Bernardes", in 1949, as well as the construction of a plant of nitrogenate fertilizers in 1952, employing the refineries residual gases as raw material and producing subsequently the first brazilian petrochemical product, namely, anhydric ammonia. In 1953 this enterprise and the refinery of Mataripe were passed into the charge of Petrobrás.

April 20 th, 1954, the CNP, recognizing the necessity of promoting the expansion of the Petrochemical Industry, lowered a resolution leaving as much as possible, the field open to private iniciative.

At this time, on the side of the official circles, there was the preocupation of releasing the governamental centers from the overwork required by this type of industrial implantation, highly

specialized and diversified in its technology, and which requires as well, knowledge of commercialization for which the brazilian technicians had not the due experience.

The whole of the attention and the effort of the government was turned towards the petroleum area, a point turned sensible not only due to the emotional impact caused by the popular interest and campaign preceeding the creation of the State Monopoly, but also according to reasons of security which were drawing the attention of the military areas.

Thus began the petrochemical industry in Brazil, arising in São Paulo in the early 50's, having as divergent point the "Refinaria Presidente Bernardes" and, as a whole, conscquence of foreign private iniciative.

In January 3rd, 1957, the CNP issued another resolution which would practically define the tracks for the brazilian petrochemical Industry. Preocupated in avoiding the establishment of monopolys which could arise in this petrochemical industry when open to private undertakings it resolved that Petrobras should pursue industrial and commercial activities in the petrochemical field to guarantye the production of basic raw materials as well as essencial products. Thus, closing the 50's the petrochemical Field was delineated, having Petrobras as furnisher of raw material and the private industry transforming these into consumption goods. In this resolution of the CNP, the raw materials for the petrochemistry were defined as methane, ethane, propane, butane, ethene, xilene and synthesis gas (a mixture of carbon monoxide and hydrogen). The essential products were: methanol, ammonia, nitric acid, lead, tetraethyl, butadiene, styrene and synthetic rubber.

The following industrial realizations marked the 50's in the Brazilian petrochemistry.

1 - Petrobras Fertilizer Plant: 90 t/day of ammonia; 34 t/day of ammonium nitrate and t/day of nitrocalcium (mixture of ammonium nitrate and calcarium). Production begin - 1958.

2 - Petrobrás - Ethylene Unit with a daily capacity of 58 tons. Production begin - 1958.

3 - Petrobrás - Propylene Unit with a capacity of 30 t/day Production begin 1959.

4 - "Companhia Brasileira de Estireno" (Koppers - Firestone-Huels). Styrene production begin in 1957 with a capacity of 5400 t/year, augmented shortly afterwards to 11000 t/year.

5 - "Companhia Petroquímica Brasileira" (Columbia Carbon - Celanese Corp). Production begin in 1958, with a capacity of 20 000 t/year of carbon black.

6 - Union Carbide do Brasil. Production begin in 1958 with 4500 t/year of polyethelene.

7 - "Adesivos e Laticínios Brasil - América" (Borden International). Production begin in 1959 with a capacity of 8200 t/year of methanol, utilizing fuel oil as feedstock.

8 - Petroclor (Solvay) - Production begin in 1959 with, 3 000 t/year of polyethelene.

9 - "Cia. Química Rhodia Brasileira (Rhonne Poulenc). Production begin in 1959 with 3 000 t/year of acetone starting from propylene.

10 - "Indústria Brasileira de Enxôfre"(an enterprise connected with Refinaria União, constituted by brazilian private investment capital). Production begin in 1960 with a daily capacity of 20 tons sulphur starting from refinery residual gases.

In 1961, the "Refinaria Duque de Caxias" has its start-up in Rio de Janeiro with a capacity of 100 000 barrils per day. Along side this refinery was installed, in 1962, the second petrochemical unit of Petrobras, a plant for the production of synthetic rubber, with an annual capacity of 40 000 tons of SBR rubber using imported styrene and butadiene.

At about the same time begins the construction of "Companhia de Carbono Coloidal" (Phillips Petroleum), having a production capacity calculated to 15 000 t/year of carbon black, and located in the vicinity of the Mataripe Refinery, in the State of Bahia, which at its turn was ampliating to a 45 000 BP/D capacity. This constituted the first petrochemical undertaking made in the brazilian Northeast.

In the following year, having a french group interested itself in obtaining an allotment of natural gas to use in producing fertilizers in Bahia, the Directory of CNP resolved, almost as a consequence of this iniciative, to create a petrochemical complex in Bahia (Conjunto Petroquímico da Bahia - COPEB), consituted of an ammonia plant to 200 t/day and another unit of urea with a 250 t/d capacity, recommending Petrobras to overtake the a iniciative.

Resuming, what can be seen is that between 1959 and 1964 there were, in fact, only two undertakings in the course of the petrochemical industry.

Petrobras had no interest in furnishing means for the fabrication of basic raw materials or even for the construction of petrochemical units. This can be understood when a general overlook into the constitutional phylosophy of the company is taken. An enterprise, whose aim is set on the spirit of monopoly cannot adapt itself easily to a new mentality of commerce and competition. And besides this, since its constitution it was believed that a state

monopoly would achieve its full destiny and potenciality when a self-suficiency of petroleum was attained. The popular campaign's slogans which anteceeded the acceptance of the state monopoly, marked definitively the policy of the enterprise, tying with it technicians and executives. The wide spread idea that the discovery of large petroleum reserves would bring the national redemption, forced all attention and concentration upon the State's enterprise.

However, this was not the sole reason explaining the lack of interest in the growth of the petrochemistry. The administrative structure had maintained itself rigid, lacking adaptation to the enterprise's growth, blocking reform and iniciatives and centralizing the executive capacities. There lacked an enterprising point of view and a know how of investment useing loan capital. All the means for investment were taken from the company 's own funds.

On the other hand, private iniciative had not enough security to be able to assume the political and economical risks of such an undertaking. And as a result of this situation the petrochemical industry, which shyly started in 1950 saw pratically no advance in the first half of the 60's.

FACTORS WHICH INFLUENCED THE RENEWAL OF INVESTMENTS IN THE BRAZILIAN PETROCHEMISTRY

In 1964, with the political turn which occurred in the country, there arose two governamental decrees which had a significant role in the renewal of investments in the petrochemical industry.

The first reinforced the 1954 and '57 orientations of the Conselho Nacional do Petróleo referent to the participation of private interest and Petrobras in the petrochemical industry. The second created a new organ in the Industrial and Commercial State Department, namely GEIQUIM (Executive Group for the Chemical Industry) which consisted of representatives of the following governamental entities:

Ministry of Industry and Commerce, Ministry of Planning, Ministry of Agriculture, Ministry of Health, Internal Affaires State Department Ministry of Mines and Energy, Ministry of War, Ministry of Finance, "Banco Nacional do Desenvolvimento Econômico (National Bank for Economic Development)", "Banco Central" (Central Bank), Port Policy Board, Bank of Brasil's Department for External Commerce and Agricultural and Industrial Credit.

A project with GEIQUIM's approval guarantees the following iniciative of exchange, fiscal, credit and tarif nature:

1 - Importation facilities for equipments.

2 - Absense of import taxes for equipments with no brazilian similar.

3 - Reduction of the Cost on Duty incident on imported raw material or elevation of cost of duty incident on the import of products to be fabricated.

4 - Financing and guaranty on the side of oficial credit establishments

5 - Income-tax reduction upon aplication of taxes of rapid devalorization.

The petrochemical industry started, in the 1950's establishing itself in a more or less desorganized fashion. This and the other branches of industry viewed more a substitution of imported materials. It didn't appear clear in the mind of the investor the possibilities of dynamic economic growth in a large potencial market, and thus, important parameters, indicators of this growth, were left aside. The implantation of a unit was based upon an historic sequence of consume and foreign exchange economy making these the principle determinants of an industrial capacity.

The criation of the GEIQUIM established, as well, project selection principles which rendered important a planned undertaking in all its technical, economical and legal aspects, guarantying, thus, an incentive to all those presenters of projects. It remained established, also, by the decree which created that governamental organ, the mon-approvation of projets with capacities beyong the market possibilities, and establishing a system which guarantyed the investor against a possible division of market through the appearance of another producer, when that is not sufficient for more than one furnisher and also determining the convenience between projects when there should be more than one presented for the production of the same product.

In this fashion, the technical assistance of the GEIQUIM began to demand from the candidates for project approval closer studies on the market consummer of the product, establishing thus, production capacities more adequate to the necessities of the

countries' development. As consequence, the investor began to feel firmer ground to support projects whose viability could eventually be menanced by the appearance of another competitor, dividing a market bearly able to support one industrial unit.

The legislation in use sustaining the GEIQUIM, established that for those competing projects presented for examination, the followuing preferences should be adopted in the choice between equivalent projects:

1 - Fortification of the National entrepreneur, and capital spreading of the enterprise.
2 - Technical improvement and dissemination of research and experimentation in the country.
3 - Tapering of regional disparities at the development level.
4 - Utilization, with production increase of already existant installations
5 - Less oficial financial support.

There arose great interest for the chemical industry exactly at a time when the undertakers had showed themselves somewhat reluctant to participate in new projects. For the first time there established itself in Brazil undisputable descrimination in favor of the national investor, without, however, creating to the foreign investment, so necessary to the development of the country. Thus developed the national investment in a field of economy which was looked upon until then reservedly due to the problems involving patents, know-how, and secrets which in general surround the chemical processes as well as the interdependance of products within industrial and commercial fields, all contributing to the apparent impossibility of survival in this sector, of a national interpreneur. And one cannot but feel that appearance of such national enterprising stimulated and still is an incentive to foreign capital inversion in the brazilian chemical and petrochemical industry.

Around these incentives to approven projects of the GEIQUIM there are several measures which aim at the rapid concretization of these and which view the elimination of all possible setbacks in the implantation of the enterprise. As to the importation facilities of equipment without national similars, an understanding may be established between the enterprising organization and ABDIB - (Brazilian Association for the Development of Basic Industry) a private entity in existance since 1957, and viewing an assistance to the government in the industrial expansion of national equipment. This association congregates more than 60 enterprises producers of Capital Goods and only in 1969 about 22 agreements were signed, with investments summing US$ 431 million, and a participation ot brazilian equipment of US$ 183 million.

The agreement signed between ABDIB and the investor, which generally is done on a basis of 50% foreign equipment and 50% national equipment, dispenses the similarity comprovation, guarantying rapidness in the implantation process of those equipments specified in the agreement, with tax exemption.

As to the aval concession or guaranty by an oficial credit establishment, the BNDE (National Bank for Economic Development) has had the major activity. This National Bank for Economic Development is a Federal autharchy, created in June of 1952 and is today under the jurisdiction of the Ministry of Planning. The available resources of the Bank built upon the operational balance of the Institution itself and through the remuneration of the Governments' Capital applied in mixed economy societies, excluding Petrobrás and Companhia Siderúrgica Nacional (National Siderurgical Company).

As a means of collecting resources, an additional is charged over the Income Tax. A duty of 10% over the profit is charged from juridical persons and from income of physical persons above a certain level.

The BNDE usually limits its participation to 60% of the cost of a private project, but may, however, give full covering for a governamental project. For this the BNDE is not limited to help a project in verifying its technical and financial viability, or its impact over the community, but tries to give birth to projects, which once implanted may conduce the country to a stage of development. Within this new systematic an accord was signed with Petrobras for equal means for 12 (twelve) petrochemical projects (period of 1968/72) representing a total investment of Cr$ 300 million.

Special funds and programs sponsered by the BNDE are:

a) FIPEME - Financing Program for Small and Medium Enterprises - chanalizing own funds and/or from entities like the BID (International Bank for Development)

b) FINAME - Financing for the Purchase of Machinery and Equipment, which operates by means of a line of more than 200 financing agents constituted by commercial Banks, Investment Banks, Regional and State Banks for Development.

c) FUNDE PRO - Productivity Development Fund, which aims at a dynamization of technical assistance for productivity.

The Bank atributes annually a minimum of 1,5% to the FUNDE PRO of the sum of the funds received from a fiscal and/or budget origin, plus the Funds mon-applied surplus from the anterior exercise.

d) FUNTEC - Technical and Scientific Development Fund, whose a is to promote projects and programs for education and scientific and technical research.

e) FINEP - Financing Funds for Studies of Projects and Programs which is today a public enterprise connected to the "Ministério do Planejamento" - Ministry of Planning.

There are, as well, Regional Banks for Development which are financial institutions of community scope, specialized in loan operations of long or medium periods for the furnishment of fixed or working capital aiming at the economic development. From these the most important are: Banco da Amazônia; Banco do Nordeste, and Banco do Extremo Sul.

What has been happening in Brazil since the establishment of a real capitalistic society in which a vigorous medium class is integrating itself more and more.

The instauration of a strong capital market has derived as a support to investing iniciatives. This capital market is constituted principally by shares from private and public entreprises, Investiment Funds (assembling means from various investors for aplication in a pool of shares from various companies); Acceptance Funds (savings application in the credit or financial sector of the consumer); Exchange Bills (loan conceeded to a commercial or industrial enterprise); Real Estate Bills (negotiable instrument to holder under the responsability of real estate credit societies and with the guaranty of "Banco Nacional da Habitação - National Habitation Bank and Government Security".

The Federal Government incentivates the juridical and physical persons to invest in development projects for under-developed regions and in the stock and shares market by chanalizing part of the income tax due to that region and subtracting investments from the income tax.

For the physical persons the law-decree nº 157 allows a discount of 12% of the income tax when applications are made in a fiscal fund, observing a privation period of two years.

Juridical persons may subtract up to 50% from their income tax for application in determined areas. Optional areas presented for investment are: SUDENE, "Superintendência do Desenvolvimento do

Nordeste" (Superintendance for the Development of the Northeast); SUDAM, "Superintendência do Desenvolvimento da Amazônia" (Superintendance for the Development of the Amazone Region) - (in both regions it is offered to the approven projects 50% income tax exemption during 10 years for the undertaking and a reduction up to 50% of the income tax dued by juridical persons for the investment on projects in the area); SUDEPE, "Superintendência do Desenvolvimento da Pesca (Superintendance for the Fishing Development)"; EMBRATUR, "Emprêsa Brasileira de Turismo" (Brazilian Touring Agency).

Due to the importance which SUDENE has been having in the establishment of the second brazilian petrochemical pole, in the State of Bahia, some considerations become necessary in relation to its activities in the last years.

SUDENE - "Superintendência do Desenvolvimento do Nordeste" was founded in 1959 with the objective of setting in practice the new policy for development of the northeastern region of Brazil.

Thus, all projects approven by the GEIQUIM which are related to the petrochemical industry and designated to the northeastern region, must obtain consent from SUDENE, as well, so as to obtain the fiscal incentives benefits deposited in the "Banco do Nordeste";

Those projects beneficiated with the resources derived from the fiscal incentives deposited in the "Banco do Nordeste" have three qualifications in three distinct priority levels designated by the letters A, B and C, and which are differentiated by means of the number of classification points obtained by the project. Thus, the priority level A, obtains 75% of the fixed investment as SUDENE's participation; level B is conceded 50% and level C obtains 25%.

Such a classification system allows the investor the advantage of applying from his own capital just 25% of the total fixed capital, from which half, that is, 12.5%, may be obtained through the public marketing of preferred capital stock.

With all this there arose a strong capital market withholding the contributions, today, of a vigorous middle class, which is one of the substancial sources for the formation of savings and which decides as well over the destination of these economies. The petrochemical industry, with its high rentability, has become one of the favorits for the application of these economies.

While referring to investment incentivation, one cannot but mention the formation of a substancial groundwork structure on the side of both SUDENE and the Federal Government, having as main purpose the supplying of cheap eletrical energy, water and paved highways.

As a result of the demands imposed by the oficial organs so that the facilities offered by the government could be proven feasible technically and economically through viability studies, several consulting firms began to arise specialized in these specific studies. Today these firms have taken the iniciative of awaking the attention of the investors, advising them as to which investments should be made.

Engineering firms, the most important of which are associated with foreign groups, such as: Foster Wheeler, Lummus, Kellogg, Procon, etc., giving substancial support to the projects, giving aid not only in the detailling but assisting as well the whole implantation of the project.

A growing equipment industry minimizes the evasion of exchange values for importation, an aspect which is being carefully controlled by the "Banco Central" (Central Bank), allowing large participation of the national currency in the investments.

On the other hand we have a great disposability of specialized personnel graduated from the post graduation courses existent, principally from the university centers of Rio and São Paulo, which began in 1963 during a period of economical stagnation gone through by this country. The rapidness of the development boom

has not been according so as to adequately absorb the annual outlet in the job market. Even in the period when the refining industry stabilized itself, Petrobras went ahead with the post-graduation courses for many years preparing, thus, excellent skilled workers which had no possibility whatsoever of adequate jobs at the refineries, but which constitute today the greater part of the reserve destinated to the Petrochemical industry.

Another factor which has, however, given a great push to the rising of the petrochemical industry in Brazil, was the foundation of PETROQUISA, in December, 1967, Being a subsidiary of Petrobras but having, however, more flexibility than the enterprise encharged with the execution of the petroleum state monopoly it has greater possibility of dedication to the petrochemical industry. Thus a new enterprising spirit prediminates in the PETROQUISA due to its association with national and foreing groups, these sometimes as minority, but always viewing above all the boasting of the petrochemical industry. The PETROQUISA has been stimulating national private capital investment to participate in the development of the section for it counts upon the political and financial prestige of PETROBRAS and with the efetive guarantee for the furnishment of raw material.

Although juridically it is a company independant from PETROBRAS, PETROQUISA operates as an administrative entity integrated in the system of PETROBRAS and using, when possible, several of its services.

The two petrochemical plants constructed anteriorly by PETROBRAS: "Fábrica de Fertilizantes" (São Paulo) for the production of nitrocalcium and ammonium nitrate; and "Fábrica de Borracha Sintética" (Rio de Janeiro), were transfered to PETROQUISA together with a unit for the recuperation of sulpher residual gases of the "Refinaria de Duque de Caxias" (Rio de Janeiro) with 33 000 t/year capacity.

In 1968 ended the negotiation for the participation of PETROQUISA in 25% of the shares of "Petroquímica União", an enterprise aiming at the production, in São Paulo, of 300.000 t/year of benzene, 14000 t/year of toluene and 59 000 t/year of xilene. The total investment will be of US$ 84 million.

In 1969, PETROQUISA acquired 20.4% of the shares of the "Companhia Brasileira de Estireno", an enterprise producing at the moment 16.000 t/year of styrene in São Paulo, with a perspective of ampliating to 60.00 t/year. The new investments shall be of US$ 9,3 million. The major share holder is Koppers.

In this same year, PETROQUISA decided to participate with the "National Distillers" and the "Unipar" (brazilian group) in a project for the production of 60.000 t/year of polyethylene, in São Paulo. The investment shall be of US$ 28,5 million and the participation of the PETROQUISA shall be of 35%.

In this year several enterprises have solicited the participation of PETROQUISA, such as: COPETRAM for the production of 1000 t/year of ammonia in the Northeast; FISIBA, for the production of 15000 t/year of acrylonitryl in the Northeast; and CIQUENE for the production of 20 000 t/year of octanol.

What is to be noted is that PETROQUISA, although existing in fact only since 1968, has augmented rapidly its participation in the brazilian petrochemical industry becoming one of the principle factors guarantying incentives for investment in this sector.

THE TWO PETROCHEMICAL POLES

SÃO PAULO

As is to be expected the Brazilian Petrochemical Industry started in São Paulo, which is by far the state which presents the largest income per capita, at the level of many developed countries and which concentrates the largest petrochemical center of Latin America. In Cubatão, in the vicinity of the city of Santos, is localized the Refinery of Cubatão, which was at the time of the foundation of the first petrochemical undertakings, the largest refinery in Brazil. With its ampliation to 175 000 barrils per day added to the construction of the "Refinaria de Paulinia" (120 000 b/day), the total refining capacity of the state of São Paulo shall rise to 326 000 b/day, meaning around 50% of the whole brazilian refining industry.

Thus, the petrochemical industry of São Paulo utilizes naphta as principle raw material.

Starting in 1965, year in which really began the implantation of the petrochemical industry in Brazil and once overcome the pioneering phase of the 50's, the projects approved for the area of São Paulo are as follows:

TABLE "A"

Firm	Product	Capacity (t/year)	Investment US$ 1 000	Situation
1. Empresa Carioca de Produtos Químicos	Dodecylbenzene	11 000	3 000	on stream
2. Union Carbide	Polyethylene	12 000 to 20 000	3 000	On stream
3. Rhodia	N Salt.	21 000		
	Adipic Acid	28 000		
	Ammonia	13 000	9 000	on stream
	Adiponitrile	16 800		
4. Ultrafertil	Ammonia	150 000		
	Nitric Acid	180 000		
	Ammonium Nitrate	180 000	70 000	on stream
	Sulphuric Acid	200 000		
	Phosphoric Acid	75 000		
	Ammonium Phosphate and NPK.	300 000		
5. Eletrocloro	PVC	24 000 to 60 000	10 000	on stream
6. Eletroteno	Polyethylene	6 000 to 32 000	9 000	Engineering
7. Petroquímica União	Ethylene	300 000		
	Propylene	167 000		
	Butbene	100 000		
	Pentene	48 000		
	Benzene	110 000	100 000	under construction
	Toluene	14 000		
	o-xilene	30 000		
	p-xilene	30 000		
8. Liquid Carbonic	Benzoic Acid	1 000	800	on stream
9. Rhodia	Nitric Acid	33 000	2 000	on stream
10. Engeclor	Ammonium Chloride	3 000	300	on stream
11. Urion Carbide	Ethilene	72.500		
	Acethylene	36.300		
	Benzene	15 400	60 000	on stream
	Vinyl Chloride	85 000		
	Polyethylene	19 500 to 62 600		
12. Companhia Brasileira de Estireno	Styrene	60 000	9 000	under construction
13. Rhodia	Phenol	50 000		
	Cyclohexanol	30 000	13 000	" "
	Acetone	30 000		
14. Refinaria União	Propylene Tetramer	30 000	4 600	" "
15. Poliolefinas	Polyethylene	60 000	27 000	Engineering
16. Copamo	Vinyl Chloride Monomer	100 000	15 000	" "
17. Elekeiroz	Phthalic Anhydride	2 000 to 4 800	2 000	under construction
18. Rio Cotia	Formaldehyde	6 000 to 10 000	330	Engineering
19. Brasivil	PVC	40 000	13 000	" "
20. Dow	Propylene oxide	16 000	10 000	" "
	Polypropylene Glycol	14 000		
21. Ucebel	Maleic Anhydride	1 400	400	under construction
22. Oxiteno	Ethylene oxide	27 000		
	Ethylene Glycols	22 000	15 000	Engineering
	Ethanolamine	3 000		
23. Celanese	Nylon 66	3 400	200	" "
24. Huels	PVC	48 000	15 000	" "

The following projects are at the GEIQUIN in competition or in study awaiting approvation. They belong to the São Paulo pole.

	Product	Capacity (t/year)	Investment US$ 1000
1	Thrichloroethylene	8 000	8 000
	Carbon Tetrachloride	8 000	
	Perckloroethylene	4 000	
			4 000
2	Cumene	77 000	
3	Butadiene	50 000	10 000
	Butane and Butene	57 000	9 000
4	Carbon Black	64 000	

BAHIA:

The petrochemical industry in Bahia began to be implanted, as said, due, principally, to the conditions established by the Federal Government, which created financial and fiscal incentives to be conceeded by SUDENE and GEIQUIM, as well as by the conditions established by the Government of Bahia which proportioned the creation of real underground structure furnishing all sort of facilities to the undertakers.

Since the petroleum and gas fields are localized in Bahia the best raw material turned out to be natural gas.

Starting 1965, GEIQUIM approved the following projects for Bahia:

TABLE "B"

FIRM	PRODUCT	CAPACITY t/YEAR	INVESTMENT US$ 1 000	
1 - Ciquine	Phthalic Anhydride	5 000	5 000	on stream
	"	5 000 to 10 000	2 000	under construction
2 - Petroquisa	Ammonia	66 000	17 000	under construction
	Urea	82 500		
3 - Paskin	Methyl Metacrylate	10 000		
	Sodium Cyanide	4 500	23 000	" "
	Ammonium Sulphate	25 000		
4 - Fisiba	Acrylonitrile	15 000		
	Acrylic Fibers	8 000	36 000	" "
	Ammonium Sulphate	5 000		
	Acrylonitrile	1 300		
5 - Polimeros	Polypropylene Glycols	10 000	5 000	Engineering
Aratu	Propylene Glicols	1 000		
6 - Resita	Formaldehyde	10 000	2 000	"
7 - Ciquine	Octanol	20 000	10 000	"
	Butanol	3 780		
8 - Agrobrasil	Polypropylene	15 000	20 000	"
9 - Metanor	Methanol	50 000	6 000	"
10 - Melamina	Melamine	9 000	9 000	"
11 - Bakolar	Styrene	30 000		
	Polystyrene	6 000	3 000	
		34 000		

The following projects are at the GEIQUIM in competitions or in study awaiting approval.

PRODUCT	CAPACITY (t/year)	INVESTMENT US$ 1 000
1 - Ethylene	70 000	16 000
2 - Polyethylene	66 000	28 000
3 - Ammonia	300 000	30 000
4 - Formaldehyde	25 000	
Hexamethylenetetramine	3 000	5 000
Pentaerythritol	3 500	
5 - Polypropylene	30 000	24 500

The following projects, belonging to the Bahia Pole, are being prepared and shall bricfly be examined by the GEIQUIM:

Caprolactam	-	40 000 t/year
D.M.T.	-	30 000 t/year
T.D.I.	-	15 000 t/year

PERSPECTIVES OF MARKET

In order to value the Brazilian possibilities concerning the petrochemical market it is possible to have based on some methodologies that are usually the most applied, a view on the perspectives regarding the growth of the Brazilian domestic market.

It became possible, then, using the regular elasticity income-consumption and knowing the projection of the per capita income and of the population in Brazil, to estimate the future of plastics and resins consumption until 1980.

TABLE I

ESTIMATE OF THE BRAZILIAN CONSUMPTION OF PLASTICS AND RESINS

YEAR	PER CAPITA CONSUMPTION (kg)	POPULATION (10^3)	TOTAL OF PLASTICS AND RESINS (ton)
1970	2.1	96 000	201 600
1971	2.4	98 800	237 000
1972	2.8	101 700	284 700
1973	3.1	104 700	314 500
1974	3.6	107 800	388 000
1975	4.0	111 000	444 000
1976	5.0	114 300	571 500
1977	5.7	117 700	670 800
1978	6.7	121 200	812 000
1979	8.6	124 800	1 073 000
1980	11.0	128 500	1 413 000

In the last years, the percentual of phenolic and aminic resins in relation to the total of plastics and resins, has been average in 22%.

Considering that the tendency of this percentual shall decline until approximately 15% at the end of the decade, we would have the following projections of phenolic and aminic resins, plus having the projections of the demand for formaldehydes , which has had in Brazil up to about 90% of its consumption dedicated to the production of resins, but which shall decline until 80% in the last years of the 1970 decade.

TABLE II

ESTIMATE OF THE BRAZILIAN CONSUMPTION OF PHENOLIC AND AMINIC RESINS AND FORMALDEHYDE

YEAR	PHENOLIC AND AMINIC RESINS (ton)	FORMALDEHYDE (100%) (ton)
1970	41 000	24 200
1971	45 000	26 400
1972	51 000	30 000
1973	56 500	35 400
1974	66 000	41 000
1975	75 000	47 500
1976	90 000	59 500
1977	1 070 000	71 500
1978	122 000	81 000
1979	160 000	106 000
1980	212 000	141 000

In Brazil about 70% of the consumption of methanol goes to formaldehyde. Due our perspective projects we can foresee that until the end of the decade this percentual will decline to 60%. Therefore, the estimate of methanol consumption until 1980 may by seen in the following manner:

TABLE III

YEARS	METHANOL CONSUMPTION (ton)
1970	40 000
1971	43 500
1972	49 500
1973	58 000
1974	72 500
1975	85 000
1976	114 000
1977	137 000
1978	156 000
1979	204 000
1980	270 000

In Brazil today the capacity of methanol production is of 44 000 tons/year. In 1973 when a plant of 50 000 tons/year starts to operate in the state of Bahia, the Brazilian capacity will rise to 94 000 tons/year.

It is estimated that until the end of the presente decade shall occur a rising of 500 to 500 ton/day in the methanol production. The first contacts concerning the planning of the future capacity of the above matter should be immediately started.

Another important petrochemical product, ammonia has ha its consumption evaluated based mainly on the estimated consumption nitrozeniaed fertilizers, hydrogen cyanide, acrylonitrile, polyamides and urea.

The methyl methacrylate consumption has presented in the last years an average percentual of 2% in relation to the total of plastics and resins.

Therefore we may estimate the future consumption of hydrogen cyanide, knowing also the consumption of sodium cyanide, which was estimated through a correlation with the industrial growing index, for which the Government estimates a production of 9% for year from 1970 on.

TABLE IV

YEAR	CONSUMPTION OF METHYL METHACRYLATE (ton)	CONSUMPTION OF NaCN (ton)	CONSUMPTION OF HCN (ton)
1970	4 000	2 100	2 800
1971	4 700	2 400	3 300
1972	5 600	2 700	3 800
1973	6 200	3 000	4 200
1974	7 700	3 400	5 100
1975	8 800	3 800	5 700
1976	11 400	4 200	6 700
1977	13 400	4 700	8 000
1978	16 200	5 200	9 300
1979	21 400	5 700	12 000
1980	28 400	6 300	15 000

There are in Brazil several petrochemical products which have no consumption due to the non-existence domestic supply, as well as the lack of incentive for importation due to custom tariffs. This is an extremely important factor in the appraisal of the real possibilities Brazil has to offer concerning the market. It must be stressed that the correlations with the per capita income, with the industrial growing index or a comparison with the average elasticty of consumption existing in the world are only some more estimations, not showing, however, the real Brazilian potential.

It often occurs in Brazil that an industry once established and having its capacity pré determined by the study of the market, will have to start working on the doubling or triplicating of its capacity just one year after operation begin.

Therefore we can estimate the potential consumption growth of acrylic fibers in Brazil considering a potential of 1% of the world consumption in 1969, and on a growing rate of 10% per year.

TABLE V

YEARS	CONSUMPTION OF ACRYLIC FIBERS (ton)
1970	8 000
1971	8 800
1972	9 700
1973	10 700
1974	11 700
1975	12 800
1976	14 000
1977	15 400
1978	17 000
1979	18 700
1980	20 400

In regard to the consumption of syntetic rubber, we can reach the following estimate, correlating it to per capita income and also departing from the knowledge of the historic consumption.

TABLE VI

YEARS	CONSUMPTION OF SYNTHETIC RUBBER (ton)
1970	88 000
1971	100 000
1972	114 000
1973	129 000
1974	141 000
1975	163 000
1976	183 000
1977	200 000
1978	220 000
1979	240 000
1980	266 000

We assume that the Brazilian development shall increase its consumption of nitrylic rubber from 1972 on, being able to reach up to 2,5% of the total of syntetic rubber in the last years of the present decade.

TABLE VII

YEARS	CONSUMPTION OF NITRYLIC RUBBER (ton)
1972	1 700
1973	1 900
1974	2 800
1975	3 200
1976	4 600
1977	5 000
1978	5 500
1979	6 000
1980	6 700

Among the petrochemical products presenting a reasonable potencial market, with tendency to start as soon as a domestic supply is shown, are the ABS resins.

There is some interest from a private national group in establishing in the Northeast of the country a 10 000 tons/year plant. Petroquisa is also considering the establishment of an unit in Rio de Janeiro. The Unipar Group (Brazilian) also intends to compete in the establishing of a plant in São Paulo. It is easy, therefore, to see that in the following year one or several ABS resin plants shall be aproved by Geiquim.

In 1969, in the United States, the structure of the structure of the consumption of ABS resins represented about 1,5% of the total consumption of plastics and resins. We believe that from 1973 on, it will increase in Brazil from 1,5% up to 2,5% of the end of the 1970 decade.

TABLE VIII

YEARS	CONSUMPTION OF ABS RESIN (ton)
1973	4 200
1974	5 800
1975	8 800
1976	11 500
1977	13 500
1978	20 200
1979	27 000
1980	35 400

Having an estimate of the future consumption of acrylis fibers, syntetic rubber and ABS resins, we could also estimate the consumption of acrylonitrile necessary for the production of those products. There is a project already approved by Geiquim for the production of acrylonitrile (Bahia), whose initial capacity is in the order of 15 000 tons/year, but which could also be increased.

TABLE IX

YEARS	CONSUMPTION OF ACRYLONITRILE (ton)
1970	8 000
1971	8 800
1972	10 400
1973	12 600
1974	14 300
1975	16 400
1976	18 600
1977	21 300
1978	24 400
1979	28 000
1980	32 000

The polyamides demand estimated in Brazil could be made correlating the per capita consumption with the per capita income. Therefore, we reach the following estimate for the future demand.

TABLE X

YEARS	CONSUMPTION OF POLYAMIDS (ton)
1970	23 000
1971	26 600
1972	30 400
1973	34 400
1974	38 600
1975	44 500
1976	49 000
1977	54 000
1978	60 500
1979	65 500
1980	71 500

Regarding the consumption of fertilizers, this is one of the great programs of the Government for the 1970 decade. An aggressive policy is being used by financing the product to the agricultors and by providing the necessary technical assistance. The use of fertilizers has, therefore, been divulged in a very intensive way. The Government has a program of aims regarding the consumption of fertilizers which is intended to be put in practice.

The following estimate of nitrogenited fertilizers consumption in terms of nitrogen has been established by the Government.

TABLE XI

YEARS	CONSUMPTION OF NITROGENATE FERTILIZER IN TERMS OF (ton)
1970	154 400
1971	181 700
1972	212 600
1973	248 700
1974	291 000
1975	340 500
1976	398 000
1977	465 600
1978	520 000
1979	580 000
1980	650 000

Through the estimate made by BNDE for the future production of melamine for which there is already a project in operation with a capacity of 8 000 tons/year and the knowledge that 60% of the phenolic and aminic resins are, in average, represented by the urea-formaldehude resin, the following estimate for the future consumption of urea for the production of melamine and resins may be determined:

TABLE XII

YEARS	CONSUMPTION OF UREA FOR MELAMINE AND RESIN (ton)
1970	16 000
1971	17 000
1972	19 000
1973	20 000
1974	24 000
1975	28 000
1976	35 000
1977	42 000
1978	47 000
1979	52 000
1980	58 000

Having an estimate of the future demand for nitrogenized fertilizers, hydrogen cyanide, acrylonitrile, polyamides, one can determine the amount of ammonia necessary to match that demand.

There is no question that the primary factor will be the consumption of fertilizers and it must be once more emphasized that several steps are being taken to increase this consumption in Brazil.

TABLE XIII

ESTIMATE OF THE BRAZILIAN CONSUMPTION OF AMMONIA

YEARS	AMMONIA FOR NITROGENATE FERTILIZER (ton)	AMMONIA FOR HCN (ton)	AMMONIA FOR ACRYLONITRILE (ton)	AMMONIA FOR POLYAMIDS (ton)	AMMONIA FOR UREA (ton)	AMMONIA TOTAL (ton)
1970	185 000	2 800	2 700	21 200	9 300	241 000
1971	218 000	3 300	2 900	24 600	10 000	258 800
1972	254 000	3 800	3 500	28 000	11 000	300 300
1973	298 000	4 200	4 200	31 600	11 600	349 000
1974	350 000	5 100	4 800	35 600	14 000	409 000
1975	408 000	5 700	5 500	41 000	16 200	474 000
1976	478 000	6 700	6 200	45 000	20 400	556 500
1977	560 000	8 000	7 100	50 000	24 400	649 500
1978	625 000	9 300	8 100	56 000	27 200	725 600
1979	700 000	12 000	9 300	60 500	30 000	811 800
1980	780 000	15 000	10 600	66 000	33 600	905 200

In an overglancing analysis, it is astonnishing to see the rapid expansion of the Brazilian petrochemical products market and somewhat overbearing the understanding of how the planning and the decisions necessary shall accompany this rapid development.

It is already possible to make through the foregoing estimates that until the end of the 1970 decade two ammonia plants of 1000 t/day each shall be working, one of whaich awaits now the approval of the GEIQUIM. As to methanol with a plant of 150 t/day now in the engineering phase, and other with 60 t/day in the start-up phase the previous indicate that in the next ten years the necessity of a 400 or 500 t/day plant, or even our 3rd larger scale production petrochemical plant with 1000 t/day of methanol.

Summing up it is a new industrial era which is beginning for Brazil. The application of larger investments in the construction large embracing plants, brings about not only a growing participation of internal and external economics but also the modern and dynamic enterprising spirit, alisted to a more sophisticated technique for which the Brazilian Universities have been preparing themselves.

The ammonia capacity in operation in this country is today in the order of 400 tons/day by ultrafertil, 100 ton/day by the Cubatão Fertilizers Plant (Petrobrás) and 200 tons/day by Copeb (Bahia), also owned Petrobrás. Once being started the operations by Copetram, which is a part of the "Programa de Metas e Bases" (the official planning of the present Brazilian Government) representig 1000 ton/day of ammonia, we will have about 56 100 ton/year of this product, presuming that Copetram.

We believe that to the end of the present decade it must begin to be considered another unity of 1000 tons/day of ammonia and the location for that should be carefully studied.

RAW MATERIAL AVAILABILITY IN BRASIL

Basically, the principle raw materials used by the petrochemical industry are naphta and natural gas.

The flow of natural gas in Bahia processes itself in the following manner:

TABLE XIV

FLOWING OF NATURAL GAS IN BAHIA

(1 000 m^3)

YEARS	SALES	FIELD APPLICATION	INTERNAL CONSUME	WASTE	TOTAL
1960	66 200	19 200	-	-	535 000
1961	53 700	33 000	38 800	407 200	526 900
1962	27 900	67 000	34 000	380 200	511 300
1963	33 800	129 200	64 500	276 300	503 800
1964	33 400	204 800	72 800	220 700	531 700
1965	33 400	263 200	57 800	329 600	684 000
1966	31 300	209 800	81 700	466 000	788 600
1967	31 300	164 500	86 200	592 500	874 600
1968	7 300	267 800	99 600	608 600	983 300
1969	4 700	230 500	104 900	857 700	1 247 800
1970(*)	3 800	136 000	51 700	412 200	603 700

(*) 1º Semestre.

The following are the furnishing obligations of Petrobrás: (in 1000 m^3/year)

COPEB ..... 76 000 m^3/year
CIQUENE ..... 54 500 m^3/year
WHITE MARTINS ..... 11 000 m^3/year
USIBA (SIDERURGY) .....115 000 m^3/year
PASKIN ..... 9 000 m^3/year
METANOP ..... 70 000 m^3/year

Summing these quantities we obtain a total of 335 500 000 m^3/year. With the new project for 1000 t/day of ammonia (COPETRAM) we would obtain the total of 665 500 000 m^3/year of natural gas a quantity still below that which has been wasted in the last years.

PETROBRÁS existant natural gas reserve is of 27 billion m^3, guarantying substancialy the continuity of petrochemical complex. It is taken into consideration a possible change in the general orientation transfering the known reserves in Bahia of natural gas and petroleum to the petrochemical industry. The petroleum production would originate from other countries, what would be more secure and of higher rentability. On the other hand this would not invalidate the search for petroleum and natural gas as one of the basic objectives of PETROBRÁS.

For Bahia as well, there is a study for a gasoil or even petroleum cracking unit aiming at the obtention of ethylene,propelene, butane, benzene, tuolene, etc. to furnish the petrochemical complex in construction in the Northeast.

As to naphta, some considerations may be made related to the possibility of the Brazilian Refining Industry furnishing the petrochemistry.

At the moment the following represents the refining capacity in Brazil.

REFINARIAS	BARRILS/DAY
Presidente Bernardes	115 000
Duque de Caxias	150 000
Mataripe	52 000
Gabriel Passos	45 000
Alberto Pasqualini	45 000
União	31 000
Manguinhos	10 000
Ipiranga	9 000
Amazônia	7 000
Matarazzo	900
Destilaria Riograndense	400
TOTAL	460 000

With the construction of the PAULINIA REFINERY having an inicial capacity of 126 000 barrils/day; with the ampliations of the MATARIPE REFINERY with 75 000 barris/day and that of PRESIDENTE BERNARDES with 175 000 barris, all projects which shall be ready in the went 3 years, the Brazilian Refining capacity shall augment, around 1971 to cerca 670 000 barrils/day. At the same time there shall begin the production of petroleum coke in the Refineries of Mataripe and Presidente Bernardes having units with the capacity, respectively, of: 60 000 and 20 000 t/year.

Using the cross - section method, we may arrive at the following previsions of petroleum and principle by - products in Brazil.

TABLE XV

CONSUMPTION PREVISIONS FOR PETROLEUM AND PRINCIPLE BY-PRODUCTS:

YEAR	PETROLEUM (1 000 barrels)	GASOLINE (1 000 barrels)	DIESEL OIL (1 000 barrels)	FUEL OIL (1 000 barrels)	LUBE OIL (1 000 barrels)
1970	181 000	59 000	47 000	57 000	2 900
1971	193 000	63 000	52 000	60 500	3 200
1972	204 000	67 000	57 000	65 000	3 500
1973	214 000	71 000	62 000	69 000	3 700
1974	227 000	75 000	67 500	73 500	3 800
1975	238 000	79 500	73 500	78 000	4 100
1976	252 000	84 000	79 000	82 500	4 200
1977	264 000	89 000	86 500	85 000	4 600
1978	274 000	93 000	90 500	92 500	4 900
1979	290 000	99 000	99 000	97 500	5 300
1980	303 000	105 000	106 000	103 000	5 600

What can be deduced from the demand projections just estimated is that in the last years of the presen decade, even considering the expansions programmed by PETROBRÁS and the new recinery of PAULINIA (126 000 b/day) Brazil shall still need 260 000 b/d. One of these new refineries shall be located in Curitiba, according to studies, and the other in the wortheastern region.

The naphta production should attend the necessities of the petrochemical industry, once this program has been fulfilled. If not Brazil will have to import substancial quantities of petroleum derivates.

To be considered is the a growing importation of LPG , sinck only the cities of Rio de Janeiro and São Paulo have town gas. Even the industrialization of schalk, one of the most promising aspects of the Brazilian industrial scene, cannot augment in order to satisfy the raw material need.

The program for intensification of highway construction brings about a larger consume of gasoline.

To prevment future stagnation points, some naphta or natural gas shall have to be imported. At least, this is the prevision that can be given, considering the actual economic situation.

What can be resumedly understood from the Brazilian Petrochemical Industry's evolution is that historical and political factors blocked the take-off started in the 50's. Today, grounded on more rational basis and with a greater amount of foreplanning it reinitiates its implantation, having São Paulo and Bahia as principal centers.

In the São Paulo area, a whole economical structure is being put into practice: capital, manpower and raw materials, all guarantying the maintenance of the enterprise and assuring rapid multiplication.

In the area of Bahia, fiscal and economic incentives are giving rise to economic measures having its exceeding manpower and technicians from the south to this northeastern region. These manpower plus the sources of natural gas then existant are bringing about conditions for the establishment even of petrochemical centers. Such as an 1000 ton/day ammonia unit which shall supply other states of the country and overcoming the transportation costs. The effort and the tenacity, of the northeastern communities, wishing the development of their region, has been an important factor in overcomming all kinds of difficulties in the establishment of a petrochemical pole in Bahia, whose reflex shall extend throughout the whole northeast.

A new mentality is imposing itself in this region. The non self-suficiency of petroleum does not mean an unsurmountable obstacle to the growth of a country. Other ways can come to the same result. Thus, Petrobras views natural gas not only as a petroleum recovery means but also as an important natural resource to be exploited.

Natural gas, economically profitable has only been found

until now, in Bahia. This gas, when directed to the petrochemical mistry alone shall supply not only the already existent projects , but also those due to the presented. The existant reserves are enough to feed Bahia's petrochemical take-off. Natural gas,however, as a raw material for the petrochemical industry cannot be isolated from the general picture of gas consume as source of energy. Several Brazilian Governments have, lately, included in their plans the town gas for large, urban centers. In the past, the importation of gas had been conjectured, but today although the idea has been retaken it shall be submited to a much more detailing and planning, what, before had nor occurred.

Once free from the ghost of self-suficiency in petroleum, Petrobras has now more time to dedicate to the production of shale oil in Brazil, where one of the world's greatest reserves is to be found. In the States of Paraná and Rio Grande do Sul, thc shale is to be found almost at the grounds surface facilitating enormously the mining process, which represents about 60% of the production cost of the shale oil.

In 1971, Petrobrás shall give start to the Prototype Plant for the Shale (1000 barrils per day) applying a self developed process named Petrosix.

A couple of years afterwards construction of the first Industrial Plant shall begin. The capacity has not yet been defined, but it shall most probably turn around 50 000 barrils/day. In Curitiba (State of Paraná) a new refinery will be installed which shall do schale-oil refining. Preliminary studies have indicated that a plant with this capacity may also produce 4000 barrils/day at LPG, 9500 barrils/day of naphta, 850 ton/day of sulphur and 1 500 000 m^3/day of gas.

Thus, shale, propiciates conditions for the constitution of a third Chemical Industrial center without constituting a State's monopoly.

Brazil has lost its fear of large undertakings, and there cannot exist another way for a country of continental dimensions and explosive demografic growth.

In truth the known reserves of gas and petroleum in Brazil are not such to preconize internal facilities of raw material in the near future. However the trend today is toward a more realistic policy of ampliating the refining field, going into the areas of shale and petrochemistry. Thus the effort until now wasted in search of a self-suficiency in gas and petroleum as fuel may be otherwise used. A better policy would be to save the actual reserves which are more designed for petrochemistry.

The petrochemical enterprises undertaken at the end of the 60's have shown the existance of an internal capacity for drawing up funds as well as conditions for gaining the trust of external capital, for investment within the country. The tabu around the association with foreign groups has fallen as well. This through the rise of the Petrochemical Industry when foreign capital has had a large participation in association with brazilian groups in the several undertakings or supply, financing the purchase of equipments and furnishment of engineering and know-how.

Petrobrás which was the pioneer in offering post-graduation courses at the Master level will be probably the pioneer as well in technological research. Two pilot plants are already working on the research for better technical conditions in the obtention of petroleum coke and on shale oil hidrogenation.

The number of technicians acquiring Master and PhD degrees is growing steadily, and these shall eventually dedicate themselves to other researches.

The BNDE (National Bank for Economic Development) and the Ministry of Planning are dedicating all their efforts to

incentivate and support new researches in the technological areas as well as in the economical. Substancial quantities are being invested for such purposes. Exemplifying this governamental striving, it is enought to mention that the contracting for the raising of the Brazilian Energetic Matrix sall cost the government round US$ 5 million.

There is an internal market in expansion and the growth of the per capita income is processing itself at an animating rythm.

A medium class in rapid evolution, acquiring a savings mentality and learning to apply on projects of greater rentability, participates and persues at close distance all the new industrial iniciatives. Never before has the stock market exchange been so interesting in Brazil.

As to the enterprising aspect there prevails in the administrative structure of the companies the traditional family structure, highly centralizing in its form. However, foreingn influence, administration courses and the demands of the government itself as to the maintenance rentability of modernly directed enterprises with new technologies and complex problems are slowly changing this traditional entrprising mentality. The Petrochemical Industry is, thus, giving rise to this new class of entrepreneurs.

Market conditions with ever growing consume, capital market conditions in expansions, governamental decisions, an enrichment in educational level, all are providing basis over which the Brazilian Petrochemical Industry may expand itself more rapidly in this decade, supported by a political environment where a rational nationalism does not creat obstacles to external support. The development objectives, in the meawhile, are in accordance with the prevailing structural aspects which cannot be changed so quickly.